

Matrix Plus II System

Volume III

Maintenance Manual

Clear-Com Part #810183, Rev F

Software Version 12.0



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Matrix Plus II System Maintenance Manual
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Clear-Com Systems
945 Camelia Street
Berkeley, California 94710-1484
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Congratulations on your purchase of a Matrix Plus II Intercom System. The Matrix Plus II System includes sophisticated hardware and software components that can be configured in many different ways. The three-volume set of the Matrix Plus II System Manual will guide you through installation, operation, and troubleshooting/maintenance of your system.

THREE-VOLUME SET DESCRIPTION

This is **Volume III — Maintenance Manual**. This manual includes troubleshooting and maintenance information on the Matrix Plus II System. The Maintenance Manual also provides schematics and bills of materials for each Matrix Plus II System hardware component. Technical Personnel will use the Maintenance Manual for locating solutions to common problems encountered in using the Matrix Plus II System.

Volume I — Operation Manual — describes the use of the Matrix Plus II System. In the Operation Manual, intercom station operators and other Matrix Plus II System users will find detailed instructions on the use of the Matrix Plus II System components, including the PGM-12 Configuration Program.

Volume II — Installation Manual — describes how to install a Matrix Plus II System and includes the specifications of each Matrix Plus II System component. Technical Personnel will use this Installation Manual when installing the Matrix Plus II System.

All of these manuals are written for beginning users of Matrix Plus II Systems, however some experience with basic intercom systems is assumed. To use the PGM-12 Configuration Program, you must have some familiarity with your IBM-PC or compatible computer and the MS-DOS Operating System. External devices which are not supplied with your Matrix Plus II System are not covered in this manual. External devices include external party-line intercom systems, audio devices, and other hardware connected to the matrix through 4-wire connections or Matrix Plus II System Interface Modules.

HOW EACH MANUAL IS DIVIDED

Each of the three manual volumes is divided into chapters and sections. Chapters are marked by divider tabs labeled with the name of the chapter. The Chapter titles are Contents, Overview, Stations, Configuration, Matrix Cards, Interfaces, Frames, and Index. With the exception of the Contents, Overview, Frames and Index Chapters (these do not contain Sections), the page following the Chapter divider lists the Sections that are contained in each Chapter. These Sections are marked by numbered dividers.

Page numbering begins at page "1" for each Chapter. With the exception of the Contents and Index Chapter (which use Roman numerals), each page is referred to by its Chapter letter, Section number, and page number. For example, the first page of the Section on the ICS-2002 Intercom Station is found on page "S1-1". "S1-1" stands for Station Chapter, Section 1, page 1".

To locate this page, turn to the Chapter divider tab labeled "Stations", and then turn to the next divider tab labeled "1".

CUSTOMER SERVICE DEPARTMENT

The Matrix Plus Customer Service Department is available to answer questions not covered in this manual.

Clear-Com Customer Service Department
Clear-Com Intercom Systems
945 Camelia Street
Berkeley, California 94710-1484
Telephone: (510) 527-6666
Telefax: (510) 527-6699

WARRANTY AND REPAIRS

CLEAR-COM LIMITED WARRANTY

Clear-Com products are warranted to be free from defects in materials and workmanship for a period of one year from the date of sale.

Clear-Com's sole obligation during the warranty period is to provide, without charge, the parts and labor necessary to remedy covered defects appearing in products returned prepaid to Clear-Com, 945 Camelia St., Berkeley, Ca. 94710-1484; U.S.A.

This warranty does not cover any defect, malfunction or failure caused beyond the control of Clear-Com, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the Manual, defective or improper associated equipment, attempts at modification and repair not authorized by Clear-Com, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

To obtain warranty service, follow the procedures described below in the sections "Repairs" and "Shipping Instructions".

This warranty is the sole and exclusive express warranty given with respect to Clear-Com products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

Any and all implied warranties, including the implied warranty of merchantability are limited to the duration of this express limited warranty.

Neither Clear-Com nor the dealer who sells Clear-Com products is liable for incidental or consequential damages of any kind.

REPAIRS

Through your Dealer — If repair of Matrix Plus System hardware products is necessary, contact the dealer where the unit was purchased.

Through the Factory — If repair through the dealer is not possible, contact the Clear-Com Customer Service Department at the address listed (refer to **CUSTOMER SERVICE DEPARTMENT** on the previous page).

Be prepared to provide your company's name, address, phone number, name of person to contact regarding the repair, type and quantity of the equipment, description of the defect, and the equipment serial number(s).

If return of the product to the factory is authorized, the Clear-Com Customer Service Department will issue you a Return Authorization ("RA") Number. Do not return any equipment to the factory without first obtaining a Return Authorization Number.

WARRANTY REPAIR EXCHANGE PROGRAM

All warranty repair of Matrix Plus II System is covered by the following exchange program. This exchange program is limited to major parts of the system. Major parts are defined as one of the following:

- Crosspoint Cards
- CPU Controller Cards
- Intercom Station
- Interface Module
- Power Supply Module
- Matrix Card Frame
- Power Supply

After issuing an RA number, Clear-Com will immediately ship a replacement part(s). The customer will be billed for the exchange item and credited when the defective part is returned, in repairable condition, to Clear-Com with the proper RA number. Clear-Com will pay freight charges on equipment we send out. The customer will pay freight on all return items.

All warranty work is to be performed at the Clear-Com factory. All service at the customer's facility will be charged at the current quoted rate plus expenses and transportation.

SHIPPING INSTRUCTIONS

All shipments of Clear-Com equipment must be prepaid via United Parcel Service or the best available shipper. The equipment should be shipped in the original packing container. If the original container is not available, use a suitable container that is rigid and of adequate size. If a substitute container is used, the equipment should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material. All shipments should be directed to the attention of the Customer Service Department and must include the Return Authorization Number.

Upon completion of repairs, equipment will be returned collect via United Parcel Service or other specified shipper.

SOFTWARE LICENSE AGREEMENT

Clear-Com Systems ("Clear-Com") provides this software program and firmware for the Matrix Plus System and licenses its use. You assume responsibility for the selection of the program and firmware to achieve your intended results, and for the installation and use of, and results obtained from, the program.

"Program" in this agreement refers to the PGM-12 Configuration Program computer software ("MXPLUS2"). "Firmware" in this agreement refers to the operating software stored in ROMs throughout the Matrix Plus System.

License The computer program and firmware contains confidential information pertaining to Clear-Com. You may not modify, reverse compile, rent, lease, or distribute the computer program or firmware, or any copy, in whole or in part.

You may use the program only on a single machine. You may copy the program into any machine-readable form for backup purposes in support of your use of the program on the single machine.

You may transfer the computer program, firmware, and license to another party if the other party agrees to accept the terms and conditions of this agreement. If you transfer the program, you must at the same time either transfer all copies (whether in printed or machine-readable form) to the same party, or destroy any copies not transferred. Clear-Com grants a license to such other party under this agreement and the other party will accept such license by its initial use of the program. If you transfer possession of any copy of the program and firmware in whole or in part to another party, your license is automatically terminated.

Termination The license is effective until terminated. You may terminate it at any time by destroying the program, together with all copies. You also will terminate upon conditions set forth elsewhere in this agreement or if you fail to comply with any of the terms or conditions of this agreement. You agree upon such termination to destroy the program together with all copies.

Limited Warranty Clear-Com warrants that the Matrix Plus II software, firmware and the accompanying media will perform substantially in accordance with the specifications set forth in the accompanying documentation. Clear-Com does not warrant that the functions contained in the program will meet your requirements or that the operation of the program will be uninterrupted or error-free.

Limited Remedies If the Clear-Com software, firmware, or media fails to perform as warranted, Clear-Com will replace it within the warranty period. Clear-Com will at its sole discretion also endeavor to fix any software/firmware problems as stated in the **Limited Warranty**. In no event will Clear-Com be liable to you for any lost profits, lost savings or other incidental or consequential damages arising from use of, or inability to use, any program, even if Clear-Com or an authorized Clear-Com representative has been advised of the possibility of such damages, or for any claim by any other party.

Some States and Provinces do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Clear-Com's liability to you for actual damages for any cause whatsoever, and regardless of the form of the action, will be limited to the money paid for the program and firmware that caused the damages or that is the subject matter of, or is directly related to, the cause of the action.

General Any attempt to rent, lease, or sublicense the program, or (except as expressly provided in this agreement) to transfer any of the rights, duties or obligations under this agreement is void.

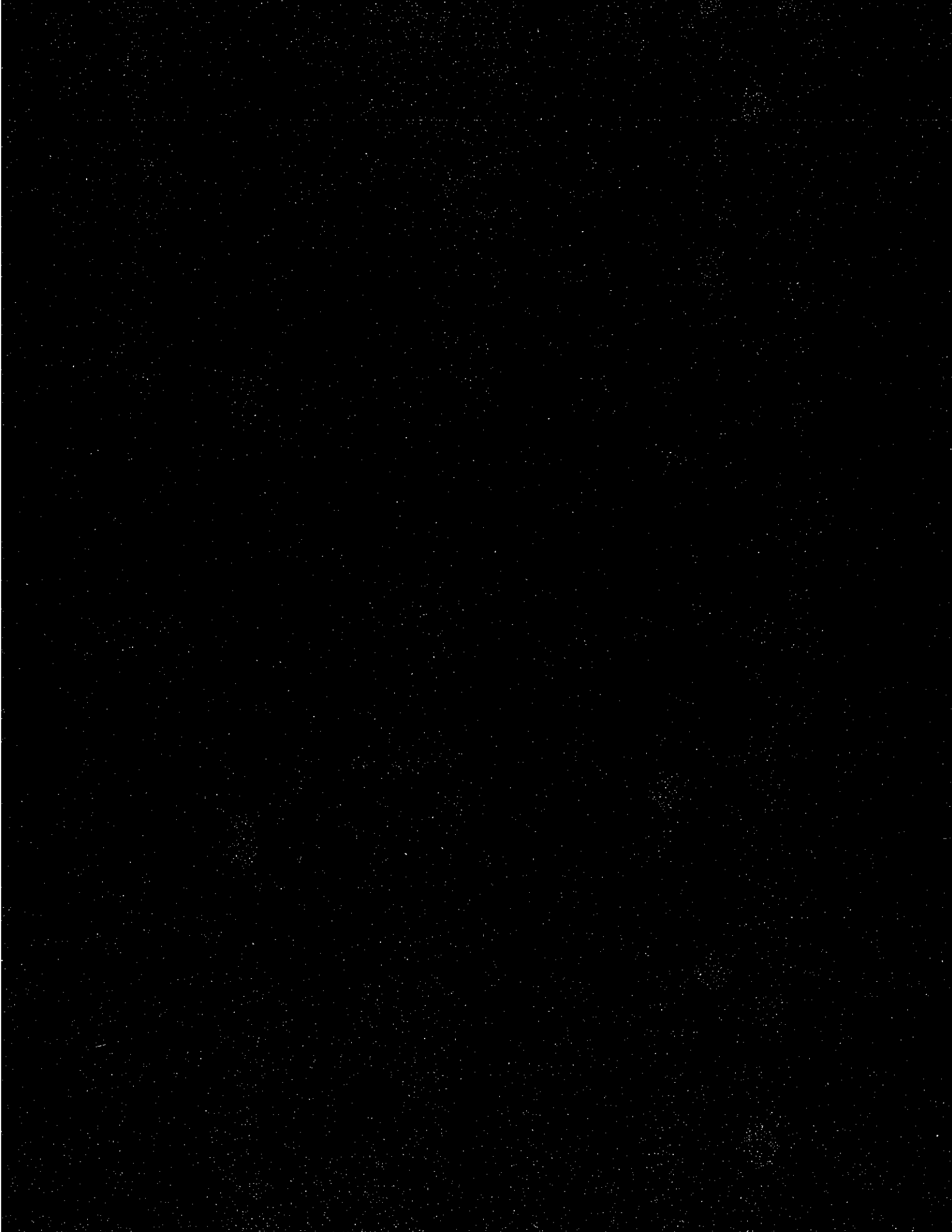
The agreement will be construed under the laws of the State of California, except for that body of laws dealing with the conflict of laws. If any provision of this agreement shall be held by a court of competent jurisdiction to be contrary to law, that provision will be enforced to the maximum extent permissible, and the remaining provisions of the agreement shall remain in full force and effect.

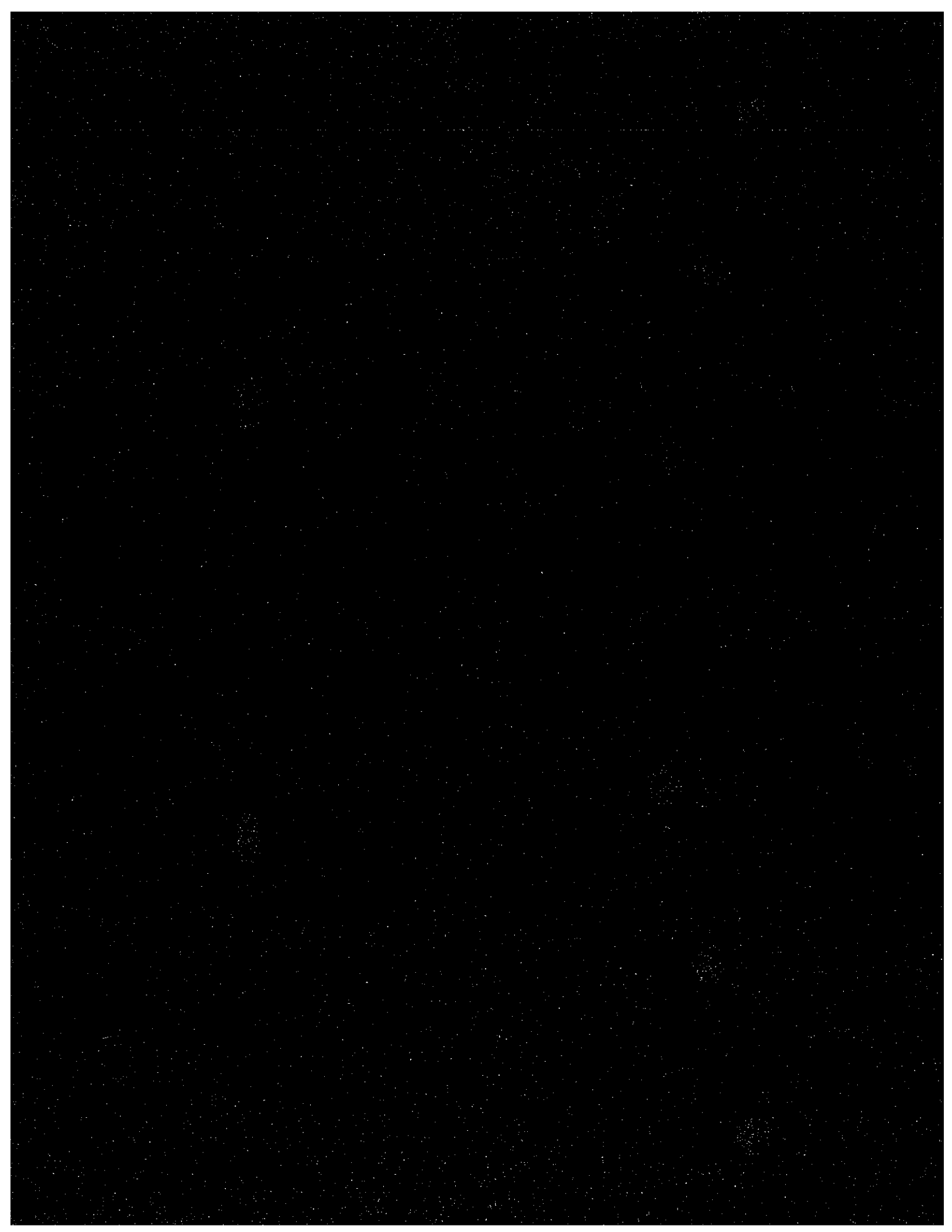
NOTICE REGARDING SPECIFICATIONS

Performance specifications included in this Maintenance Manual are "design-center specifications" and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

NOTICE REGARDING SAFETY

Caution: These Servicing Instructions Are For Use By Qualified Personnel Only. To Reduce The Risk Of Electric Shock, Do Not Perform Any Servicing Other Than That Contained In The Operating Instructions Unless You Are Qualified To Do So. Refer All Servicing To Qualified Service Personnel.





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Introduction

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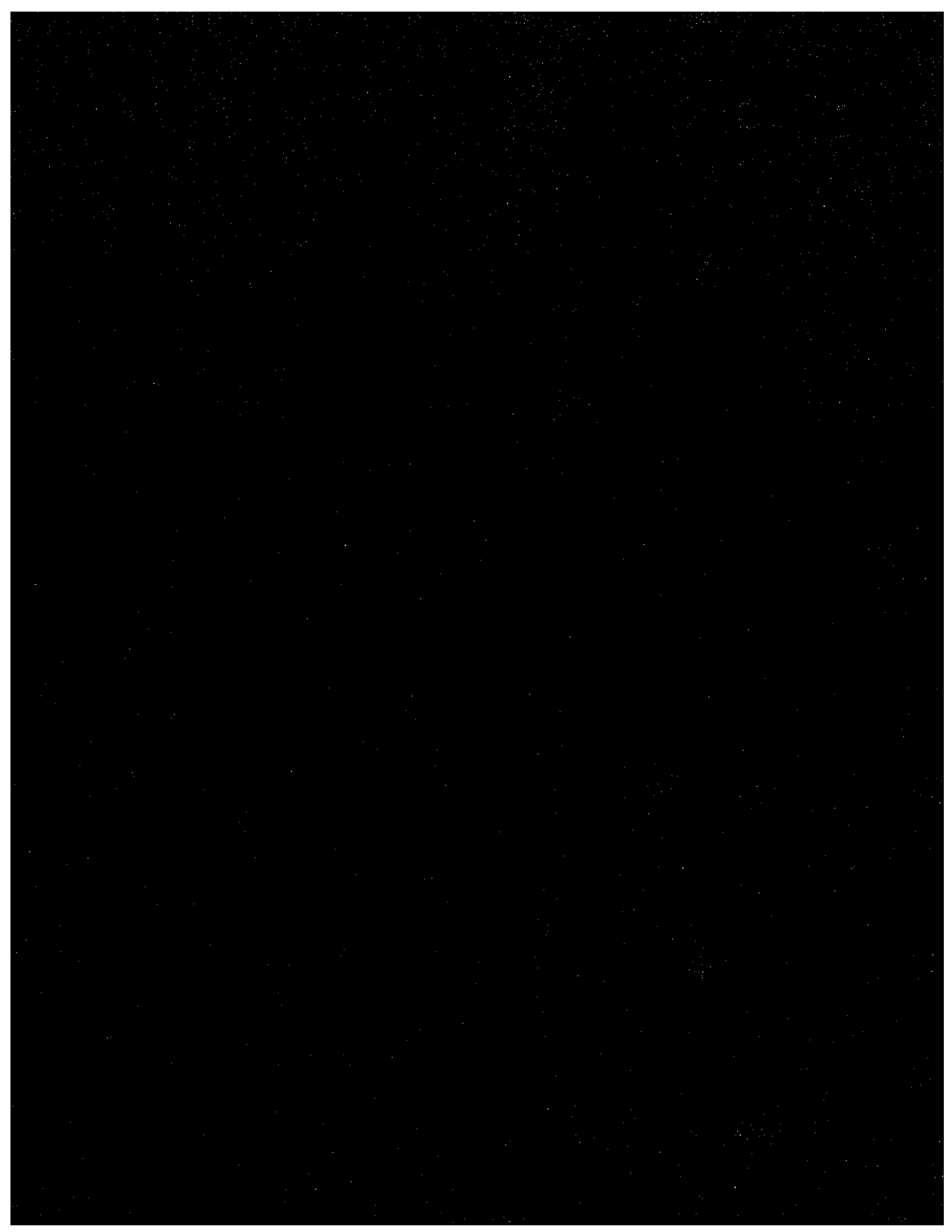
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FIGURE F6-5 Schematic - MCF-10 Frame, Power Connector PCB, Rev. A	F6-12

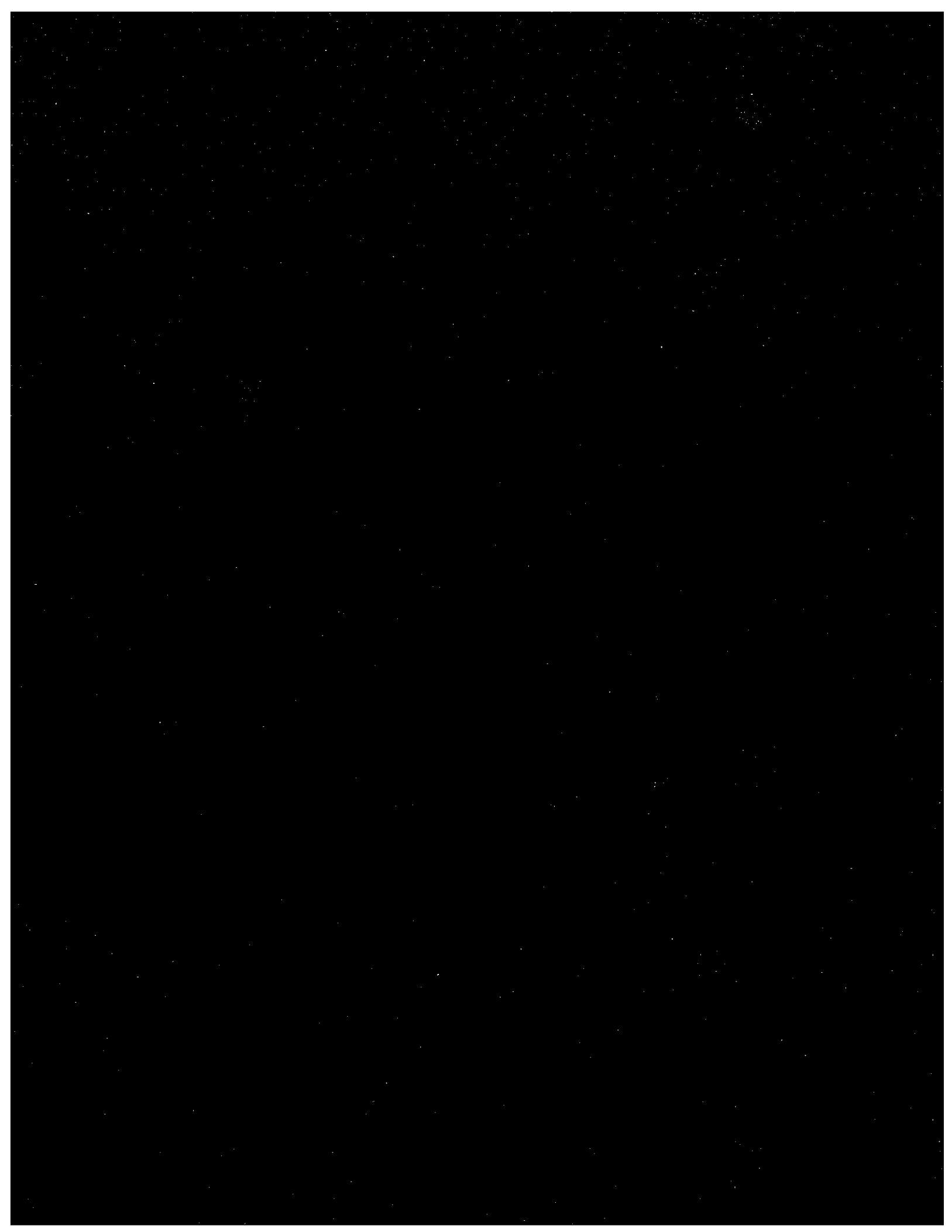
Introduction

FIGURE F7-1 Schematic, Overall - IMF-1 Frame, Rev. A

F7-1

F7-3





Introduction

This Chapter describes the overview of troubleshooting and technical reference materials for each of the components in the Matrix Plus II System.

Each Section in the *Maintenance Manual* contains some or all of the following topics as appropriate:

- Troubleshooting procedures that describe symptoms and solutions to solve the most common problems as they occur.
- Block Diagrams, Schematics, Assembly Drawings and Component Lists describing the digital and analog circuits including the miscellaneous printed circuit board (PCB) components.

The remaining paragraphs in this Overview Chapter provide the following:

Reliability This section is a summary of the Matrix Plus II System design features that affect reliability and maintenance.

Recommended Spare Parts This section provides a list of recommended spare parts.

System Troubleshooting This section provides some guidelines on system troubleshooting that address the common situations encountered when using the system.

Reliability

High reliability is one of the primary objectives in the design of the Matrix Plus II System. During the design phase of the product, numerous failure modes were analyzed in great detail and a design was created that minimizes the effect of component failures.

Dual/Redundant Power Supplies

The matrix frame can be provided with two power supplies, each with its own separate mains AC power cord. The Matrix Plus II System can operate normally on either supply, so that if one mains AC supply fails, or one of the power supply modules fails, the system can still operate.

A set of alarm relay contacts are provided with each power supply. These alarm relay contacts close if any of the power supply outputs fail. The relay contacts can be wired to an alarm that sounds at a remote location to alert operators that all or part of the power supply system has failed. The failure of only one of the two power supply modules will cause the relay contacts to close, but the Matrix Plus System will continue to operate normally.

"Hot Patch" Capability

All circuit boards in the matrix frame, all interface modules, and all power supplies are "hot patchable". This means that they can be installed or removed from the system while the power is on, and they will neither damage the system or be damaged themselves. System operation is not disturbed by insertion and removal of components, and the system's microprocessor smoothly incorporates a newly added card.

Component Isolation

If one crosspoint card malfunctions, it only affects the operation of the two intercom stations or interfaces connected to the ports on that card, with rare exceptions. In all cases, removing the faulty card removes any effect on other components in the system.

"Fail-Safe" Talk Paths

Each crosspoint card has its own microprocessor and its own talk path crosspoints. Each crosspoint card can activate talk paths regardless of the condition of other cards or components in the system, including the CPU-100 Master CPU Controller Card and CPU-150 Slave CPU Controller Card. Should the CPU-100 or CPU-150 fail, the system is only partially disabled because stations can continue talking to each other. Stations cannot activate new listen paths or deactivate existing ones, because activating listen paths requires communications between crosspoint cards, which is managed by the CPU-100

Automatic Station Reconfiguration

If any intercom station in the system is removed and another installed in its place, that station's configuration is automatically sent to the replacement by the Matrix Plus II System. For example, if one ICS-2002 intercom station is replaced by another, the configuration of the original station will be sent to the replacement station within seconds of being plugged in. This is possible because the complete configuration of each station is stored in the crosspoint card that the station is connected to in the matrix frame. To further enhance this feature, the same type of station is not needed at the same location. The software is intelligent enough to configure for an ICS-102 after an ICS-2002 has been replaced by an ICS-102.

Automatic Crosspoint Card Reconfiguration

If a crosspoint card in the matrix frame is removed and another of the same type is installed in its place, the CPU-100 Master CPU Controller Card will automatically send it the complete configuration for the two stations or interfaces associated with the new crosspoint card. That configuration information is then sent automatically to the stations or interfaces.

Automatic Frame Controller Card Reconfiguration

If a CPU-100 is replaced for any reason while the system is operating, the current configuration is still resident in the MTX cards in the frame. The new CPU-100 will up-load any legitimate configurations that reside in MTX cards and continue on. All talk paths are maintained.

Recommended Spare Parts

To facilitate quick repair of the system with minimum down-time, keep a set of fully operational spare components at your site. A minimum list is as follows:

- 1 - MTX-100 crosspoint card.
- 1 - MTX-200 crosspoint card.
- 1 - STX-101 expansion crosspoint card.
- 1 - CPU-100 master controller card
- 1 - CPU-150 slave controller card (if used in the system).
- 1 - PSU-102 System Power Supply (if used in the system).
- 1 - Each of every Intercom Station type installed in the system. If a mix of standard and "Digital" stations are used, a more economical method would be to stock 1 each of an ICS-2002 and ICS-2002D with OPT-100s installed that can be used anywhere in the system.
- 1 - Each of each interface type used

System Troubleshooting

The following section is an overall guide to troubleshooting the system as a whole. The use of RESET switches is discussed. A table of symptoms and possible solutions for trouble shooting the overall system is also presented. Each individual chapter for each product also will contain a table of symptoms and possible solutions.

If you are unable to resolve your problem, call the factory at the number listed under the heading Customer Support in the Contents Chapter of this Maintenance Manual.

Reset Switches

All of the components of the Matrix Plus II system that contains microprocessors have local microprocessor RESET switches available from the front of the unit that will re-start that microprocessor's program from its beginning.

The CPU-100 Master CPU Controller Card has two reset pushbuttons, one for resetting all crosspoint cards in the matrix frame simultaneously, and another for resetting the CPU-100 card itself. Each crosspoint card has its own reset pushbutton that resets the microprocessor on that card only.

Each intercom station has a front panel accessible RESET pushbutton. The RESET pushbutton is available through small unmarked holes on the front panel. To access the RESET switch use a small screwdriver or piece of wire to press the internal RESET pushbutton behind the hole. Refer to each chapter on the individual stations for location.

Troubleshooting

The following section is a list of symptoms of problems and possible solutions.

1. The entire system seems to be operating except for one crosspoint card.
 - Reset that crosspoint card only. Only that card and any stations connected to it will be effected.
2. The stations appear to operate, but the Frame Data Communication LED indicators on the crosspoint cards are not blinking. Blinking Frame Data Communication LEDs indicate that frame controller communication is present.
 - Reset the CPU-100 card only (top pushbutton on CPU-100 card).
3. Several components in the system are operating incorrectly, and neither of the above solutions solve the problem.
 - Reset both the CPU-100 and all crosspoint cards by pressing both reset pushbuttons on the CPU-100 card. This has the same effect as cycling the mains AC power to the matrix frame.
4. The configuration information in the CPU-100's battery backed memory is lost, labels have names like "PL01", "PL02" and the Default LED is on.
 - This means that the CPU-100 cannot find any configuration information and has used its "minimum" configuration. The CPU-100 looks for configuration information in the battery-backed RAM.
 - Check that the Battery Disconnect jumper is placed properly. If this jumper is not in place, the battery-backed RAM loses its configuration information when power is removed from it.
5. The CPU-100 card is acting strangely, including resetting itself intermittently.
 - If you for some reason you do not want the battery connected, be sure that the Battery Disconnect jumper is placed across the sets of pins toward the rear of the CPU-100 card, which grounds the battery monitoring circuit as required for correct operation.
 - Check that the Battery Disconnect jumper is placed across its own set of jumper pins, connecting together the pair closest to the front of the card.

6. Configuration of the Matrix Plus System hopelessly corrupted.

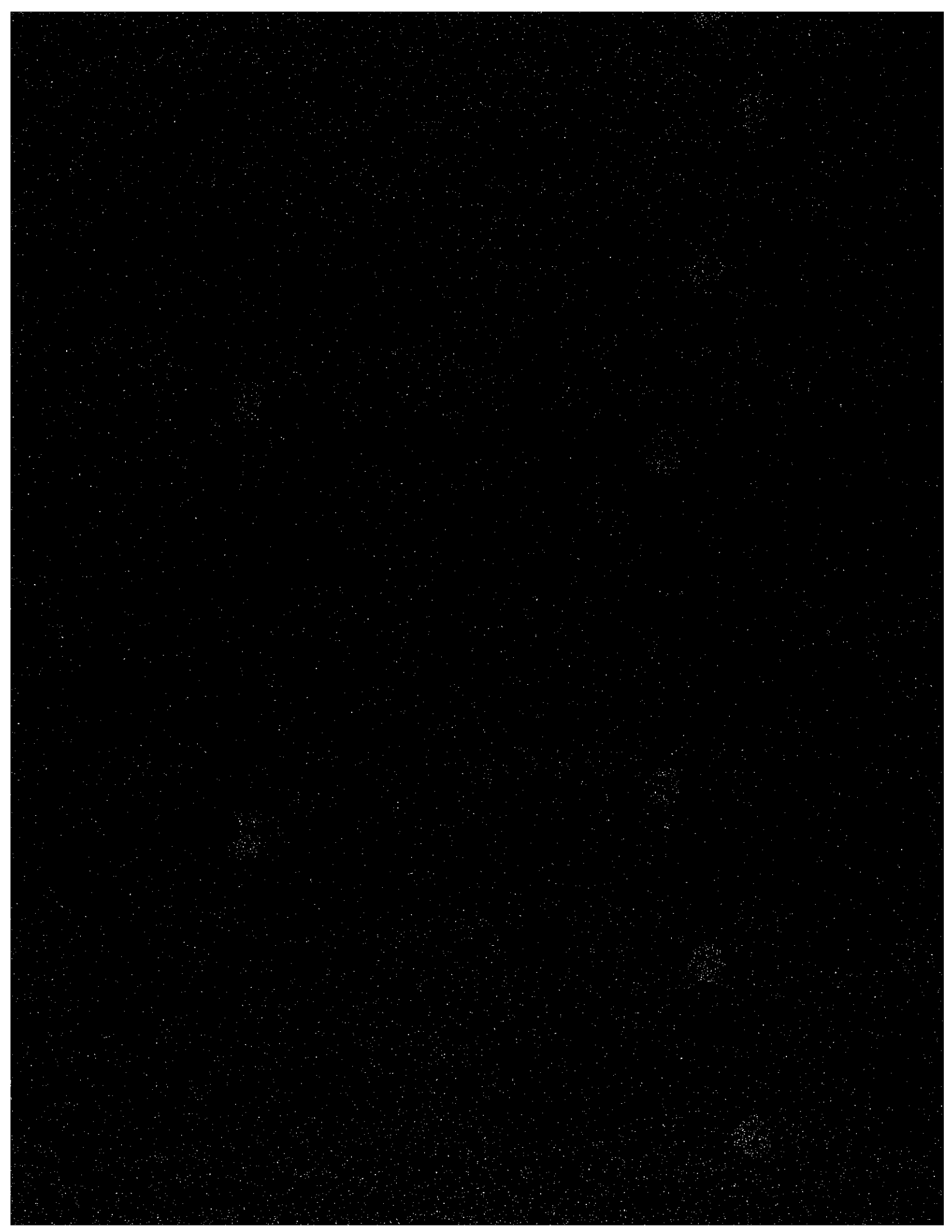
- Press both reset pushbuttons on the CPU-100 while holding the DEFAULT memory button. This forces a complete restart of the system using the default battery-backed RAM for a configuration source.
- If the above does not work, down-load the configuration from the PC.
- The configuration could be faulty and cause the RAM configuration to be unrecoverable. Restart the RAM on the CPU-100 with the following procedure:
 1. Remove the CPU-100 from the frame.
 2. Remove the Battery Disconnect jumper and place in the OFF position for five seconds and then place it back in the ON position. This will clear all of the RAM memory.
 3. Place the CPU-100 back in the frame and press both reset buttons. This will place a default configuration in RAM which has twelve party-lines established and assigned to the first twelve keys of all stations. It is possible to use the system with this simple assignment of keys to check out the hardware of the system. If the system works in this configuration it is safe to assume that the configuration is faulty.
- If the above steps do not work, replace the CPU-100.

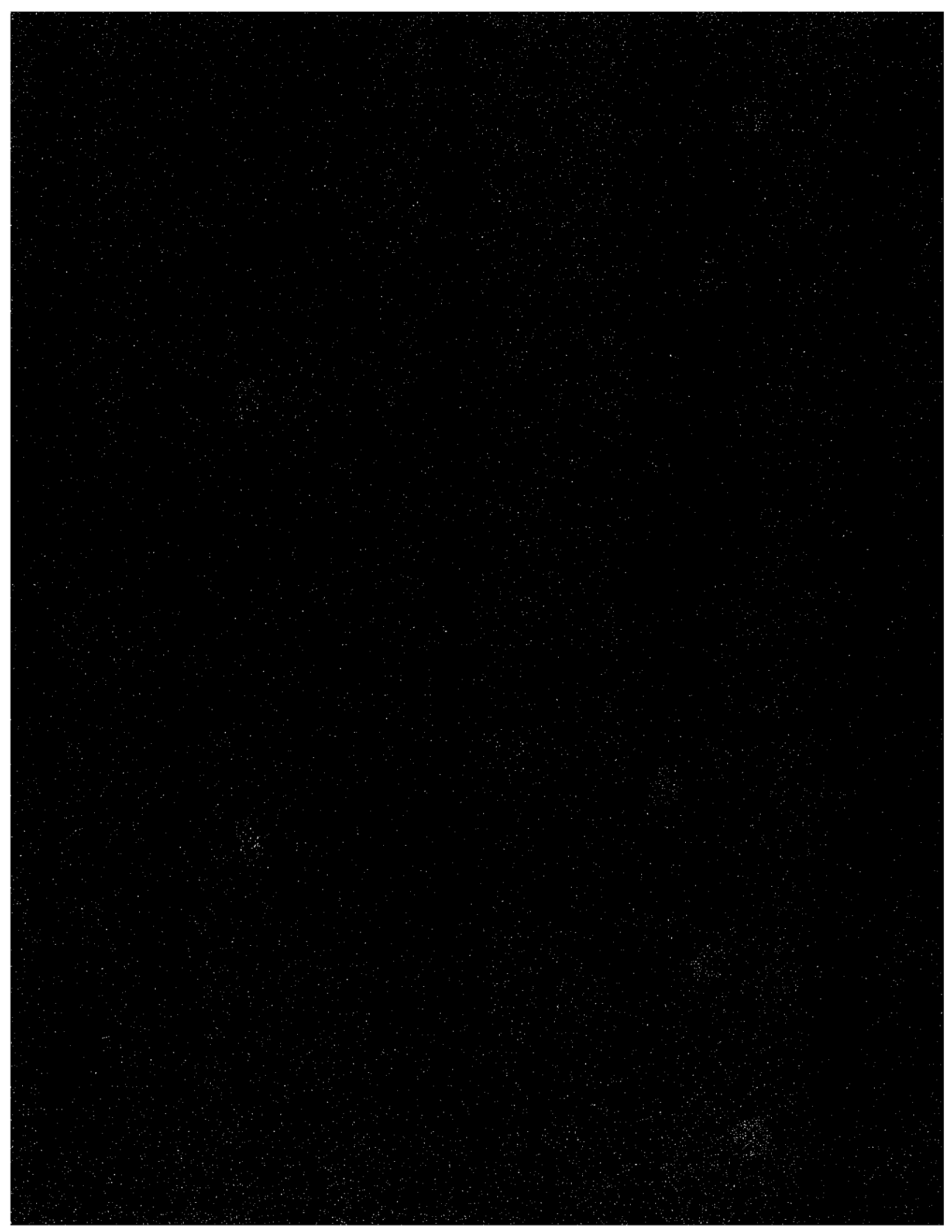
7. Stations do not receive call signals, answerback indication, or other communications from other stations (except for audio on active talk paths).

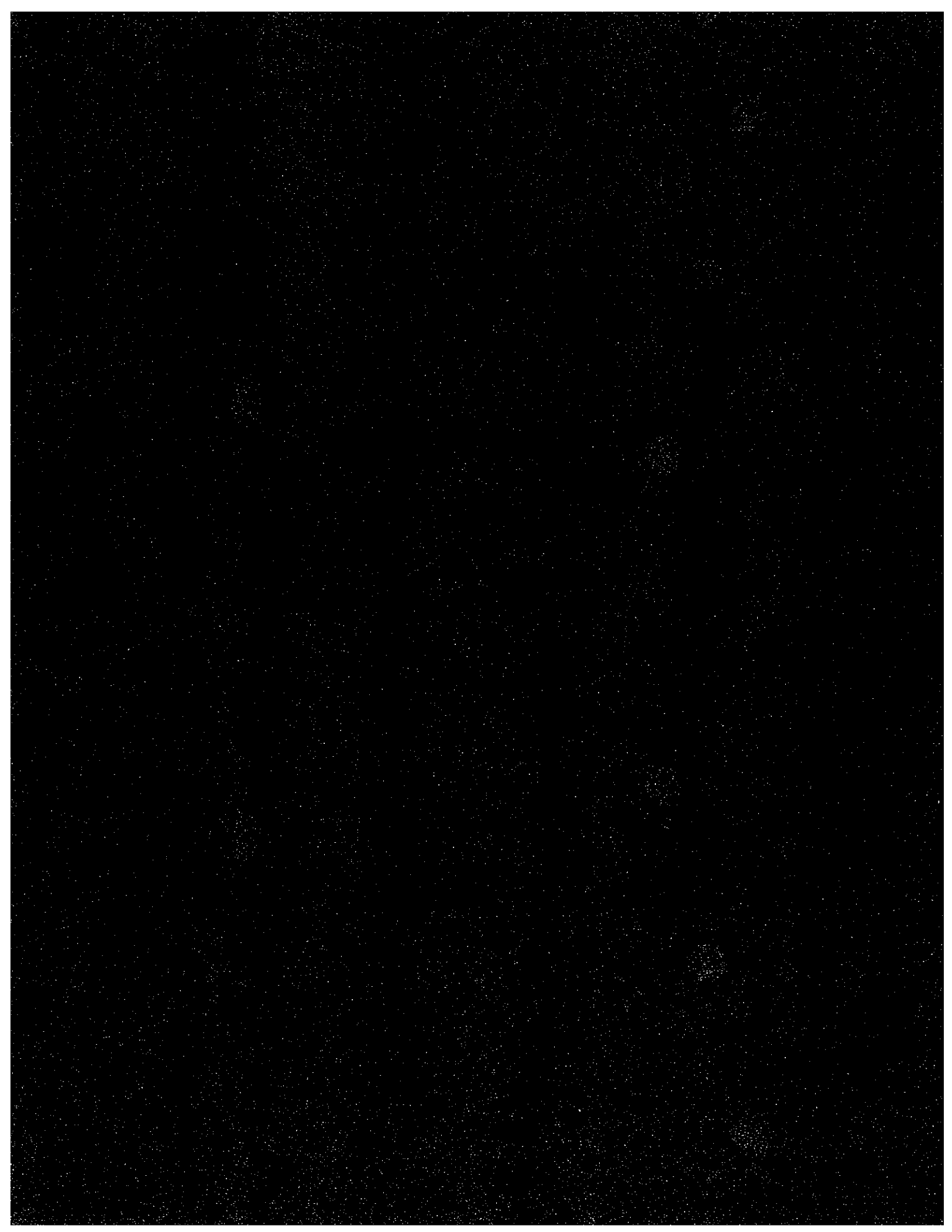
- Check that the Frame Ser LED (green) indicators are blinking in the matrix frame, indicating that the CPU-100 is communicating with the crosspoint cards. If they are not blinking, reset the CPU-100 card. If that does not initiate the cycling of the LED indicators, replace the CPU-100.

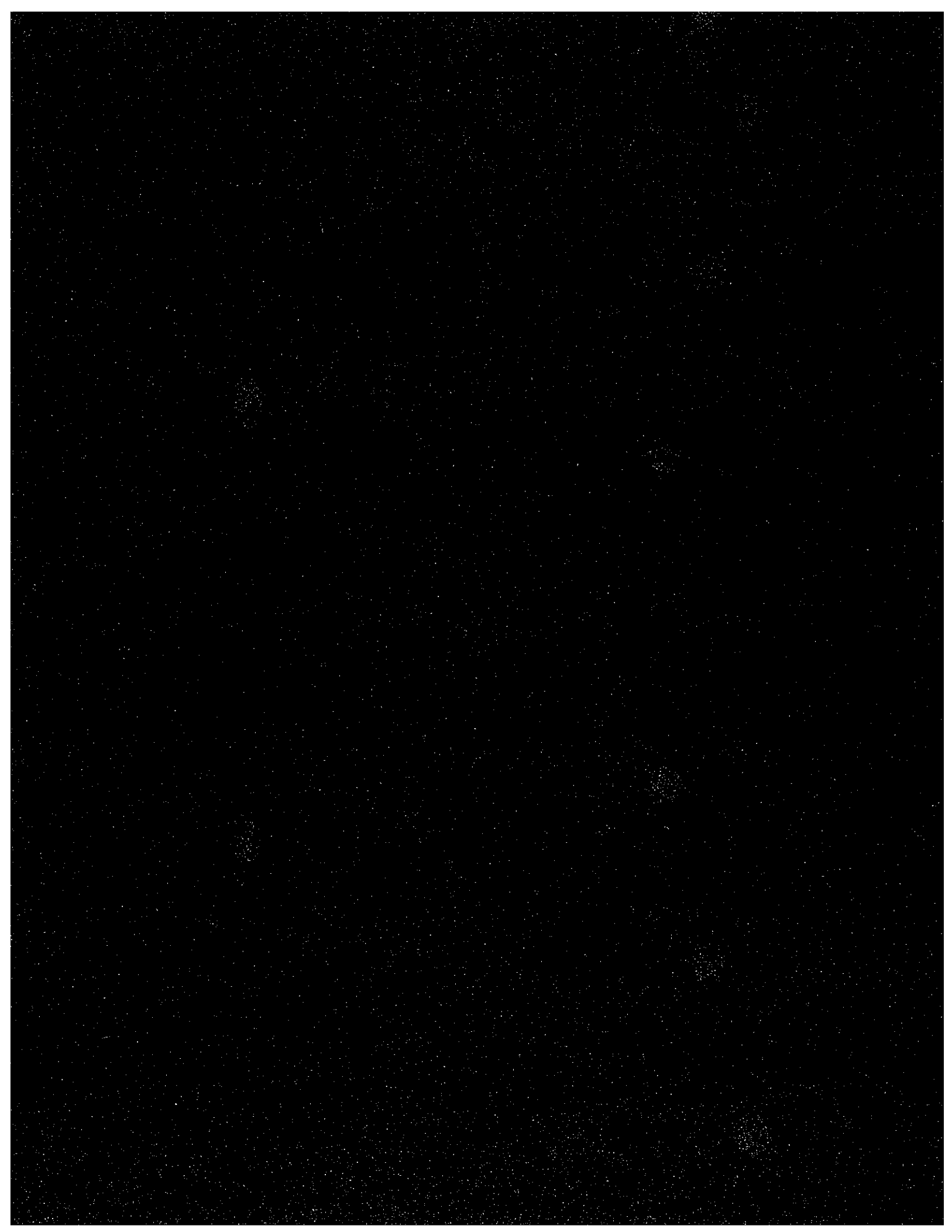
8. The matrix is dead. No LED indicators are on at all.
 - Check the mains AC power to the matrix frame.
 - If mains AC power is present, check the mains AC power cable to the PSU-102 Power Supply Module, and check the connection of the multi-pin connector between the PSU-102 and the Matrix Card Frame.
 - If mains AC power is definitely coming into the matrix frame, check the AC fuse on the rear of the PSU-102.

9. Interfaces in IMF-1 Interface Frame are not functioning properly.
 - Check connections between IMF-1 and Matrix Card Frame including ground.









Introduction

This Section provides instructions on resetting the station's microprocessor, using the Maintenance Menu in the ICS-2002, troubleshooting guidelines, schematics, assembly drawings and component lists for the following products:

- ICS-2002 Master Intercom Station
- ICS-2002D Digital Master Intercom Station
- ICS-1802 Master Intercom Station
- ICS-1802D Digital Master Intercom Station
- OPT-100 Auxiliary Audio Input/Output Option
- XP-12 10 Key Expansion Key Panel
- XP-22 20 Key Expansion Key Panel



The ICS-1802 is identical to the ICS-2002 except the keypad on the right side of the ICS-1802 does not contain all of the keys. Local programmability and DTMF dialing is not available. There is a jumper on the front panel that is placed in different positions for the two station types to allow the Configuration Software to identify the station type.

The "D" version of the ICS-2002 and ICS-1802 is the same except for the transmission method to the Matrix frame. The standard version station uses a 2-wire RS-422 data path and 4-wire analog audio paths to the Matrix Frame. The "D" versions use a single 2-wire digital transmission scheme for both data and audio. The communications portion of the circuit is separated from the main PCB and is mounted on the rear panel of the station. The program EPROM is also different for the two stations.

Station Reset

The microprocessor in the station has a RESET switch accessible from the front panel of the unit. This pushbutton switch is located behind an unmarked hole just below the green MIC ON led on the left side of the unit. If the station is acting erratically, try resetting the station.

To reset the station use a small screwdriver or a stiff piece of wire to activate the pushbutton switch behind the RESET hole. Unplugging and reconnecting the AC power to unit will also reset it.

Maintenance Menu (ICS-2002 and ICS-2002D only)

The Maintenance menu of the ICS-2002 includes several functions that aid in testing the installation and isolating problems. These functions are listed below, and their use and effect is described in subsequent paragraphs. The Maintenance Menu is not available on the ICS-1802.

To access the Maintenance menu, enter the System Information menu by pressing the Menu button on the station's keypad. Then press and hold the Menu button for one second to bring up the hidden menus. The Maintenance menu is one of the "hidden menus", and will require that you enter a password if one has been assigned by your system operator. Once a valid password is entered, select Maintenance menu, and the following menu of functions will be displayed:

- A - Version Information
- B - Send Tone To Matrix
- C - Activate Matrix Loopback
- *D - Activate Internal Loopback
- *E - Monitor 2-Wire Line Quality

* - Available on in the "D" version stations.

To choose a function, press the selector key whose talk label area is assigned the letter of the menu choice. The following paragraphs explain each menu item in detail.

Version Information

This function displays the software version number of the software installed in the station, and the accompanying copyright information. This is valuable in older systems as new versions of the software become available. Add-on stations purchased at a later date could have newer software that may or may not be compatible.

Send Tone To Matrix

This function sends a tone to the matrix, which is useful for tracing signal paths through the system. To use this function, activate a talk path to the station to be checked, then send the tone. The tone is generated by the station internally.

Activate Matrix Loopback

This function causes the audio from the station to be routed back to the station via the matrix frame. This allows you to check the audio paths between the station and the matrix frame. This effect is achieved by connecting a cross-point between the incoming audio from the station and the path for audio going out to the station from the matrix.

This function also checks that the communication between the station and the matrix frame is working correctly. If the loop is successfully completed, the station must be communicating with the matrix frame.

Activate Internal Loopback (ICS-2002D Only)

This function causes the audio that would be sent out of the station to be routed back into the station as though it were coming in from the matrix. This tests the local portion of the digital audio circuitry in the station. It also tests the local audio circuits in the station, including the station's microphone and earphone circuitry.

Monitor 2-Wire Line Quality (ICS-2002D Only)

This function displays a number from 0 to 3, which indicates relative 2-wire line quality. In normal operation, using a good line, this number should be 3. The number 2 appears if the line is excessively long or very noisy. However, experience has shown that the station will usually operate normally. The numbers 1 or 0 indicate an unusable line. If the 2-wire line quality reading jumps between 0 and 3, first check the wiring to the station, then check the cross-point card.

ICS-2002

Troubleshooting

To help isolate a problem you are trying to resolve, a list of possible symptoms and possible solutions that are peculiar to the station has been provided. The Overview chapter of the manual also contains troubleshooting guidelines for the entire system.

1. The LCD display and all indicators on the front panel fail to come on.
 - Check mains AC power into the station.
 - If mains power is definitely going into the station, check the mains AC fuse on the rear of station.
 - If the fuse is blown and replacing it causes it to blow again, then replacing it is unlikely to fix the station since whatever caused the fuse to blow is still broken.
 - Replace the station.
2. The LCD display is blank.
 - Verify that the backlight is not disabled by the configuration program.
 - Adjust the Display contrast control on the front panel.
 - If this does not help, reset the station using the hidden RESET pushbutton on the front panel or power it OFF and then ON.
 - Replace the station.
3. Unexpected characters in display.
 - Reset the station by powering it OFF and then ON.
 - If that does not help, reset the crosspoint card that this station is connected to at the matrix frame.
 - Replace the station.
4. Electroluminescent backlight of LCD display is off.
 - Activate any talk or listen function and the back light should turn on.
 - Check the Configuration menu on the station to be sure that the Panel Light setting is set to ON.
 - Replace the station.

5. LED indicator above selector key does not light when key is pressed.
 - Note that selector key LED indicators do not light if the selector key has no labels assigned to it.
 - Reset the station.
 - Replace the station.
6. Key pad button functions do not operate, or station beeps when button is pressed (affected buttons include including Assign Keys Mode, Station Selection, Dial Phone, Swap Window, Menus).
 - These functions can be inhibited. Check the station's Configuration menu to be sure they are not inhibited.
 - Reset the station.
 - Replace the station.
7. Station appears to activate talk paths, but station operator cannot be heard by other stations.
 - Check Mic ON/OFF and PANEL MIC buttons to make sure the microphone they are using is selected and turned on.
 - Verify that the station has not been defined as "Nearby".
 - If the correct mic is turned on, confirm that the station audio has not been muted externally through the logic inputs.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested. The Matrix Loopback mode from the station's Maintenance menu on an ICS-2002 can also be used directly.
 - Reset the station.
 - Replace the station.

8. LCD display says "WAITING FOR SYSTEM CONNECTION" and all red LED indicators flash slowly. This condition will exist when the matrix frame is powered up and is still down-loading a configuration to the matrix cards (60 seconds max).

- Check that the cable that connects the station to the matrix is plugged in both at the station and at the matrix frame.
- Reset the station.
- Reset the associated crosspoint card in the matrix frame.
- Check the Configuration Program to ensure that the station is assigned the correct port type (ICS-2002/ICS-1802 Intercom Station).
- Confirm that the Matrix card type matches the station.
- If 3/4 pair transmission mode is being used, check the integrity of the RS-422 data paths. Polarity is important in this transmission scheme.
- If parallel stations are being used on the port in question, check that each parallel station has a unique ID wired on its connector at the station. Remove all but one parallel station to see if the port recovers.
- If Digital 2 Wire transmission mode is being used, check for a solid DC path between the station and the matrix frame. Use the Monitor 2-Wire Line Quality function in the station's Maintenance menu to measure the quality of the digital data path between the station and the matrix frame. A reading of less than 3 is suspect.
- Replace the station.
- Replace the crosspoint card that the station is connected to.

9. No audio from station's speaker.

- Be sure the Intercom volume control on the front of the station is turned up.
- Be sure the Speaker On/Off button is set to ON.
- Perform the Matrix Loop-back test to insure the integrity of the audio transmission path.
- Reset the station.
- If that does not help, replace the station,
- Reset or replace the crosspoint card that the station is connected to.

10. Cannot hear page from another station.
 - Check and adjust the Page Volume control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.
 - Check in the configuration of the station to see if the PAGE OVERRIDE INHIBIT is set.
11. No announce tones (call signal tones, eavesdropping indication, etc.) at the station.
 - Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.
 - Check the station's Configuration menu to be sure that the monitoring tones are not inhibited.
 - Check the configuration of the station to see if the PAGE OVERRIDE INHIBIT is set.
12. No audio from external program feed in speaker.
 - Check the Program volume control on the front of the station.
 - Check the program source.
 - Reset the station.
 - Replace the station
13. No audio from external program feed in headphone.
 - If there is program in the speaker check the Configuration of the station with the Configuration Program to make sure the program was not disabled for 2nd earphone feed.
14. Station does not receive call signals, answerback indication, or other communications from other stations (except for audio on active talk paths).
 - Check that the Frame Ser LED indicators are blinking in the crosspoint cards in the matrix frame, indicating that the CPU-100 is able to coordinate communication between the crosspoint cards. If they are not blinking, reset the CPU-100 card. If that does not initiate the cycling of the LED indicators, replace the CPU-100.



15. Incorrect identification of station type at Configuration Computer

- Check ID jumper on the front panel PCB of the station. Refer to the Assembly Drawing of the Front Panel PCB for correct position

16. Expansion key panel keys do not function.

- Check connection of expansion key panel on rear of station.
- Check the Configuration with the Configuration Software to ensure that the correct number of keys are defined.

17. Stations receive call signals, answer backs and other communication but cannot send any talks, call signals or other communication.

- If two frames are connected and this symptom is true only in the second (SCF-101) frame, reset or replace the CPU-150 in the second frame.



Miscellaneous Bill of Materials for the ICS-2002/2002D/1802/1802D

Description	Part #	Designator
CABLE , 26 PIN 3 IN. RIBBON CABLE	730078	
CABLE, 34 PIN RIBBON	730181	
CONNECTOR, FILTRD AC LINE W/FUSE	210176	
DISPLAY, LCD ASSY	710294	
EPROM, ICS-2002 PROGRAM	710293	
EPROM, ICS-2002D PROGRAM	710311	
FUSE, 1/2A SLO-BLO 20MM	520030	
KNOB, SMALL	240080	P3
KNOB, LARGE	240076	P1 P2
SPEAKER 2 1/2" 8 OHM 3.5W	500103	
POWER CORD	610022	
TRANSFORMER , POWER	560025	

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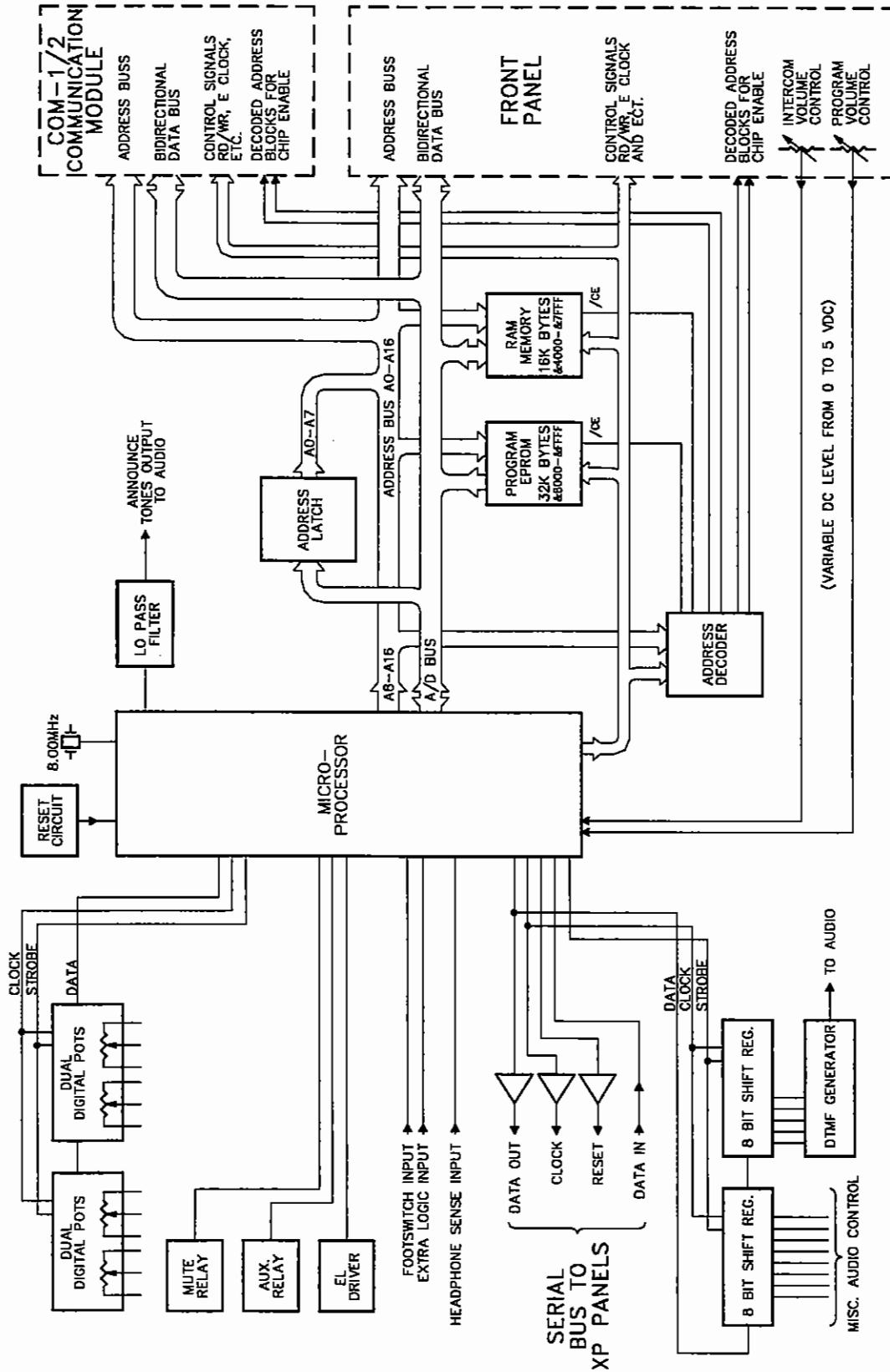
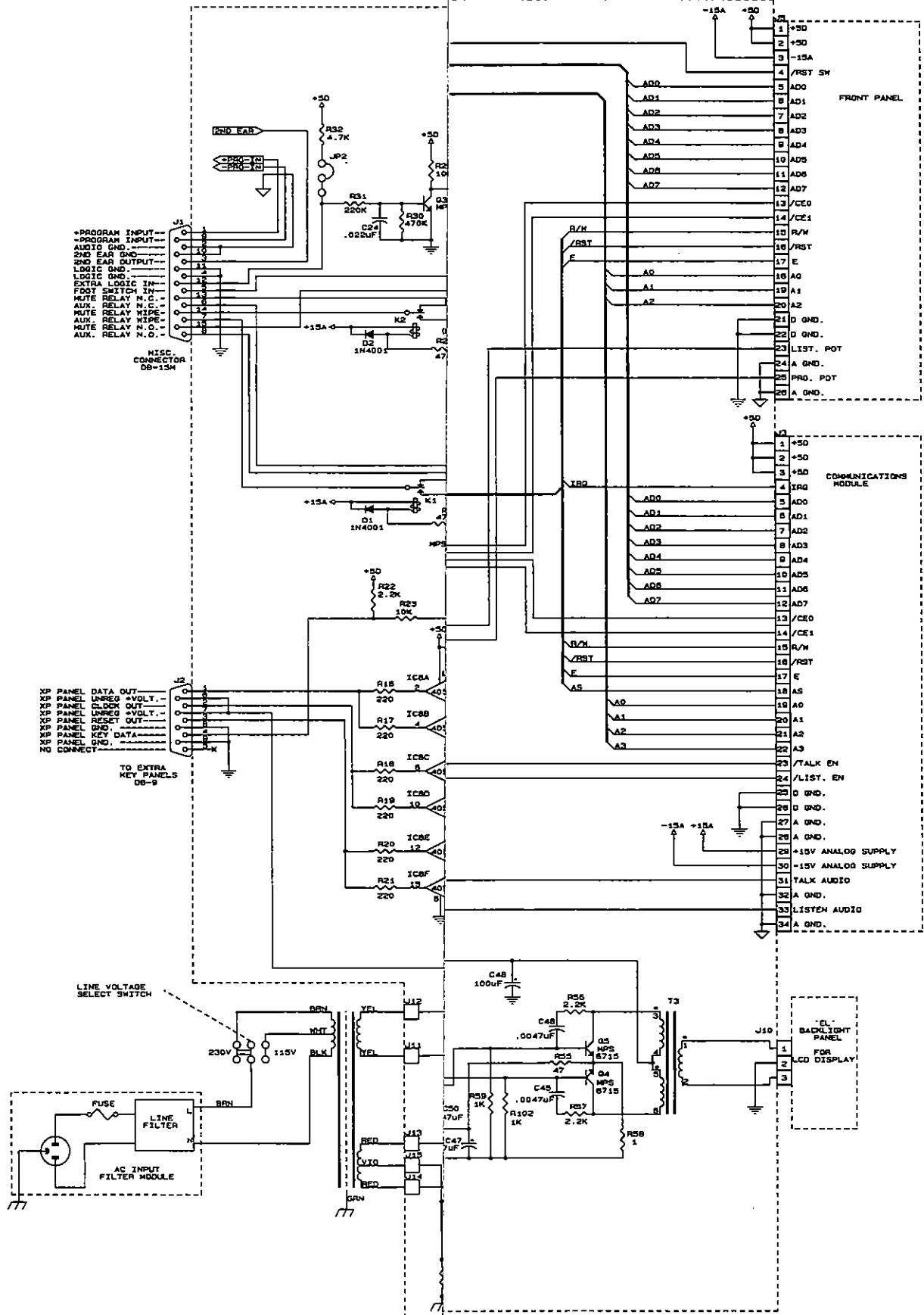


FIGURE S1-1 Digital Block Diagram - ICS-2002 Main PCB





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ICS-2002

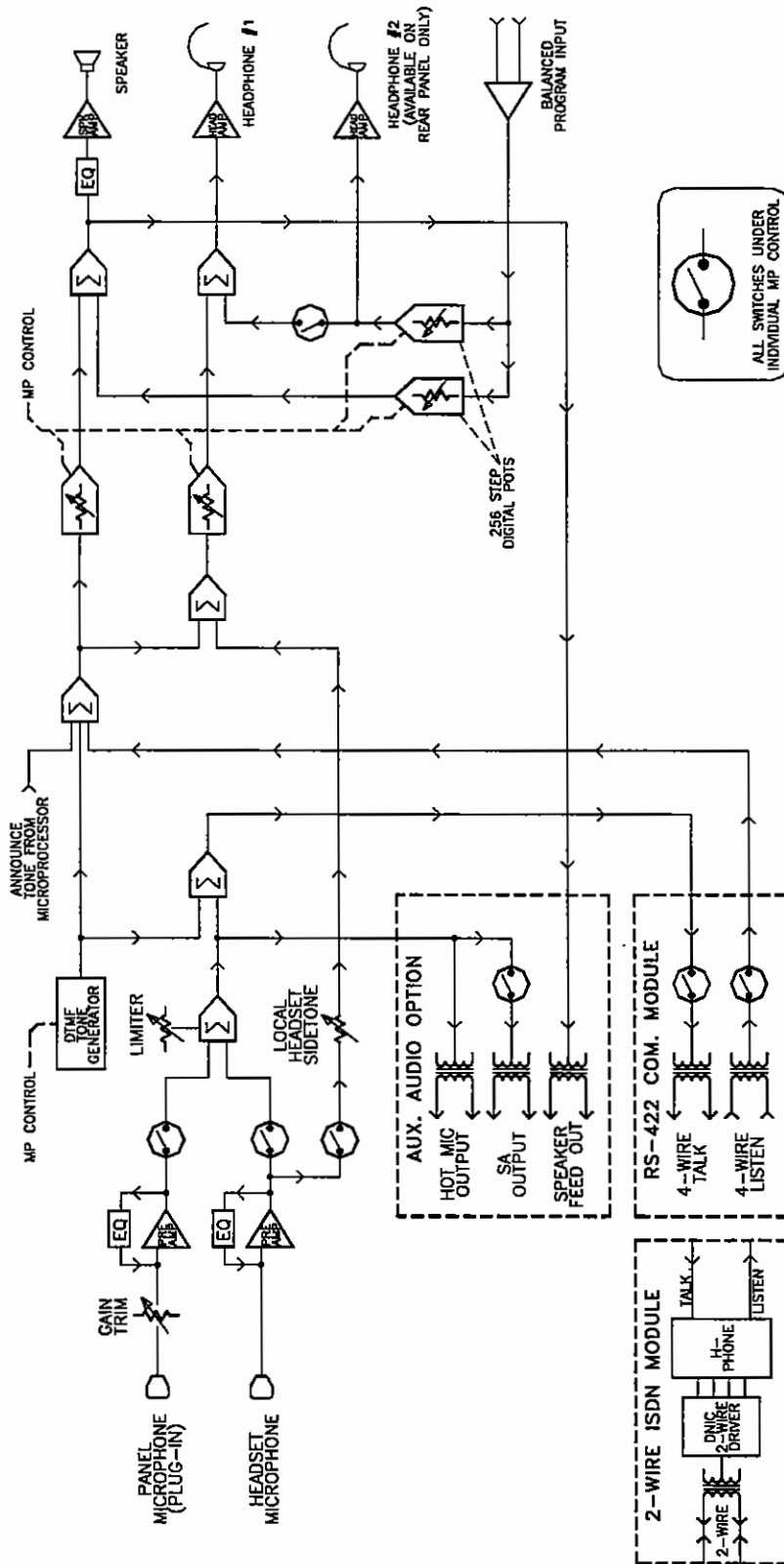


FIGURE S1-3 Analog Block diagram - ICS-2002 Main PCB

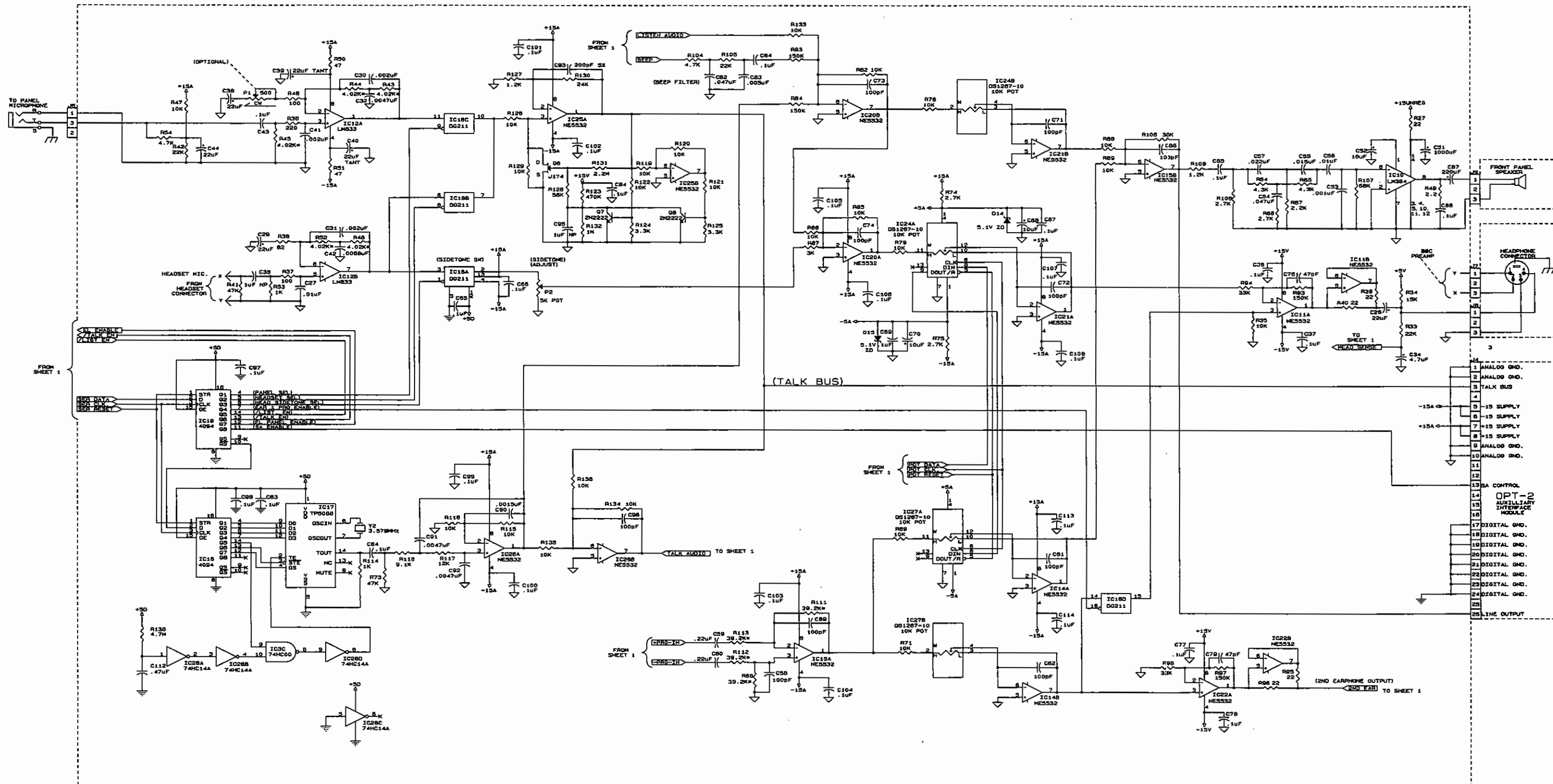


FIGURE S1-4 ICS-2002 Main PCB Sheet 2 of 2 Rev. C

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ICS-2002

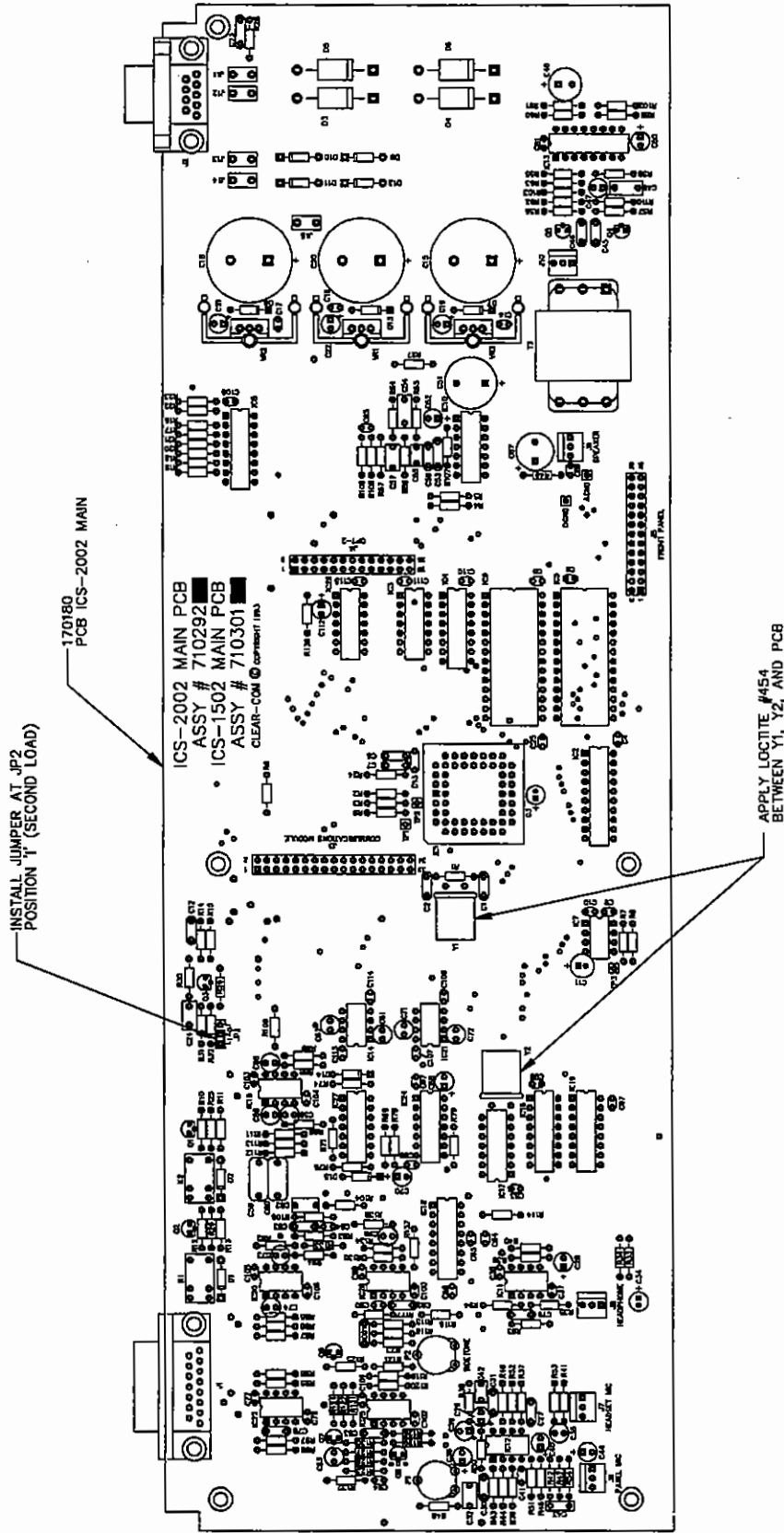


FIGURE S1-5 Assembly Drawing - ICS-2002 Main PCB Rev. A

Bill of Materials for the ICS-2002 Main PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
27	pF	Ceramic Disc	50V	5%	150071	C1 C2
47	pF	Ceramic Disc	50V	10%	150041	C76 C79
100	pF	Ceramic Disc	50V	10%	150006	C58 C61 C62 C71 C72 C73 C74 C88 C89 C96
200	pF	Ceramic Disc	100V	5%	150063	C93
0.001	uF	Ceramic Disc	30V	20%	150052	C53
0.0015	uF	Monolithic	50V	10%	150125	C90
0.0022	uF	Mylar	100V	5%	150045	C30 C31 C41
0.0047	uF	Ceramic Disc	50V	10%	150016	C45 C46 C83
0.0047	uF	Mylar	50V	5%	150114	C32 C91 C92
6800	pF	Ceramic Disc	50V	5%	150057	C42
0.01	uF	Ceramic Disc	30V	20%	150012	C7 C8 C12 C27 C56
0.01	uF	Ceramic Disc	1400V	20%	150029	C23
0.015	uF	Metal Polyester	50V	5%	150093	C55
0.022	uF	Mylar	100V	10%	150008	C24 C57
0.047	uF	Monolithic	50V	10%	150111	C49
0.047	uF	Metal Polyester	50V	10%	150005	C54 C82
0.1	uF	Monolithic	50V	10%	150035	C4 C5 C6 C9 C10 C14 C17 C19 C25 C36 C37 C63 C64 C65 C66 C67 C69 C77 C78 C81 C84 C85 C86 C94 C97 C98 C99 C100 C101 C102 C103 C104 C105 C106 C107 C108 C109 C110 C111 C113 C114 C115
0.1	uF	Monolithic	100V	10%	150085	C43
0.22	uF	Mylar	100V	20%	150003	C59 C60
0.47	uF	Tantalum	35V	10%	150110	C50 C112
1	uF	Ceramic Disc	50V	10%	150073	C13
1	uF	Aluminum	50V	10%	150002	C35 C95
4.7	uF	Aluminum	16V	10%	150141	C3 C34
10	uF	Aluminum	50V		150064	C21 C22 C44 C52 C68 C70
22	uF	Aluminum	16V		150010	C16 C28 C29 C38
22	uF	Tantalum	16V		150032	C39 C40
47	uF	Aluminum	16V	20%	150143	C11 C47
100	uF	Aluminum	35V		150136	C48
220	uF	Aluminum	35V		150021	C87
1000	uF	Aluminum	35V		150092	C51
4700	uF	Aluminum	25V	20%	150126	C15 C18 C20

ICS-2002

Bill of Materials for the ICS-2002 Main PCB ---- continued

Resistors & Resistor Packs

Value		Power	Type	Tol.	Part #	Designator
1	OHM	1/4	Carbon Film	5%	410139	R58
2.2	OHM	1/4	Carbon Film	5%	410113	R49
10	OHM	1/4	Carbon Film	5%	410002	R28
22	OHM	1/4	Carbon Film	5%	410004	R27 R39 R40 R95 R96
47	OHM	1/4	Carbon Film	5%	410039	R25 R26 R50 R51 R55
82	OHM	1/4	Carbon Film	5%	410038	R38
100	OHM	1/4	Carbon Film	5%	410071	R37 R48
220	OHM	1/4	Carbon Film	5%	410007	R16 R17 R18 R19 R20 R21 R36 R60 R61
1K	OHM	1/4	Carbon Film	5%	410010	R24 R53 R59 R102 R114
1.2K	OHM	1/4	Carbon Film	5%	410041	R109 R127
2.2K	OHM	1/4	Carbon Film	5%	410011	R22 R56 R57 R67
2.7K	OHM	1/4	Carbon Film	5%	410040	R66 R74 R75 R108
3.0K	OHM	1/4	Carbon Film	5%	410104	R87
3.3K	OHM	1/4	Carbon Film	5%	410015	R2 R3 R7 R8 R9 R124 R125
4.02K	OHM	1/8	Metal Film	1%	410155	R43 R44 R45 R46 R52
4.3K	OHM	1/4	Carbon Film	5%	410158	R64 R65
4.7K	OHM	1/4	Carbon Film	5%	410013	R32 R54 R104
9.1K	OHM	1/4	Carbon Film	5%	410100	R118
10K	OHM	1/4	Carbon Film	5%	410016	R4 R5 R6 R11 R13 R15 R23 R29 R35 R47 R69 R71 R76 R79 R82 R83 R85 R86 R88 R89 R115 R116 R119 R120 R121 R122 R126 R129 R133 R134 R135 R136
12K	OHM	1/4	Carbon Film	5%	410031	R117
15K	OHM	1/4	Carbon Film	5%	410017	R34
22K	OHM	1/4	Carbon Film	5%	410018	R33 R42 R105
24K	OHM	1/4	Carbon Film	5%	410083	R130
33K	OHM	1/4	Carbon Film	5%	410020	R94 R98 R110
36K	OHM	1/4	Carbon Film	5%	410163	R106
39.2K	OHM	1/8	Metal Film	1%	410111	R68 R111 R112 R113
47K	OHM	1/4	Carbon Film	5%	410021	R41 R62 R63 R73 R103
56K	OHM	1/4	Carbon Film	5%	410023	R128
68K	OHM	1/4	Carbon Film	5%	410025	R107
100K	OHM	1/4	Carbon Film	5%	410024	R10 R12 R14
150K	OHM	1/4	Carbon Film	5%	410026	R84 R93 R97
220K	OHM	1/4	Carbon Film	5%	410028	R31
470K	OHM	1/4	Carbon Film	5%	410030	R30 R123

Bill of Materials for the ICS-2002 Main PCB ---- continued

Value	Power	Type	Tol.	Part #	Designator
1M OHM	1/4	Carbon Film	5%	410058	R132
2.2M OHM	1/4	Carbon Film	5%	410153	R131
4.7M OHM	1/4	Carbon Film	5%	410077	R138
10M OHM	1/4	Carbon Film	5%	410059	R1

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D1 D2 D7 D8 D13
Diode	1N4003 RECT 1A 200PIV	480058	D9 D10 D11 D12
Diode	1N5231B ZENER 5.1V 5%	480038	D14 D15
Diode	1N5401 RECT 3A 100PIV	480005	D3 D4 D5 D6
Transistor	2N2222 NPN 30V	480006	Q7 Q8
Transistor	J174 JFET PCHAN 8V VGS	480079	Q6
Transistor	MPS-A13 NPN 30V DARL	480004	Q1 Q2 Q3
Transistor	MPS6715 NPN 40V 1W	480095	Q4 Q5

Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	DG211CJ CMOS QUAD SWITCH	480092	IC18
Digital IC	DS1267-10 DUAL 10K POT	480195	IC24 IC27
Digital IC	TL7705AP RESET IC	480134	IC7
Digital IC	TP 5088 DTMF GENERATOR	480196	IC17
Logic Chip	4050B CMOS HEX BUFFER	480077	IC8
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC16 IC19
Logic Chip	74HC00 CMOS QUAD NAND	480157	IC3
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC4
Logic Chip	74HC14 CMOS HEX INVERTER	480199	IC28
Logic Chip	74HC373 CMOS OCTAL D LATCH	480142	IC2
Microprocessor	68HC11AOFN CMOS MCU	480132	IC1
Op Amp	LM384 POWER 4W OP AMP	480012	IC10
Op Amp	LM833N DUAL 8 PIN DIP	480175	IC12
Op Amp	NE5532 DUAL OP AMP	480070	IC11 IC14 IC15 IC20 IC21 IC22 IC25 IC26
Memory IC	GM76C256L CMOS RAM 32K X 8	480183	IC5
Regulator	7805T POS 5V REG. TO220 PKG	480083	VR3
Regulator	7915 NEG 15V 1.5A REG. IC	480149	VR1
Regulator	LM340-15 POS 15V REGULATOR	480024	VR2
Regulator	LM3524 REG PW MOD IC	480150	IC13

Bill of Materials for the ICS-2002 Main PCB ---- continued**Miscellaneous**

Device	Description	Part #	Designator
Connector	DB-9F RT ANG PC MTG	210186	J2
Connector	DB-15F RT ANG PC MTG CON	210187	J1
Crystal	3.579545MHz CRYSTAL	230001	Y2
Crystal	8.000MHz CRYSTAL	230003	Y1
Pot	500 OHM TRIM POT	470060	P1
Pot	5K TRIM POT .	470022	P2
Relay	SPDT 12V RELAY ITT#SZ12	450006	K1 K2
Transformer	XFORMER, 110 TO 12V 70mA	560022	T3

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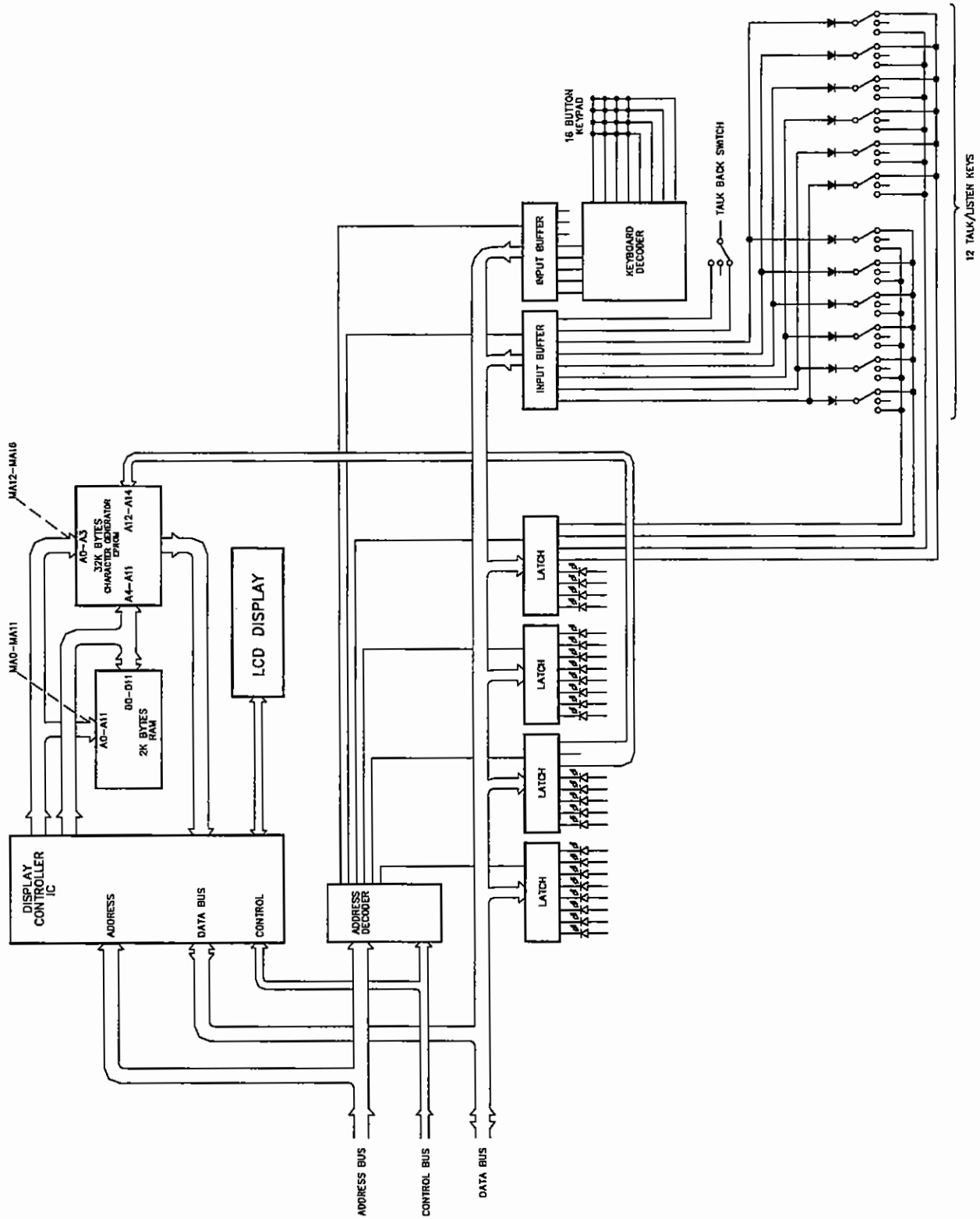


FIGURE S1-6 Block diagram - ICS-2002 Front Panel PCB

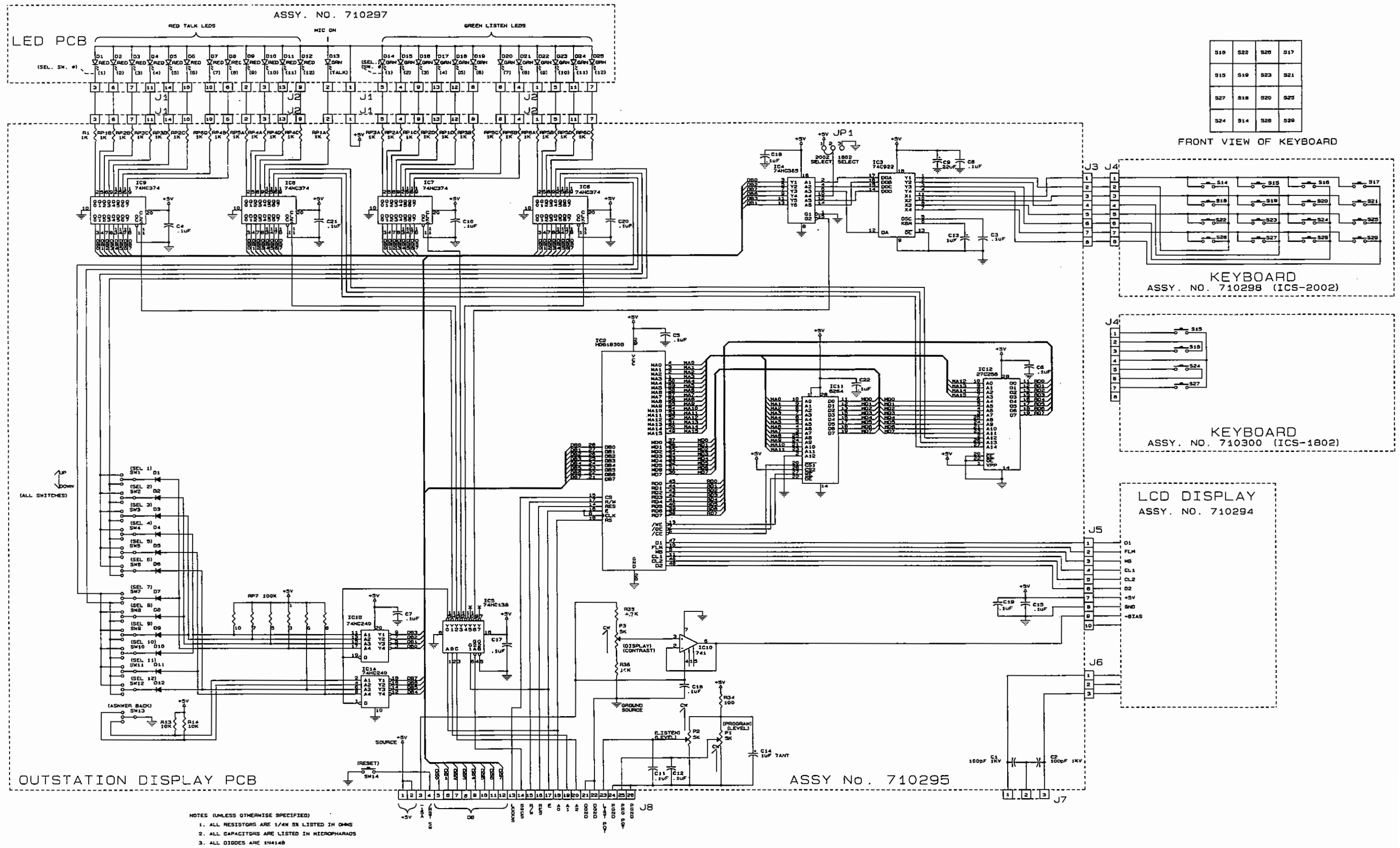


FIGURE S1-7 ICS-2002 Front Panel PCB Schematic Sheet Rev. A

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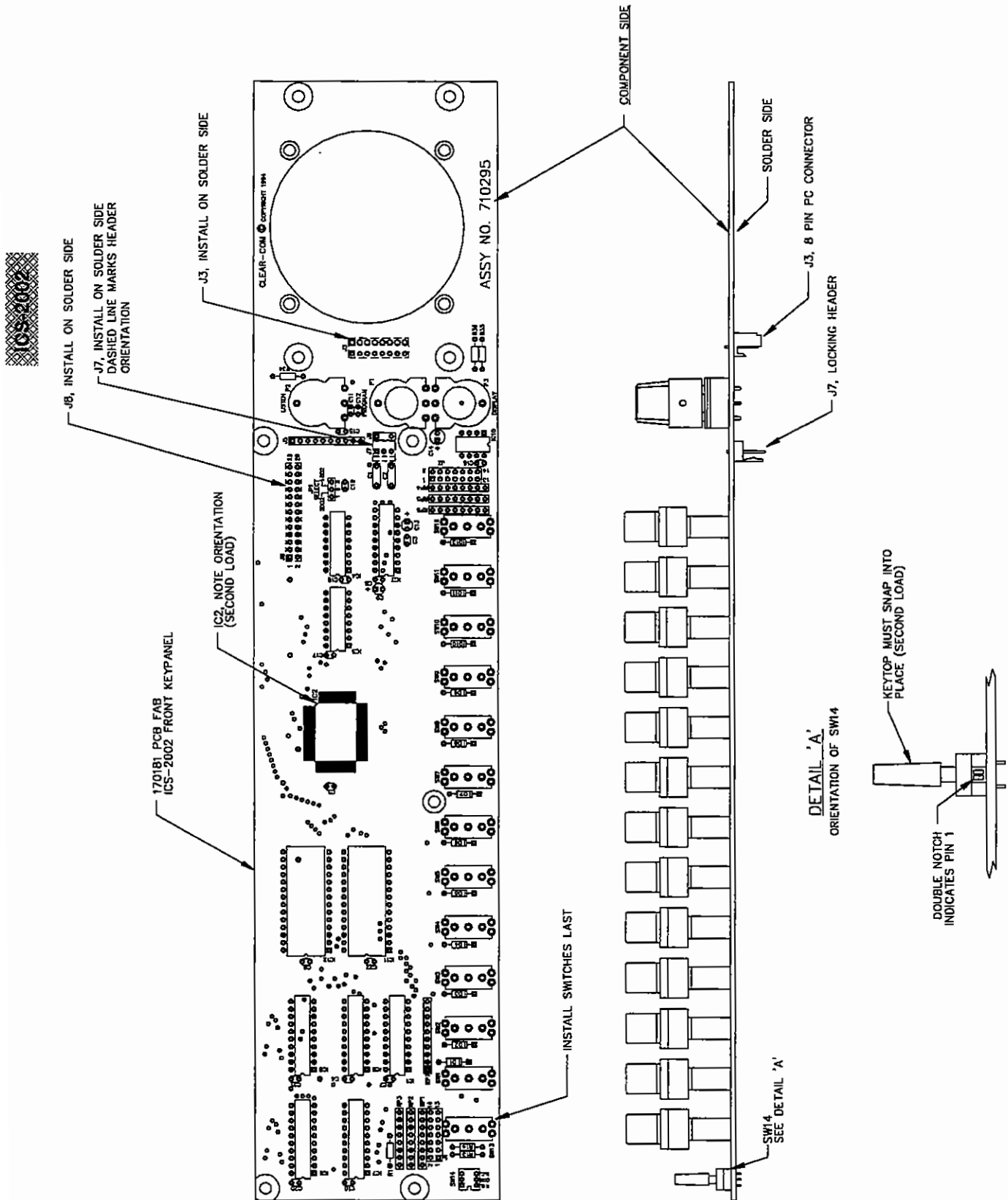


FIGURE S1-8 Assembly Drawing - ICS-2002 Front Panel PCB Rev. A

Bill of Materials for the ICS-2002 Front Panel PCB

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
100 pF	Ceramic Disc	1000V	20%	150048	C1 C2
0.1 uF	Monolithic	50V	10%	150035	C3 C4 C5 C6 C7 C8 C10 C11 C12 C15 C16 C17 C18 C19 C20 C21 C22
1 uF	Tantalum	35V	20%	150116	C13 C14
22 uF	Tantalum	16V		150032	C9

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Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100 OHM	1/4	Carbon Film	5%	410071	R34
1K OHM		X 8 SIP bussed		415006	RP1 RP2 RP3 RP4 RP5 RP6
5.1K OHM	1/4	Carbon Film	5%	410138	R35
10K OHM	1/4	Carbon Film	5%	410016	R13 R14
20K OHM	1/4	Carbon Film	5%	410151	R36
100K OHM		X 9 SIP Bussed		415002	RP1

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12

Integrated Circuits

Device	Description	Part #	Designator
Display Driver	HD61830B LCD CONTROLLER /	480119	IC2
Logic Chip	74C922 CMOS I6 KEY ENCODER	480122	IC3
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC5
Logic Chip	74HC240 CMOS INV BUFFER	480121	IC1
Logic Chip	74HC365 CMOS HEX BUFFER	480123	IC4
Logic Chip	74HC374 CMOS OCTAL D FF	480143	IC6 IC7 IC8 IC9
Op Amp	LM741 IC OP AMP 8-PIN DIP	480018	IC10
ROM/RAM Mem	6264 CMOS 8K X 8 STATIC RAM	480117	IC11

Bill of Materials for the ICS-2002 Front Panel PCB -- cont.

Miscellaneous

Device	Description	Part #	Designator
	5K LINEAR POT 25MM	470067	P3
	5K LINEAR POT 30MM	470068	P1 P2
	SWITCH, PUSHBUTTON	510102	SW14
	ICS-2002 CHAR. GEN EPROM	710296	IC12 IC12
	SWITCH, 3PST	510080	SW1 SW2 SW3 SW4 SW5 SW6 SW7 SW8 SW9 SW10 SW11 SW12 SW13
LED	LED, ROUND GREEN FLAT TOP	390045	D13 D14 D15 D16 D17 D18 D19 D20 D21 D22 D23 D24 D25 D25
LED	LED, ROUND RED FLAT TOP	390044	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12
	KEYCAP, SET OF 12	240071	
	KEYCAP, SET OF 4	240072	
	PUSH BUTTON SWITCH	510082	S14 S15 S16 S17 S18 S19 S20 S21 S22 S23 S24 S25 S26 S27 S28 S29 S29

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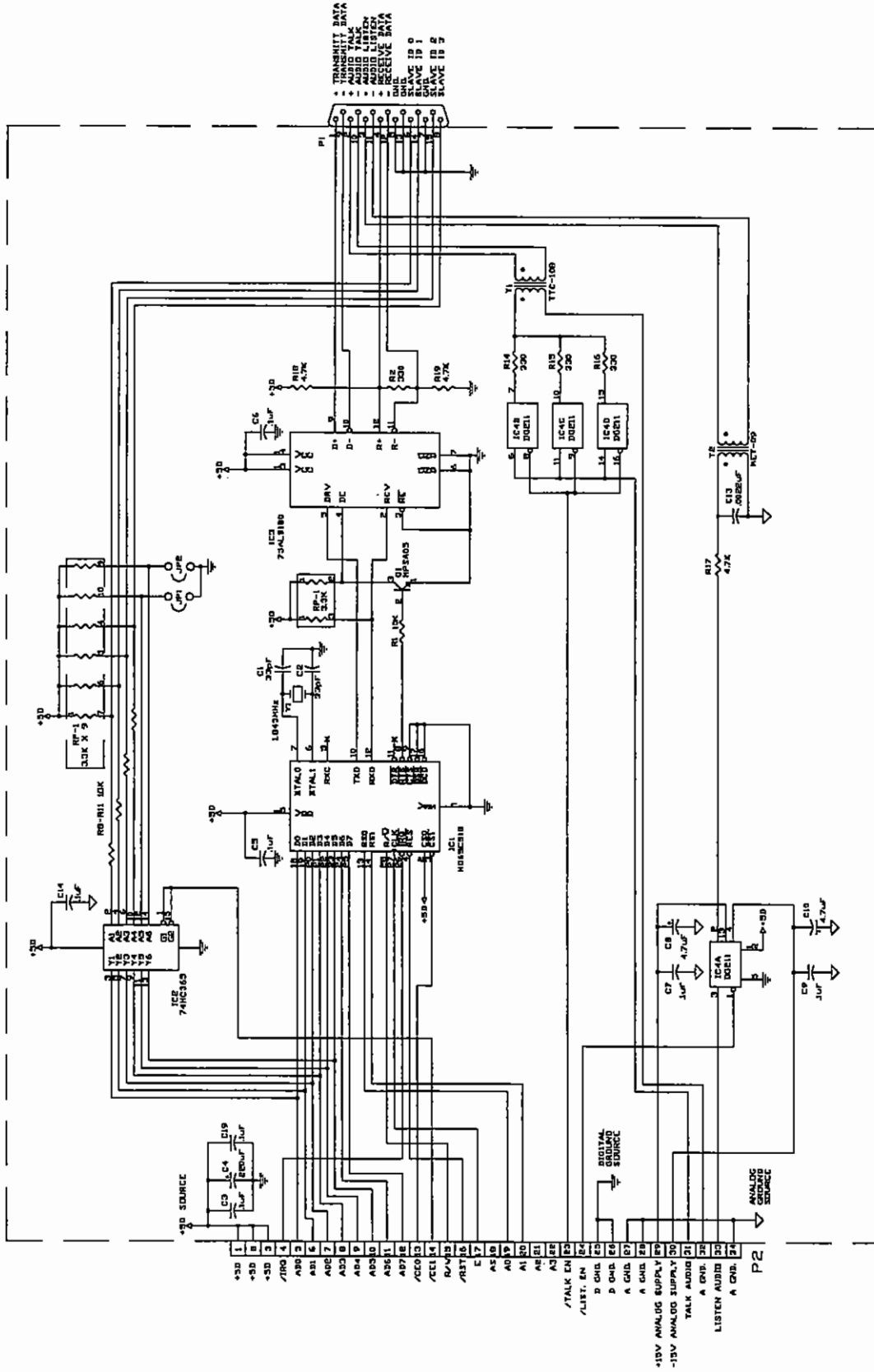


FIGURE S1-9 COM-1 Communications Module Schematic Rev. A

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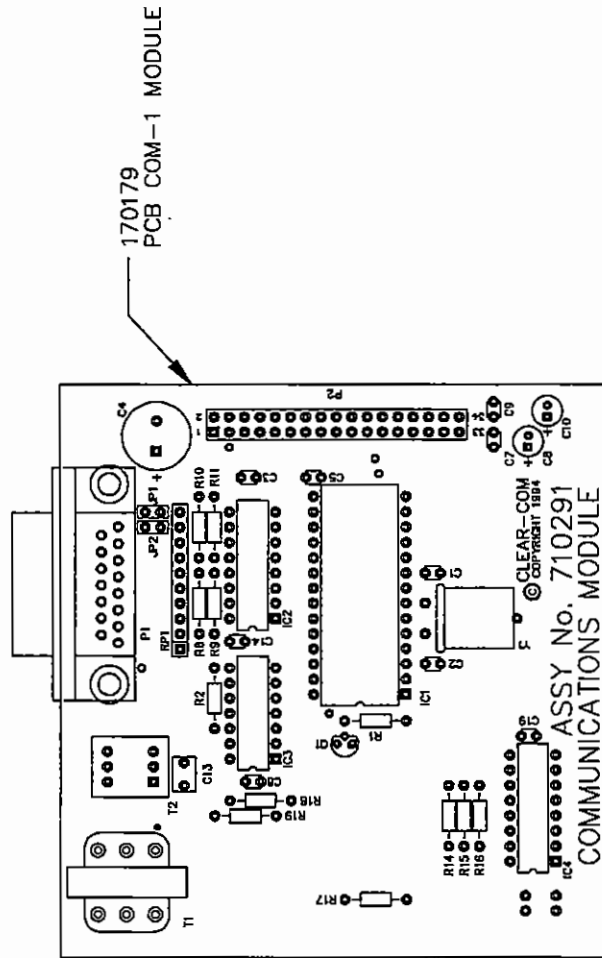


FIGURE S1-10 Assembly Drawing - COM-1 Communications Module Rev. A

Bill of Materials for the ICS-2002 COM-1 (RS-422) PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator	
33	pF	Monolithic	50V	10%	150128	C1 C2
0.1	uF	Monolithic	50V	10%	150035	C3 C5 C6 C7 C9 C14 C19
4.7	uF	Aluminum	16V	10%	150141	C8 C10
220	uF	Aluminum	35V		150021	C4

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator	
330	OHM	1/4	Carbon Film	5%	410061	R2 R14 R15 R16
3.3K	OHM	1/4	Carbon Film	5%	415000	RP-1
4.7K	OHM	1/4	Carbon Film	5%	410013	R17
10K	OHM	1/4	Carbon Film	5%	410016	R1 R8 R9 R10 R11

Diodes and Transistors

Device	Description	Part #	Designator
Transistor	MPS-A05 NPN 60V	480052	Q1

Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	DG211CJ CMOS QUAD	480092	IC4
Interface Chip	75ALS180 RS-422 TRANCEIVER	480187	IC3
Logic Chip	65SC51 SERIAL ADAPTER IC	480197	IC1
Logic Chip	74HC365 CMOS HEX BUFFER	480123	IC2

Miscellaneous

Device	Description	Part #	Designator
Connector	DB-15M RT ANG PC MTG CON	210188	P1
Crystal	1.843MHZ CRYSTAL	230002	Y1
Transformer	AUDIO 10K:10K	560034	T2
Transformer	XFORMER, AUDIO 600CT/600CT	560018	T1

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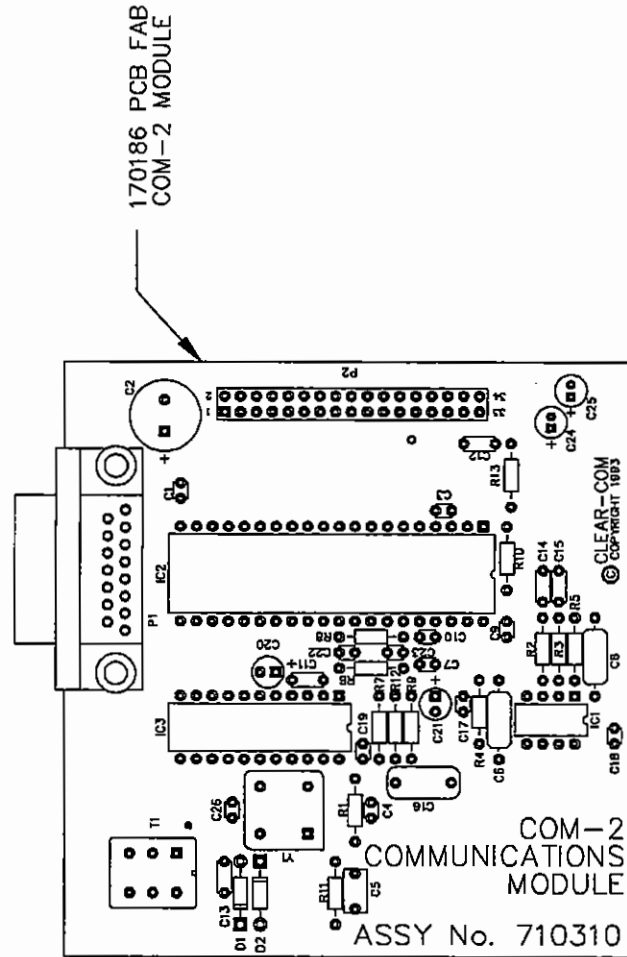


FIGURE S1-12 Assembly Drawing - COM-2 Communications Module

(2-wire Digital) Rev. A

Bill of Materials for the ICS-2002 COM-2 (2-wire) PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
1000 pF	Polystyrene	50V	2.5%	150119	C6 C8
0.0015 uF	Monolithic	50V	10%	150125	C4
0.01 uF	Monolithic	50V	20%	150109	C22 C23
0.022 uF	Mylar	100V	10%	150008	C5
0.1 uF	Monolithic	50V	10%	150035	C1 C3 C7 C9 C10 C17 C18 C19 C26
0.22 uF	Mylar	100V	20%	150003	C16
0.47 uF	Aluminum	50V		150024	C20
0.47 uF	Monolithic	50V		150043	C11 C12 C13 C14 C15
4.7 uF	Aluminum	50V		150087	C24 C25
47 uF	Tantalum	6V		150091	C21
220 uF	Aluminum	35V		150021	C2

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Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
47 OHM	1/4	Carbon Film	5%	410039	R11
270 OHM	1/4	Carbon Film	5%	410009	R10
390 OHM	1/4	Carbon Film	5%	410005	R1
1K OHM	1/4	Carbon Film	5%	410010	R6 R8
1.2K OHM	1/4	Carbon Film	5%	410041	R7 R13
5.6K OHM	1/4	Carbon Film	5%	410056	R12
6.8K OHM	1/4	Carbon Film	5%	410036	R9
10K OHM	1/4	Metal Film	1%	410089	R2 R3 R4 R5

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N5817 SHTKY 1A 20V	480147	D1 D2

Bill of Materials, ICS-2002 COM-2 (2-wire) PCB --- cont.**Integrated Circuits**

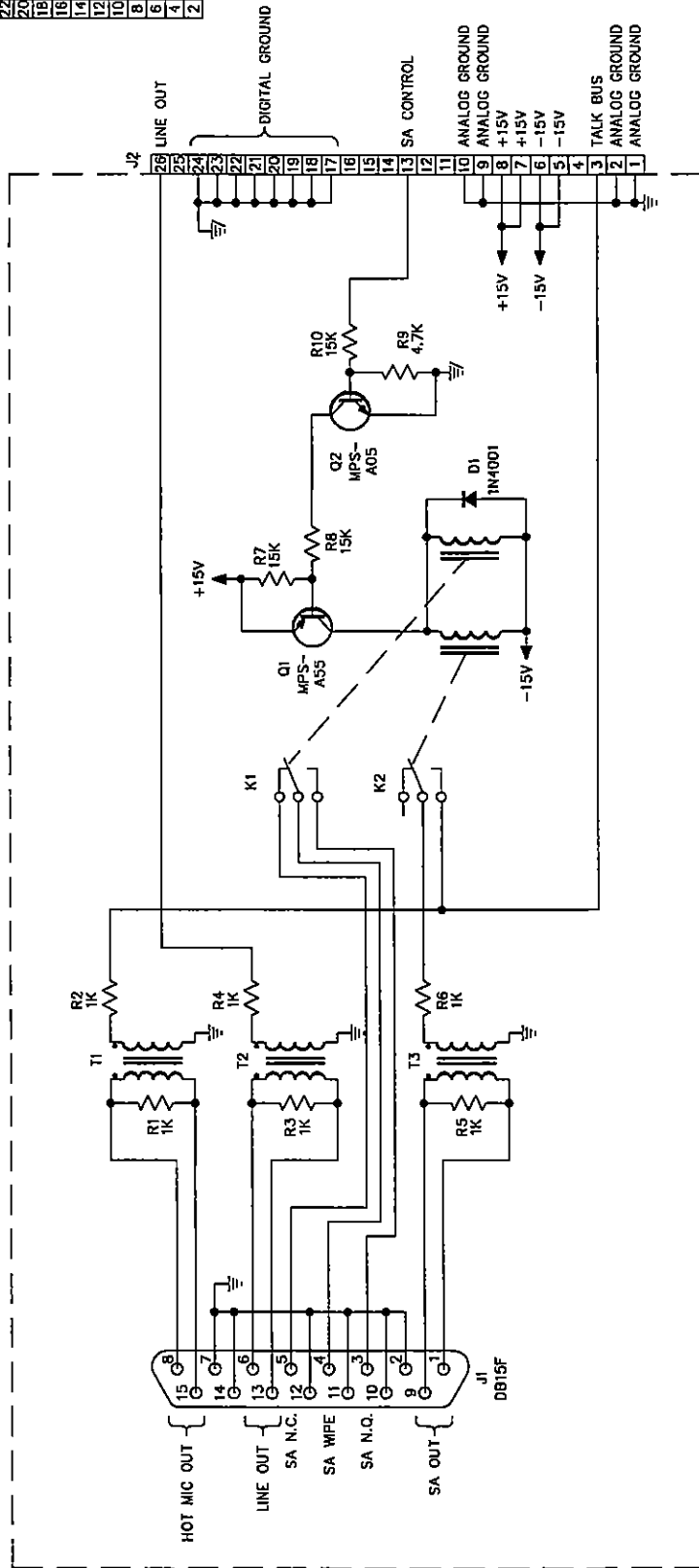
Device	Description	Part #	Designator
Interface Chip	CMOS 2-WIRE DIGITAL INT.	480125	IC3
Interface Chip	CMOS CODEC IC	480176	IC2
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC1

Miscellaneous

Device	Description	Part #	Designator
Connector	DB-15M RT ANG PC MTG	210188	P1
Crystal	10.24MHZ CLOCK OSCILLATOR	230005	Y2
Transformer	2:1 PULSE	560023	T1

TOP VIEW

26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	---	---	---	---	---	---	---	---	---



REFERENCE DESIGNATORS

LAST USED	NOT USED
R	10
D	1
Q	2
J	2
T	3
K	2

- 4. $\frac{\perp}{\perp}$ = ANALOG GROUND $\frac{\perp}{\perp}$ = DIGITAL GROUND
- 3. ALL RESISTORS ARE 1/4W, 5% LISTED IN OHMS.
- 2. ALL CAPACITOR VALUES ARE LISTED IN MICROFARADS.
- 1. ALL DIODES ARE 1N4148.

NOTES: (UNLESS OTHERWISE SPECIFIED)

FIGURE S1-13 OPT-100 (Aux Audio Option) Schematic Rev. A

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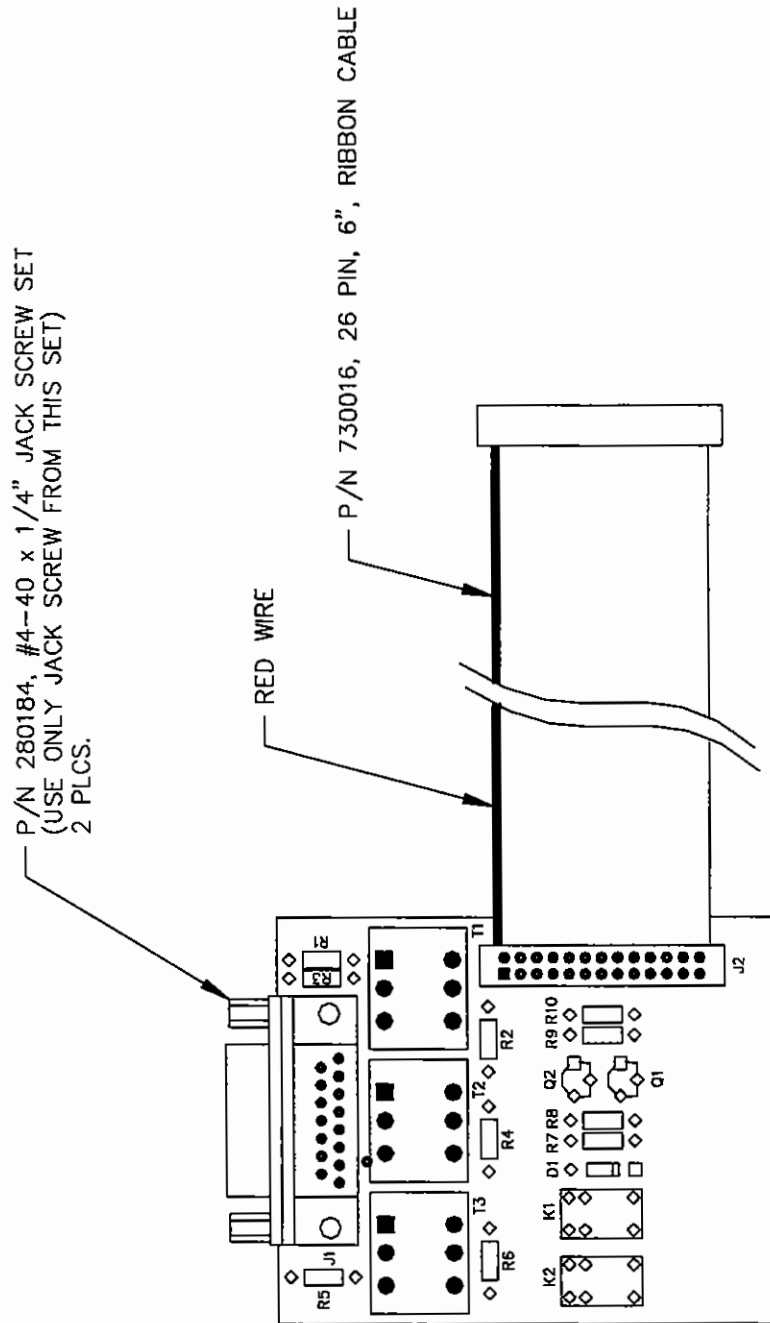


FIGURE S1-14 Assembly Drawing - OPT-100 Module Rev. A

Bill of Materials for the OPT-100 PCB**Resistors & Resistor Packs**

Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R1 R2 R3 R4 R5 R6
4.7K OHM	1/4	Carbon Film	5%	410013	R9
15K OHM	1/4	Carbon Film	5%	410017	R7 R8 R10

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D1
Transistor	MPS-A05 NPN 60V	480052	Q2
Transistor	MPS-A55 PNP 60V	480050	Q1

Miscellaneous

Device	Description	Part #	Designator
Connector	db-15fRT ANG PC MTG	210187	J1
Relay	SPDT 24V MINI PC RELAY	450004	K1 K2
Transformer	AUDIO, 600CT/600CT	560018	

Accessory Panels

There are three types of accessory panels: XP-12/22 Expansion Key Panels, XPL-12/22 Expansion Key Panels with Electronic Labels, and AP-22 Assignment Panels. Much of the same circuitry is common to the various panels, and also to the ICS-52/92 intercom station. For this reason the common schematics, assembly drawings, and bills of materials are not duplicated. Instead, the following sections describe which parts are used in each, and only the unique components are shown.

XP-12

The XP-12 schematic is shown here. It references two PC boards, #710308 and #710253. Assembly drawings and BOMs are shown for each of these.

XP-22

The XP-22 consists of two XP-12 circuits packaged together. The schematic shows the interconnection between the two circuits. For details of the circuits see the XP-12 documentation.

XPL-12

The XPL-12 schematic is shown here. It references two PC boards, #710343 and #710344, which are also used in the ICS-92 intercom station. See the ICS-92 for details of those circuits. The schematic also references the PSU assembly #710349, for which the assembly drawing and BOM are shown here.

XPL-22

The XPL-22 duplicates the XPL-12 circuits. The schematic shows the interconnection between the circuits. For details see the XPL-12 documentation.

AP-22

The AP-22 schematics reference the same PSU and display PCB units used in the XPL-12. Assembly diagrams and BOMs are shown for the pushbutton PCB.

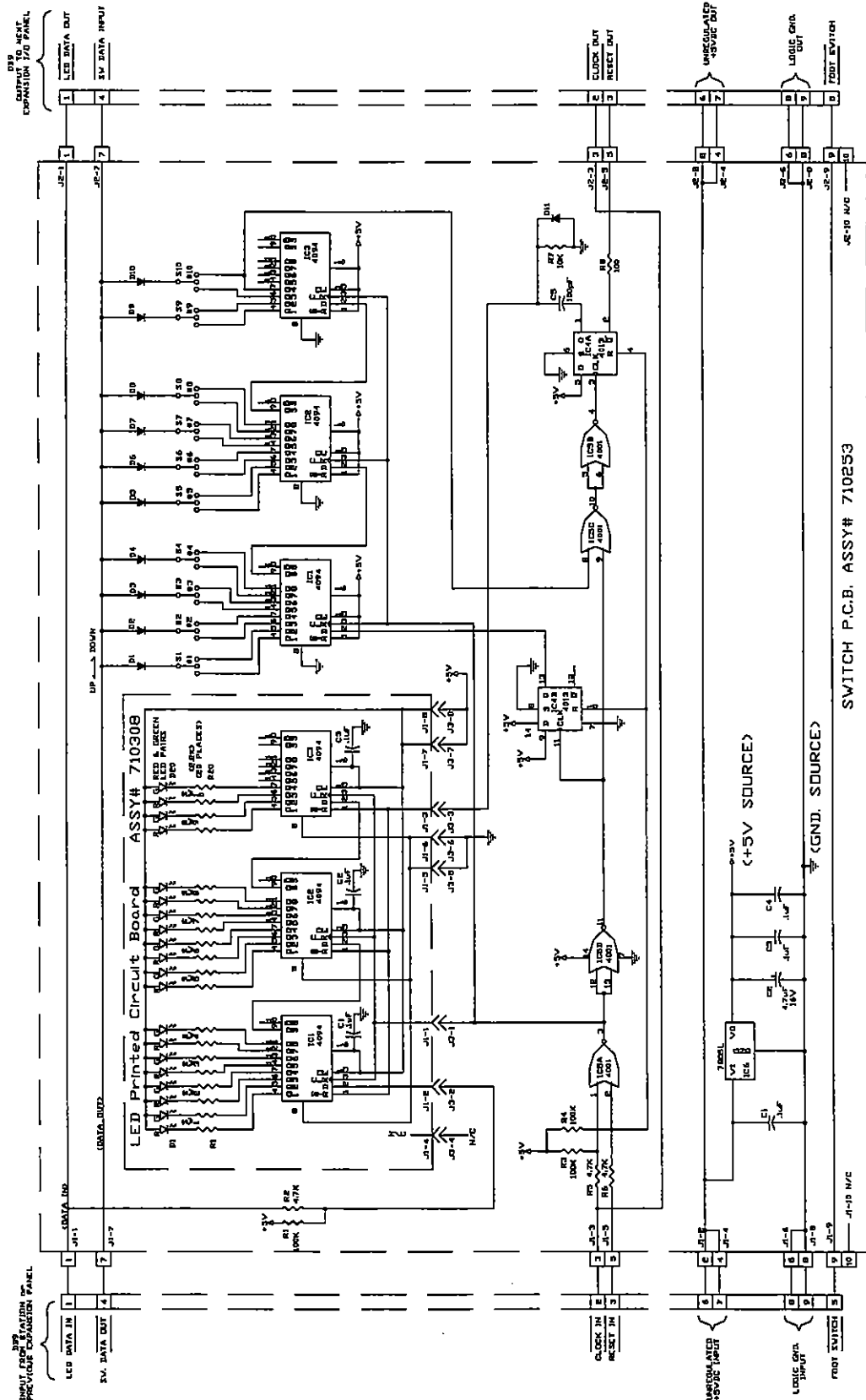


FIGURE S1-15 XP-12 (10 Key Expansion Panel) Schematic Rev. A

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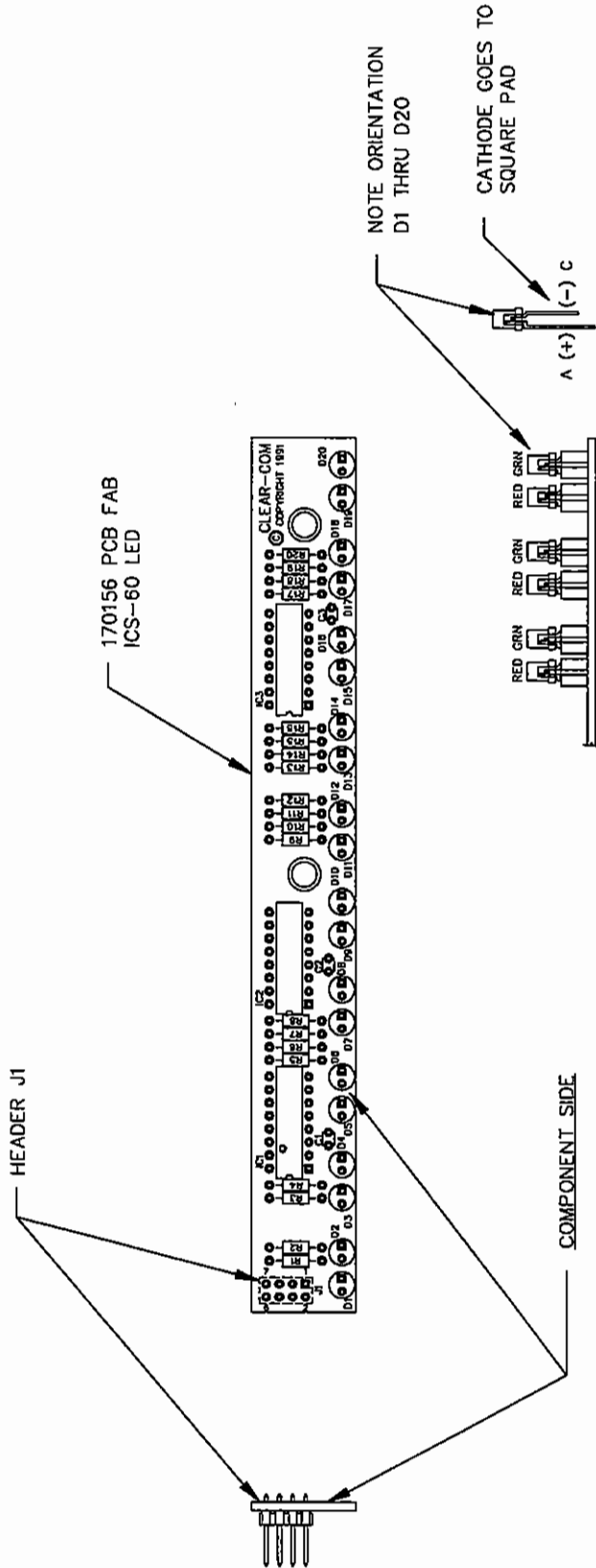


FIGURE S1-16 Assembly Drawing - XP-12 (10 Key Expansion Panel) Rev. A

Bill of Materials for the XP-12 PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
.1 uF	Monolythic			150035	C1,C2,C3

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R1-R20(20)

Diodes and Transistors

Device	Description	Part #	Designator
CMOS IC	4094B CMOS SHIFT REGISTER	480107	IC1,IC2,IC3
Led	RED, ROUND, FLAT TOP	390044	D1,D3,D5,D7,D9,D11, D13,D15,D19
Led	GREEN, ROUND, FLAT TOP	390045	D2,D4,D6,D8,D10,D12, D14,D16,D18,D20 S8,S9,S10

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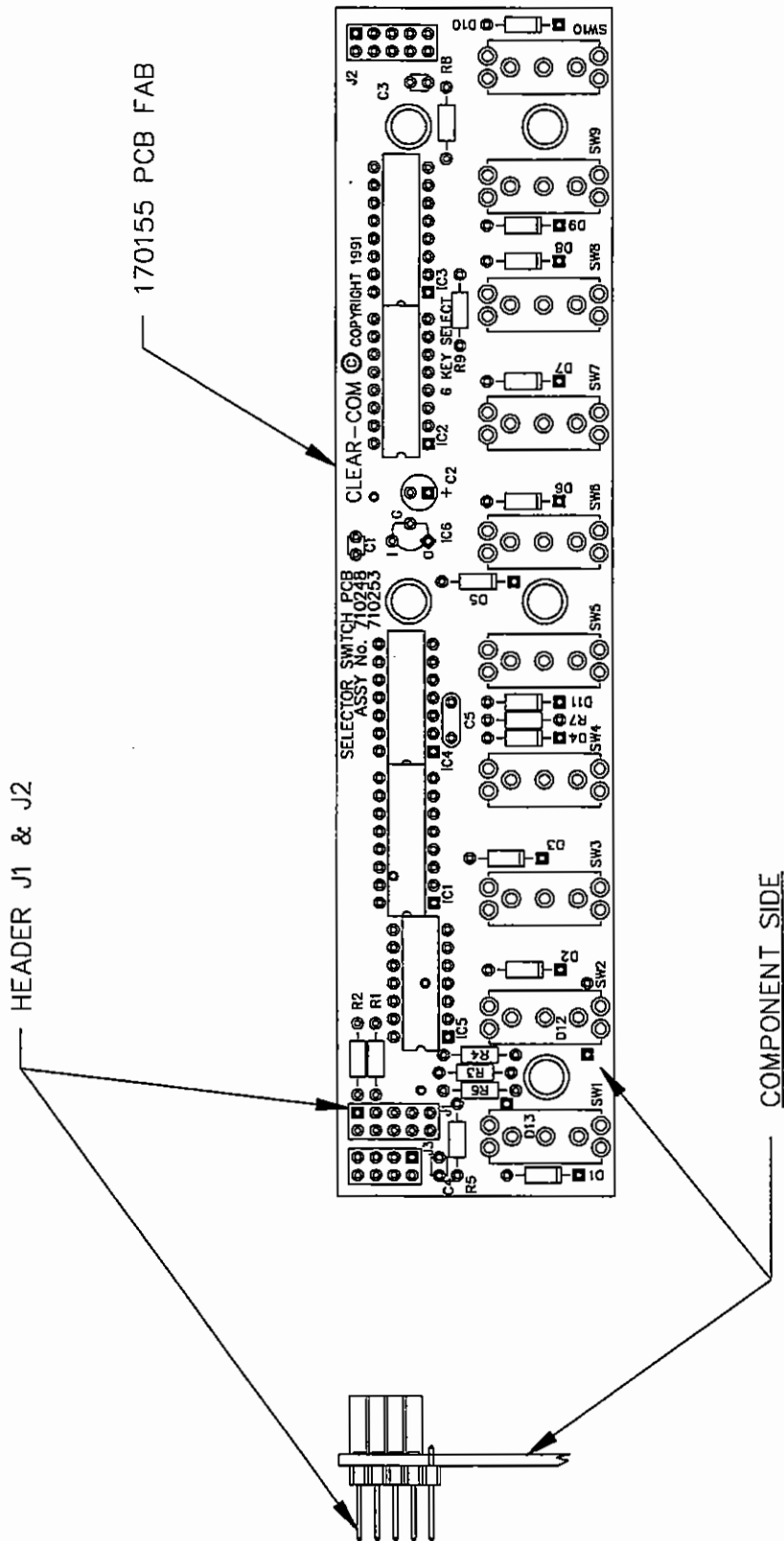


FIGURE S1-17 Assembly Drawing - XP-22 (20 Key Expansion Panel) Rev. A

Bill of Materials for the XP-22 PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
.001 uF	Ceramic	30V	20%	150052	C5
.1 uF	Monolythic	50V	10%	150035	C1,C3,C4
4.7 uF	Aluminum NP	50V		150087	C2

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100 OHMS	1/4W	Carbon Film	5%	410071	R8
4.7K OHMS	1/4W	Carbon Film	5%	410013	R2,R5,R6
10K OHMS	1/4W	Carbon Film	5%	410016	R7
100K OHMS	1/4W	Carbon Film	5%	410024	R1,R3,R4

Diodes and Transistors

Device	Description	Part #	Designator
CMOS IC	4094B SHIFT REGISTER	480107	IC1,IC2,IC3
CMOS IC	4001 QUAD 2 INPUT NOR GATE	480112	IC5
CMOS IC	4013 DUAL D TYPE FLIP FLOP	480171	IC4
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1,D2,D3,D4,D5,D6,D7, D8,D9,D10,D11
Regulator	7805L POS 5V TO-92 PKG	480088	IC6

Miscellaneous

Device	Description	Part #	Designator
Switch	SP3T MOM-OFF-MOM PC MTG	510080	S1,S2,S3,S4,S5,S6,S7,

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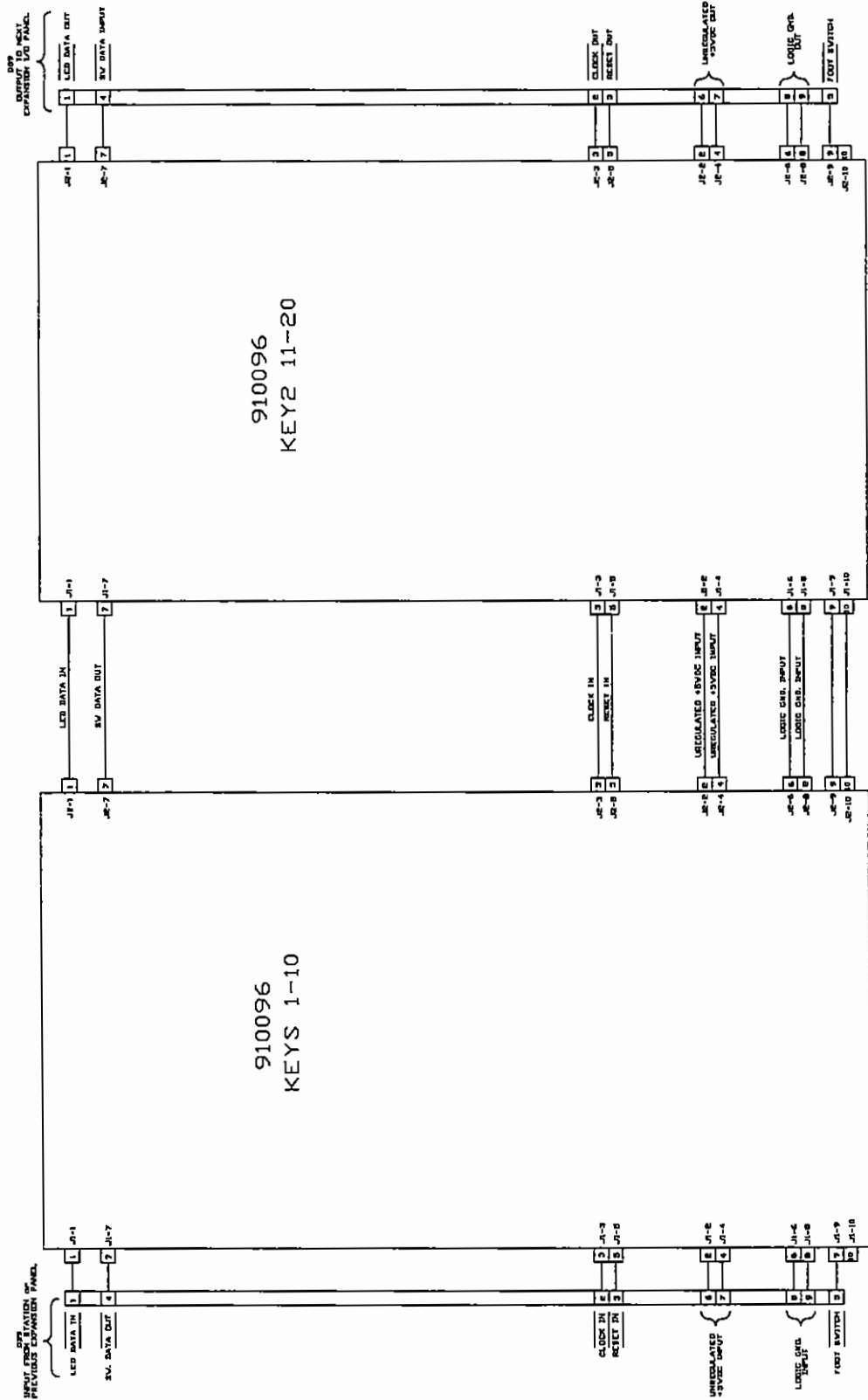


FIGURE S1-18 XP-22 (20 Key Expansion Panel) Schematic Rev. A

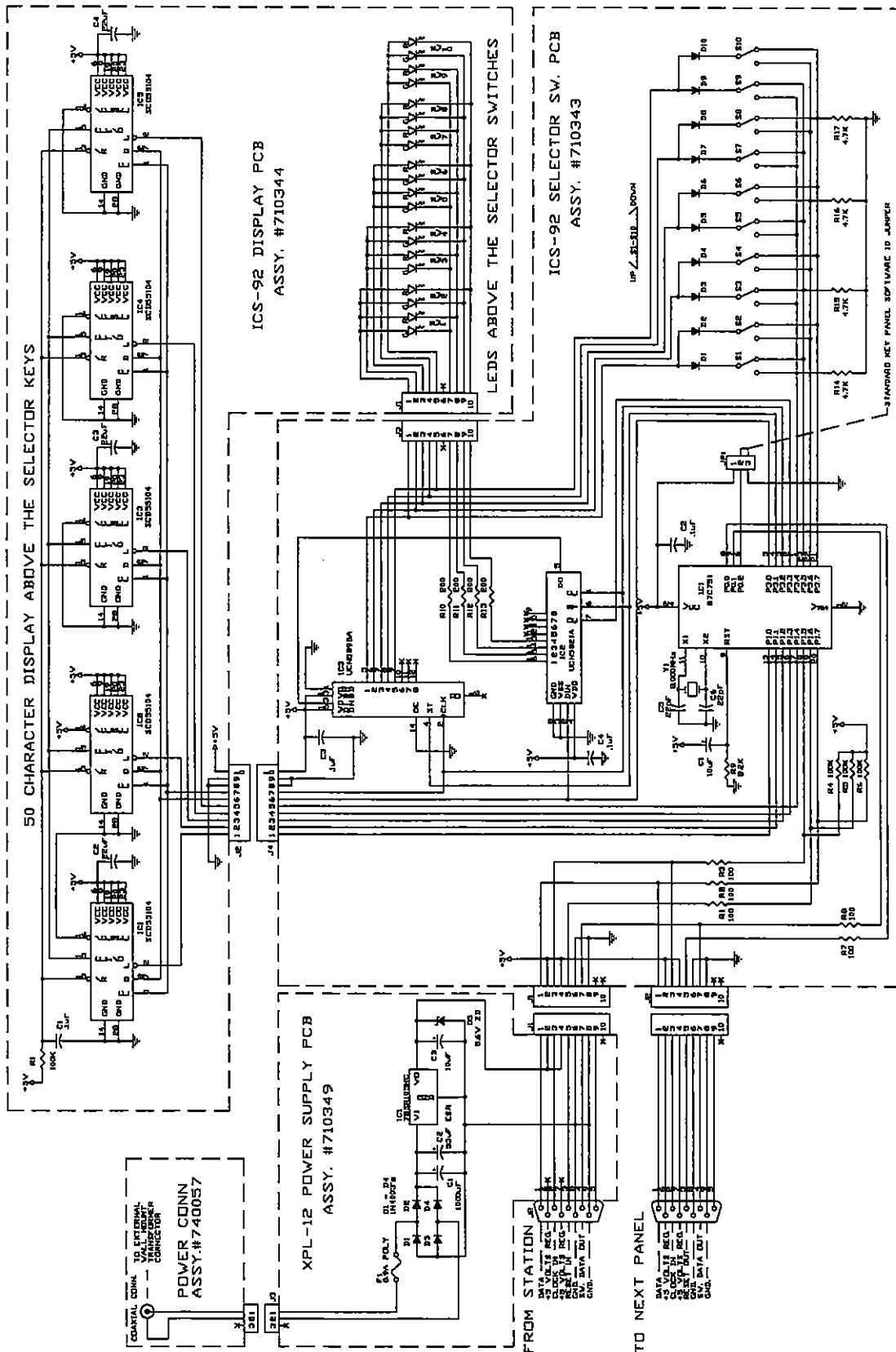


FIGURE S1-19 XPL-12 (10 Key Panel w/ Electronic Labels) Schematic Rev. B



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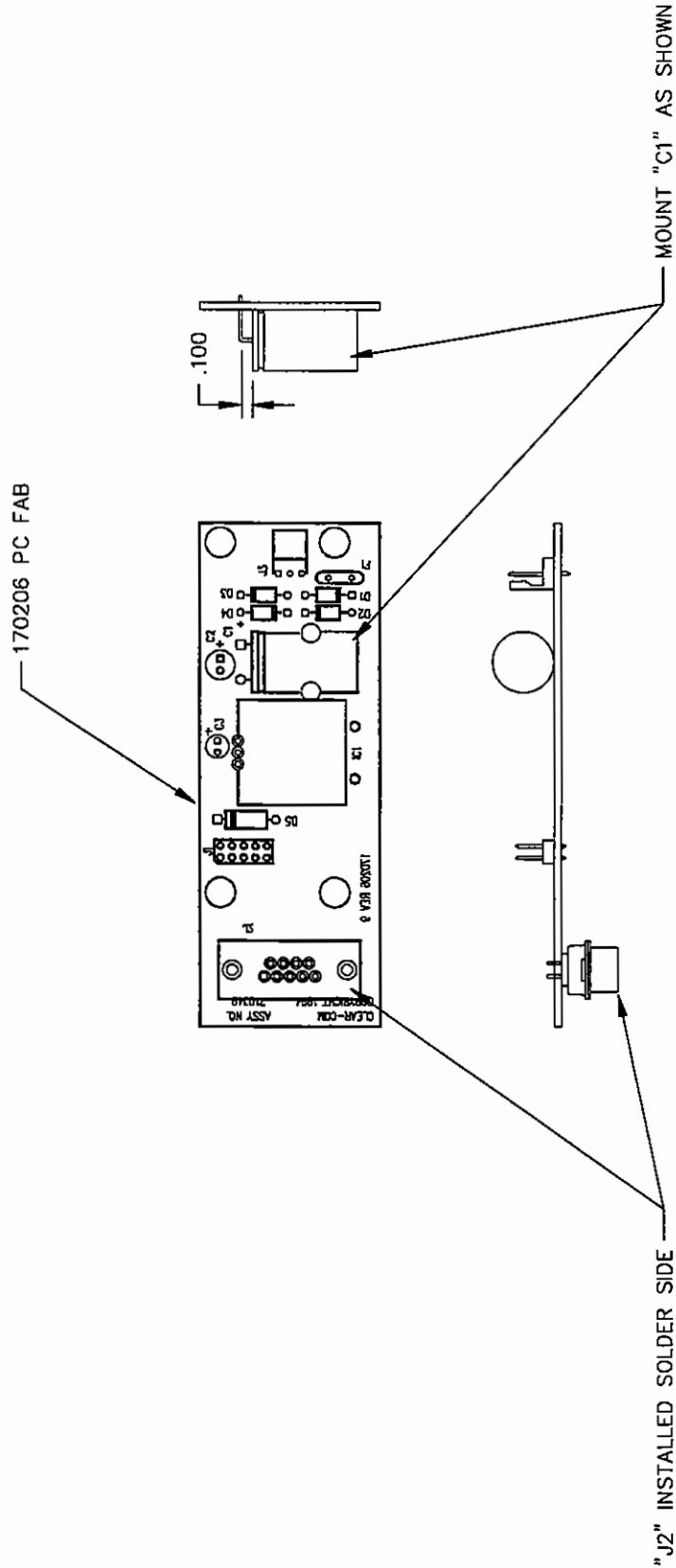


FIGURE S1-20 Assembly Drawing - XPL-12 (10 Key Panel w/ Electronic Labels) Rev. A

Bill of Materials for the XPL-12 PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
10	uF	Aluminum	50V		150064	C3
33	uF	Alu. LOW ESR	35V	20%	150130	C2
1000	uF	Aluminum	35V		150092	C1

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4003 RECT 1A 200PIV	480058	D1,D2,D3,D4
Diode	1N5339 ZENER 5.6V 5W	480182	D5
Regulator	78SR105HC POS 5V 1A	480206	IC1

Miscellaneous

Device	Description	Part #	Designator
Connector	9 PIN (M) D TYPE SOLDER PINS	210310	J2
Fuse	0.90A POLY SWITCH	520036	F1

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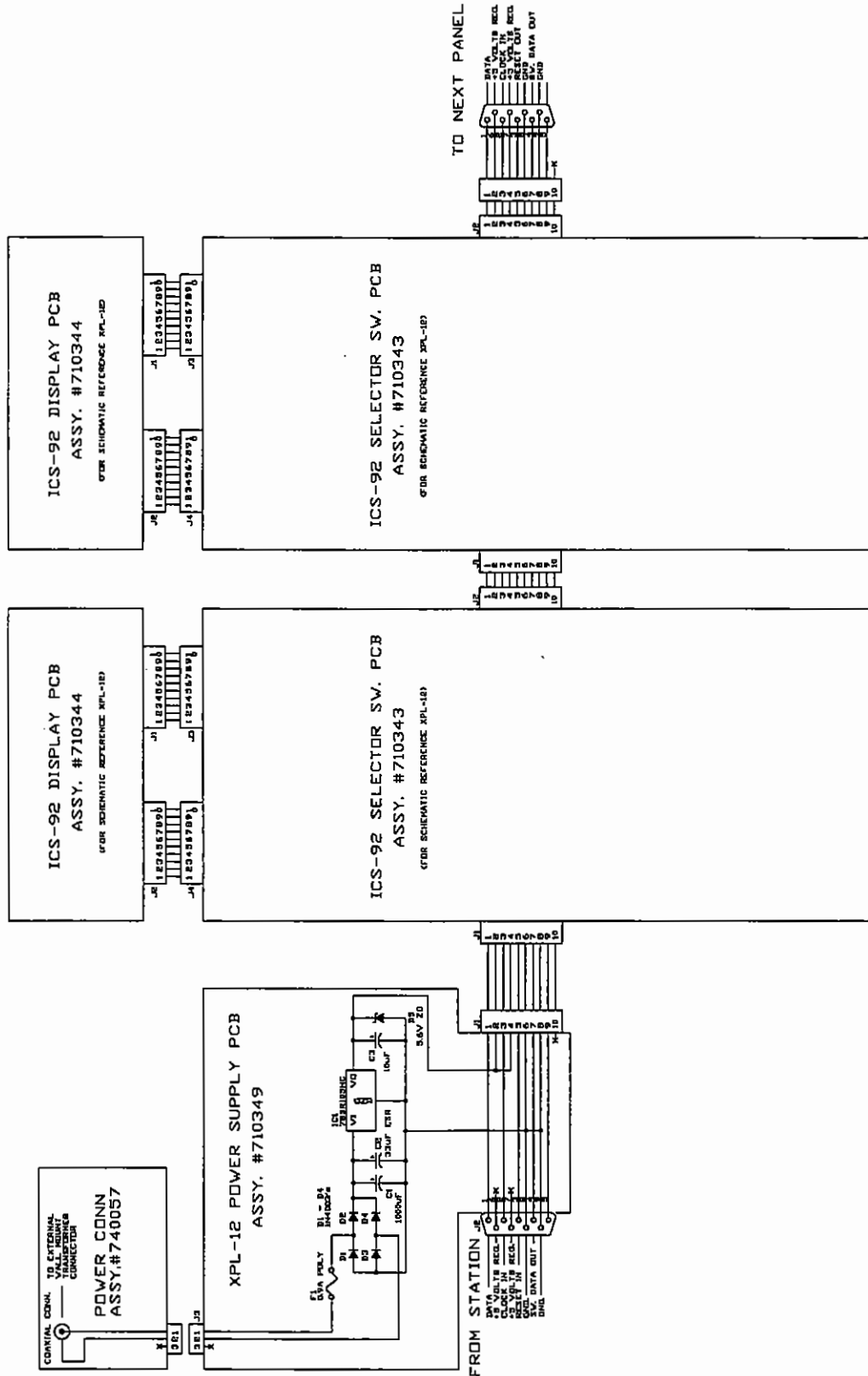


FIGURE S1-21 XPL-22 (20 Key Panel w/ Electronic Labels) Schematic Rev. A

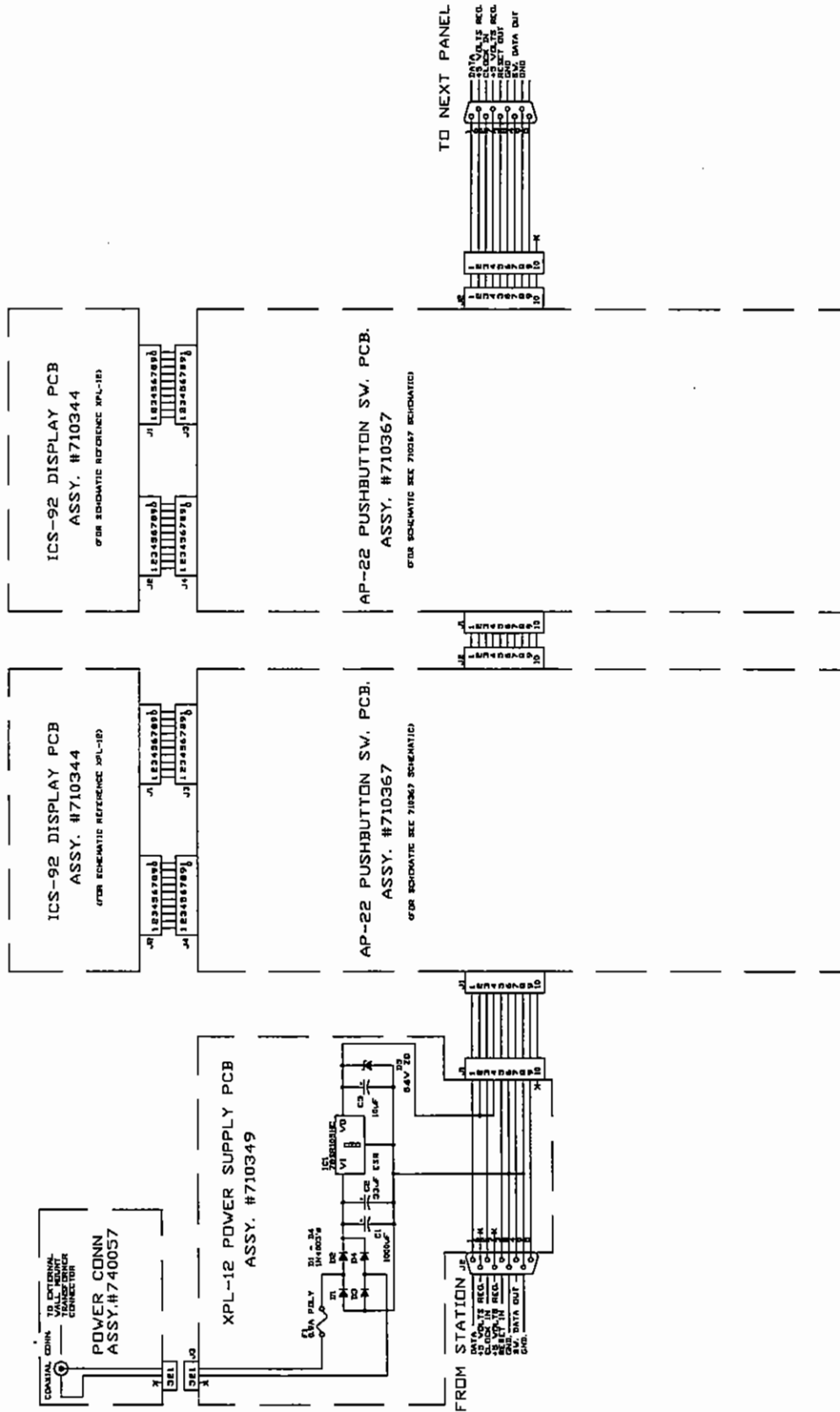


FIGURE S1-22 AP-22 (IFB Assignment Panel) Schematic Rev. A

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170203 PC FAB.

HEADERS "J1" AND "J2"
SOLDER SIDE

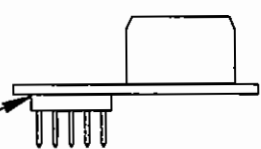
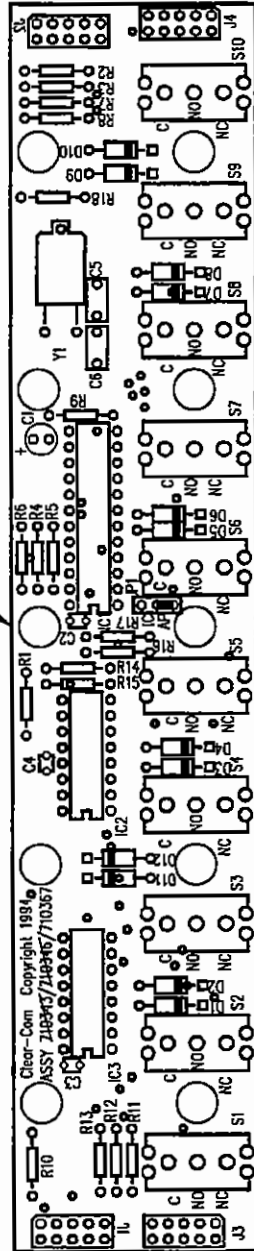


FIGURE S1-23 Assembly Drawing - AP-22 (IFB Assignment Panel) Rev. A

Bill of Materials for the AP-22 PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
.1 uF	Monolythic	50V	10%	150035	C2,C3,C4
10 uF	Aluminum NP	50V		150064	C1
22 pF	Ceramic	50V	10%	150098	C5,C6

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100 OHMS	1/4W	Carbon Film	5%	410071	R1,R2,R3,R7,R8
4.7K OHMS	1/4W	Carbon Film	5%	410013	R14,R15,R16,R17
100K OHMS	1/4W	Carbon Film	5%	410024	R4,R5,R6
8.2K OHMS	1/4W	Carbon Film	5%	410037	R9
200 OHMS	1/4W	Carbon Film	5%	410072	R10,R11,R12,R13

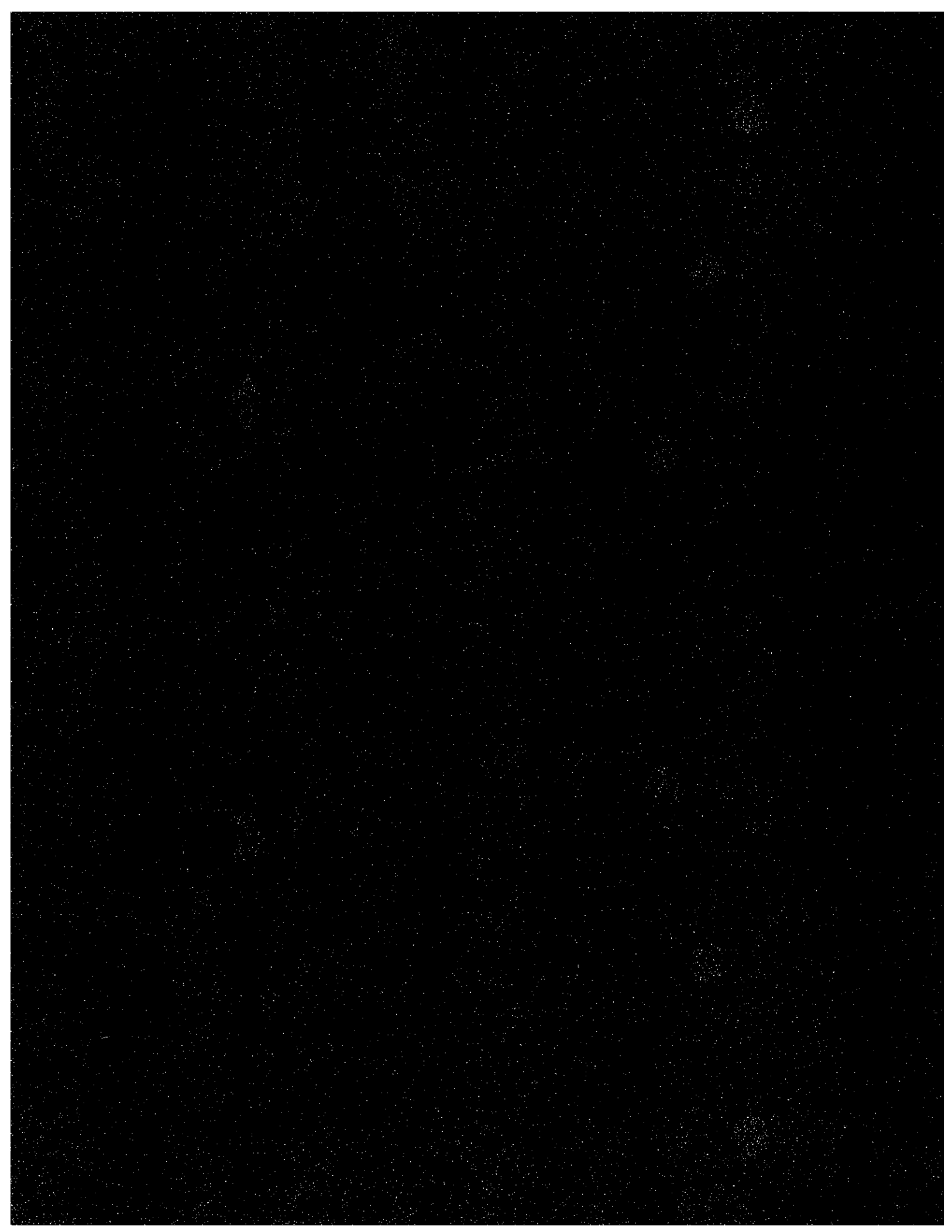
Diodes and Transistors

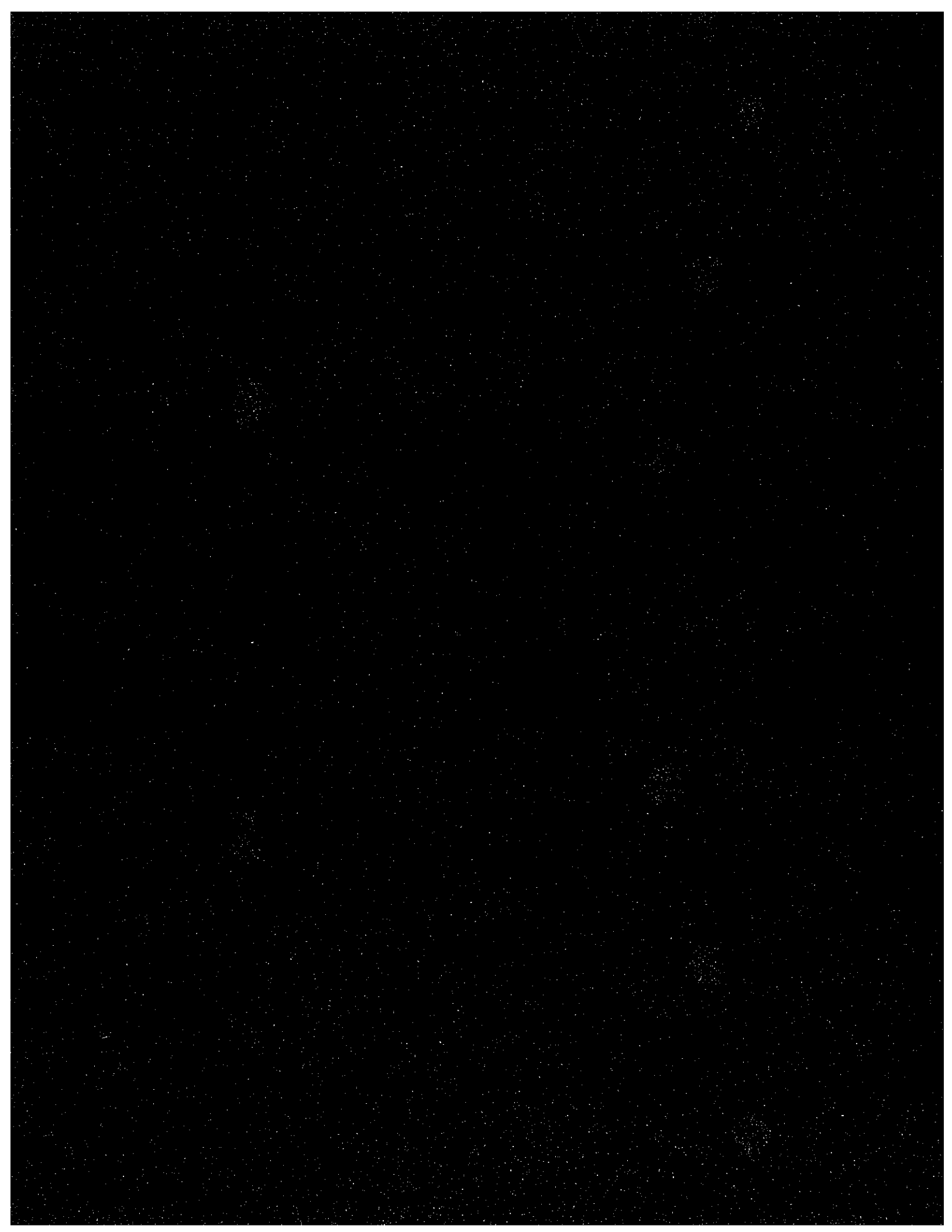
Device	Description	Part #	Designator
CMOS IC	UCN5821A SHIFT REGISTER	480164	IC2
CMOS IC	UCN5895 SHIFT REGISTER	480210	IC3
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1,D2,D3,D4,D5,D6,D7, D8,D9,D10
Microprocessor	87C751 CMOS MCV	480209	IC1

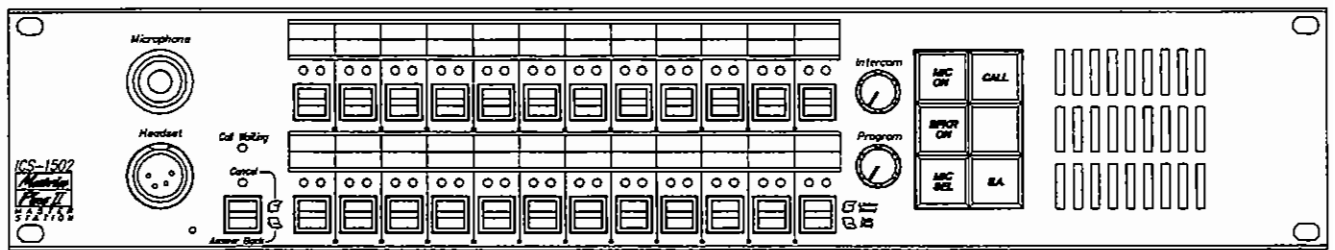
Miscellaneous

Device	Description	Part #	Designator
Switch	SPDT MOMENTARY PC MTG	510115	S1,S2,S3,S4,S5,S6,S7,S8, S9,S10
Crystal	8.000MHz PARALLEL CRYSTAL	230003	Y1

ICS-2002







Matrix Plus II System **ICS-1502**
MASTER STATION INTERCOM STATION

Introduction

This Section provides instructions on resetting the station's microprocessor, troubleshooting information, schematics, assembly drawings and component lists for the ICS-1502 and ICS-1502D Intercom Stations. Information on the XP-12 and XP-22 Expansion Key Panels and the OPT-100 are included in the ICS-2002 Master Intercom Station Section in this Maintenance Manual.

The "D" version of the ICS-1502 is the same except for the transmission method to the Matrix frame. The standard version station uses a 2-wire RS-422 data path and 4-wire analog audio paths to the Matrix Frame. The "D" version uses a single 2-wire digital transmission scheme for both data and audio. The difference between the two stations is which communication module is used. The communications portion of the circuit is separated from the main PCB and is mounted on the rear panel of the station. The program EPROM is also different for the two stations. Schematics, assembly drawings, and bills of materials for these communication modules are provided in the ICS-2002 Master Intercom Station Section in this Maintenance Manual.

The ICS-1502 uses the same basic printed circuit board as the ICS-2002. Some portions of the ICS-2002 are not used such as the EL Driver circuitry and the DTMF tone generator so these components are omitted. The equalizer used to tailor the frequency response of the speaker in the ICS-2002 has been eliminated because of the different speaker mounting arrangement. All other features and functions supported by the main PCB are operational in the ICS-1502.

Station Reset

The microprocessor in the station has a RESET switch accessible from the front panel of the unit. This pushbutton switch is located behind an unmarked hole just below the PROGRAM volume control. If the station is acting erratically, try resetting the station.

To reset the station use a small screwdriver or a stiff piece of wire to activate the pushbutton switch behind the RESET hole. Unplugging and reconnecting the AC power to unit will also reset it.

Troubleshooting

To help isolate a problem you are trying to resolve, a list of possible symptoms and possible solutions that are peculiar to the station has been provided. The Overview chapter of the manual also contains troubleshooting guidelines for the entire system.

1. No LEDs or pushbutton lights come on.
 - Check mains AC power.
 - Check the mains AC fuse on the rear of station.
 - If the fuse is blown, then replacing it is unlikely to fix the station since whatever caused the fuse to blow is still broken.
 - Replace the station.
2. LED indicator above selector key does not light when key is pressed.
 - Note that selector key LED indicators do not light if the selector key has no labels assigned to it.
 - Reset the station.
 - Replace the station.
3. Station appears to activate talk paths, but station operator cannot be heard by other stations.
 - Check Mic ON/OFF and PANEL MIC buttons to make sure the microphone they are using is selected and turned on.
 - If the correct mic is turned on, confirm that the station audio has not been muted externally through the logic inputs.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station.

4. All red LEDs flash slowly, station is inoperative.
 - Check that the cable that connects the station to the matrix is plugged in both at the station and at the matrix frame.
 - Reset the station.
 - Reset the associated crosspoint card in the matrix frame.
 - Check the Configuration Program to ensure that the station is assigned the correct port type (ICS-1502 Intercom Station).
 - If 3/4 pair transmission mode is being used, check the integrity of the RS-422 data paths. Polarity is important in this transmission scheme.
 - If Digital 2 Wire transmission mode is being used, check for a solid DC path between the station and the matrix frame.
 - Confirm that the Matrix card type matches the station.
 - Replace the station.
 - Replace the crosspoint card that the station is connected to.
5. No audio from station's speaker.
 - Check to see if audio can be heard in a headphone.
 - Be sure the Intercom volume control on the front of the station is turned up.
 - Be sure the Speaker On/Off button is set to ON.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station,
 - Reset or replace the crosspoint card that the station is connected to.
6. Cannot hear page from another station.
 - Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.

ICS-1502

7. No announce tones (call signal tones, eavesdropping indication, etc.) at the station.
 - Check and adjust the Page Volume level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.
 - Check the station's Configuration menu to be sure that the monitoring tones are enabled.
8. No audio from external program feed in speaker.
 - Check the Program volume control on the front of the station.
 - Check the program source.
 - Reset the station by powering it OFF and then ON.
 - Replace the station.
9. No audio from external program feed in headphone.
 - If there is program in the speaker check the Configuration of the station with the Configuration Program to make sure the program was not disabled for 2nd earphone feed mode.
10. Station does not receive call signals, answerback indication, or other communications from other stations (except for audio on active talk paths).
 - Check that the Frame Ser LED indicators are blinking in the crosspoint cards in the matrix frame, indicating that the CPU-100 is able to coordinate communication between the crosspoint cards.
 - If they are not blinking, reset the CPU-100 card.
 - If that does not initiate the cycling of the LED indicators, replace the CPU-100.
11. Expansion key panel keys do not function.
 - Check connection of expansion key panel on rear of station.
 - Check the Configuration with the Configuration Software
12. Stations receive call signals, answer backs and other communication but cannot send any talks, call signals or other communication.
 - If two frames are connected and this symptom is true only in the second (SCF-101) frame, reset or replace the CPU-150 in the second frame.

Miscellaneous Bill of Materials for the ICS-1502/1502D

Description	Part #	Designator
CABLE, RIBBON, 26 PIN 6 IN.	730016	
CABLE, RIBBON, 34 PIN	730181	
CONNECTOR, FILTRD AC LINE W/FUSE	210176	
EPROM, ICS-1502 PROGRAM	710302	
EPROM, ICS-1502D PROGRAM	710312	
FUSE, 1/2A SLO-BLO 20MM	520030	
POWER CORD	610022	
TRANSFORMER, POWER	560025	

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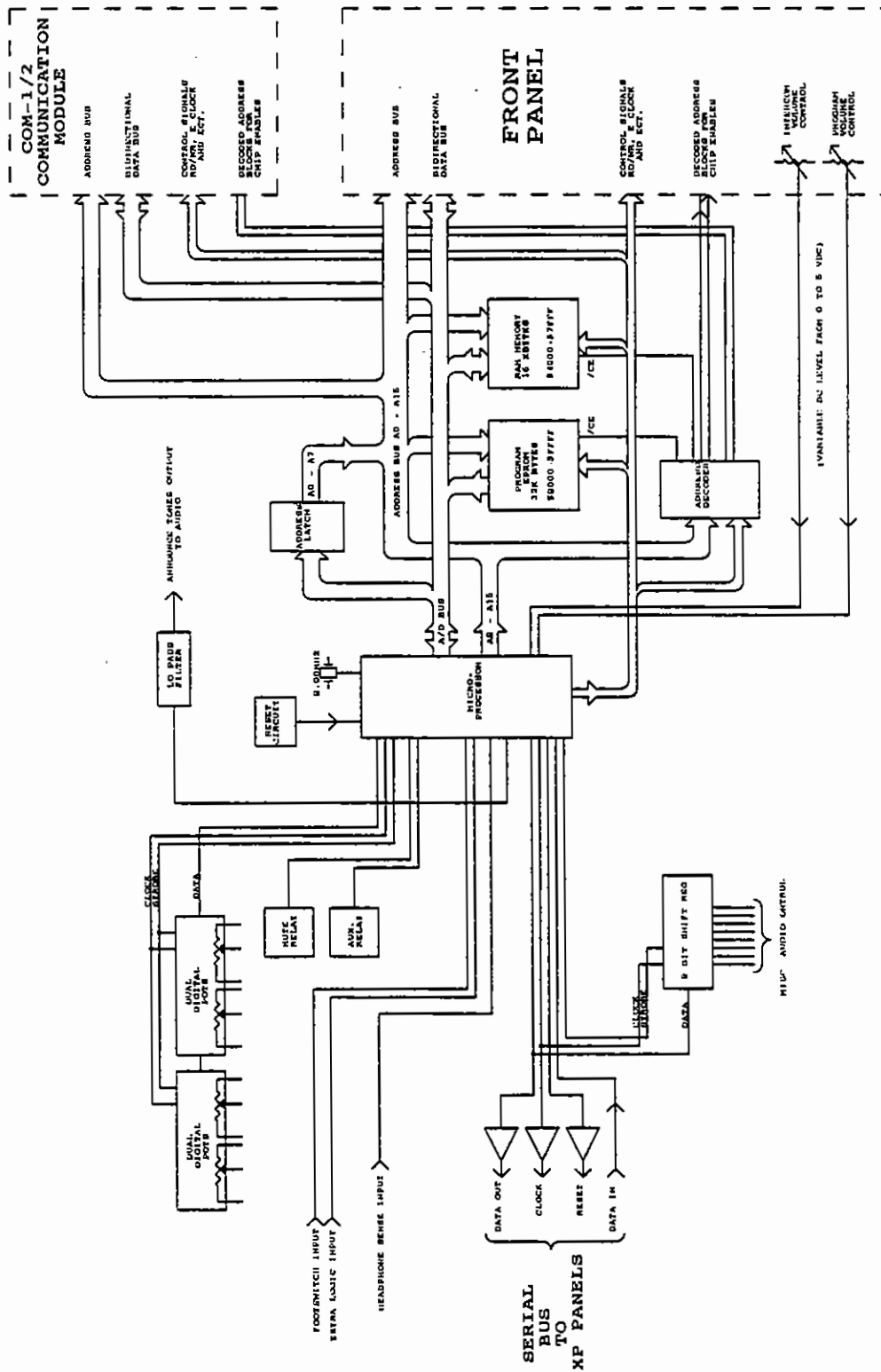


FIGURE S2-1 Digital Block Diagram - ICS-1502 Main PCB

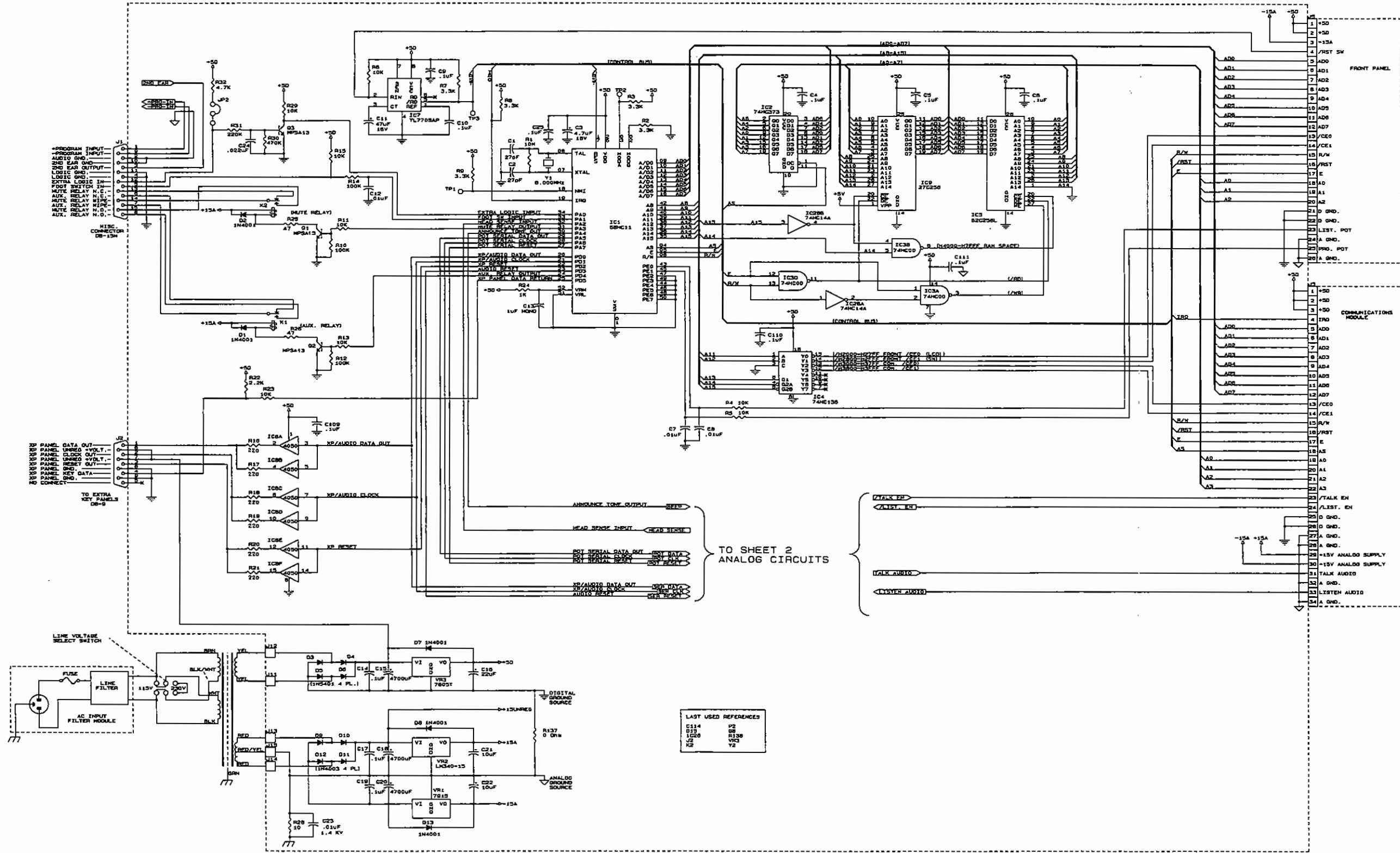


FIGURE S2-2 Schematic - ICS-1502 Main PCB Sheet 1 Rev. C

ICS-1502

ICS-1502

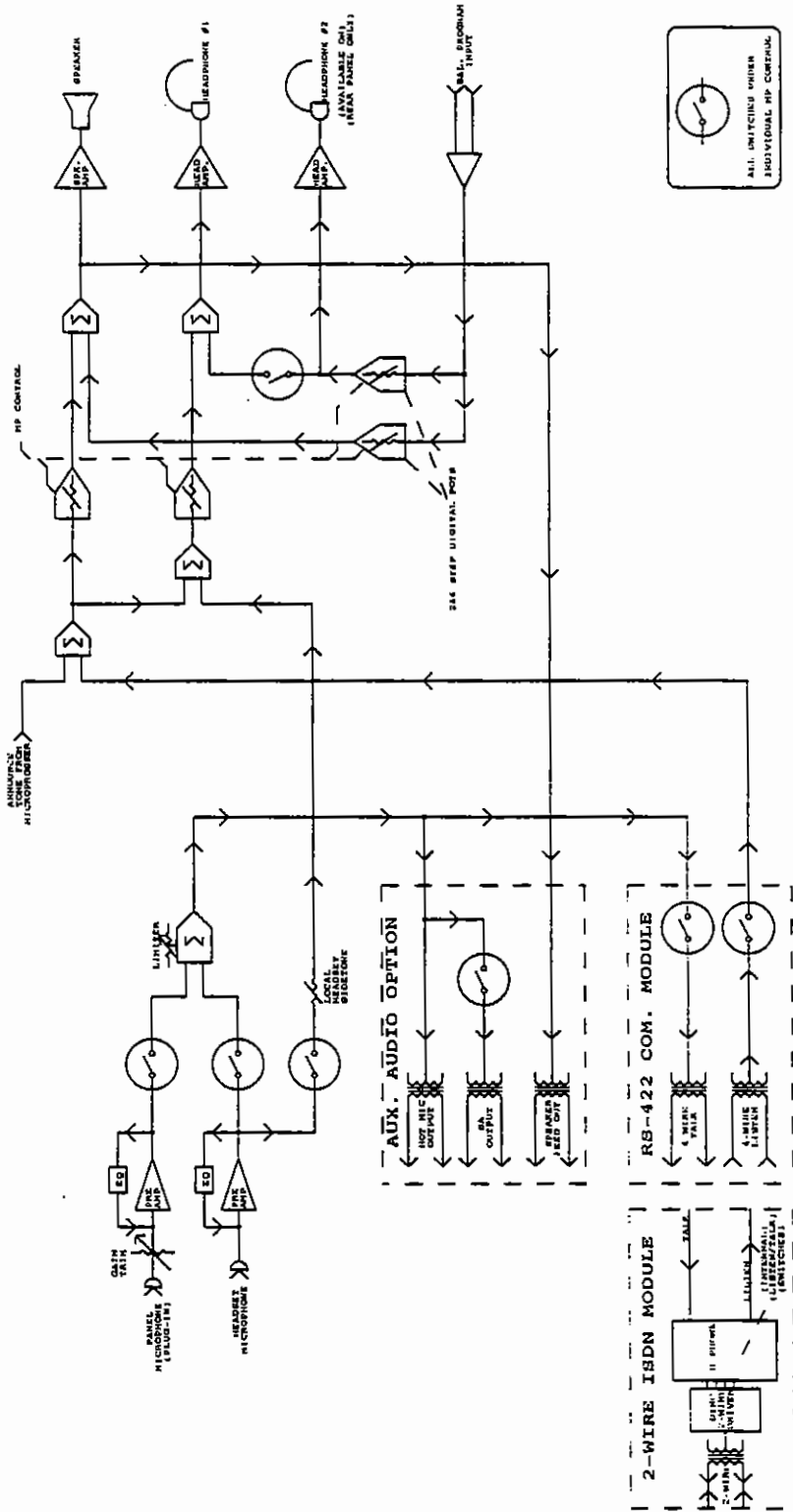


FIGURE S2-3 Analog Block Diagram - ICS-1502 Main PCB

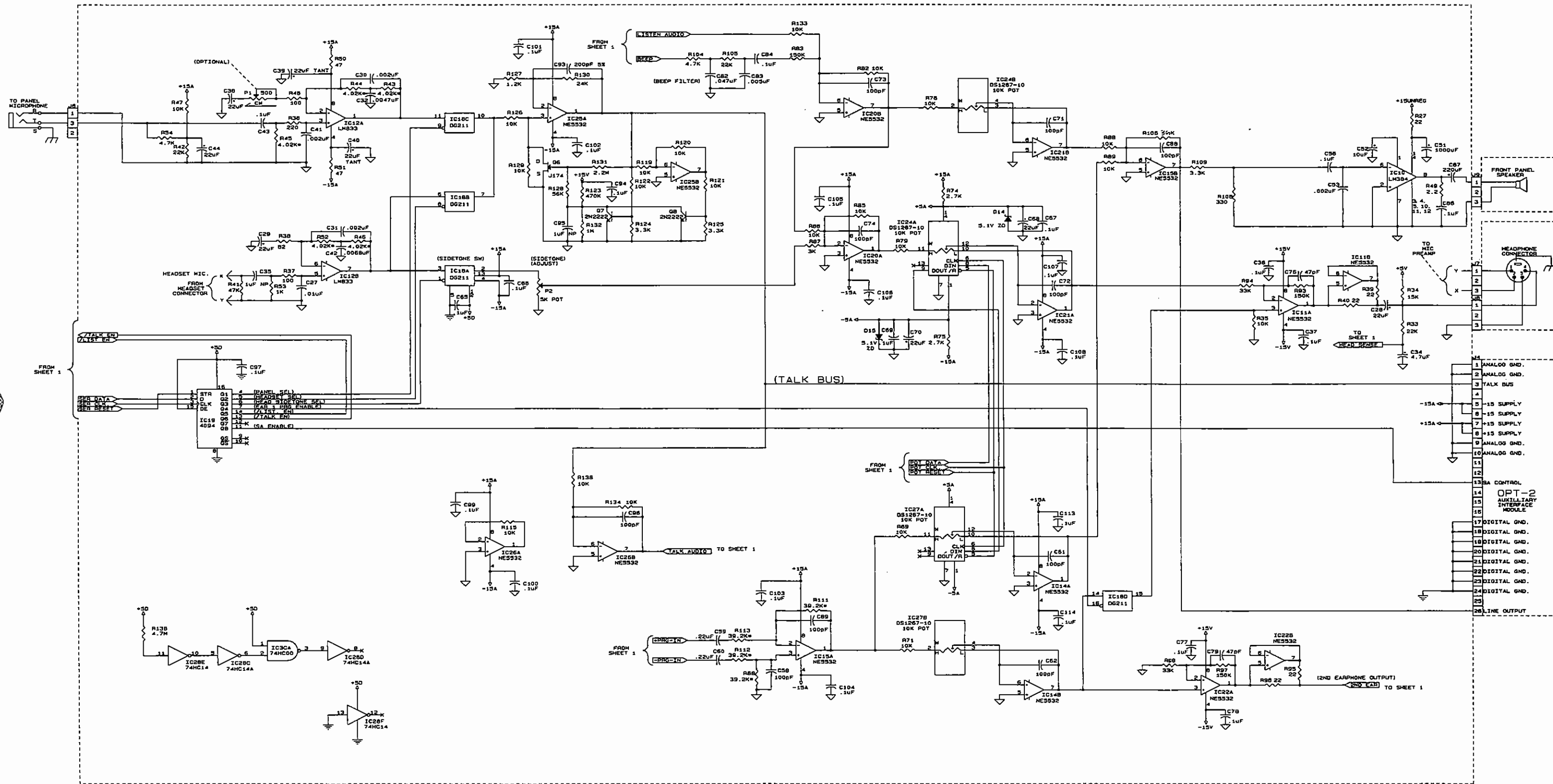


FIGURE S2-4 Schematic - ICS-1502 Main PCB Sheet 2 Rev. C

ICS-1502

ICS-1502

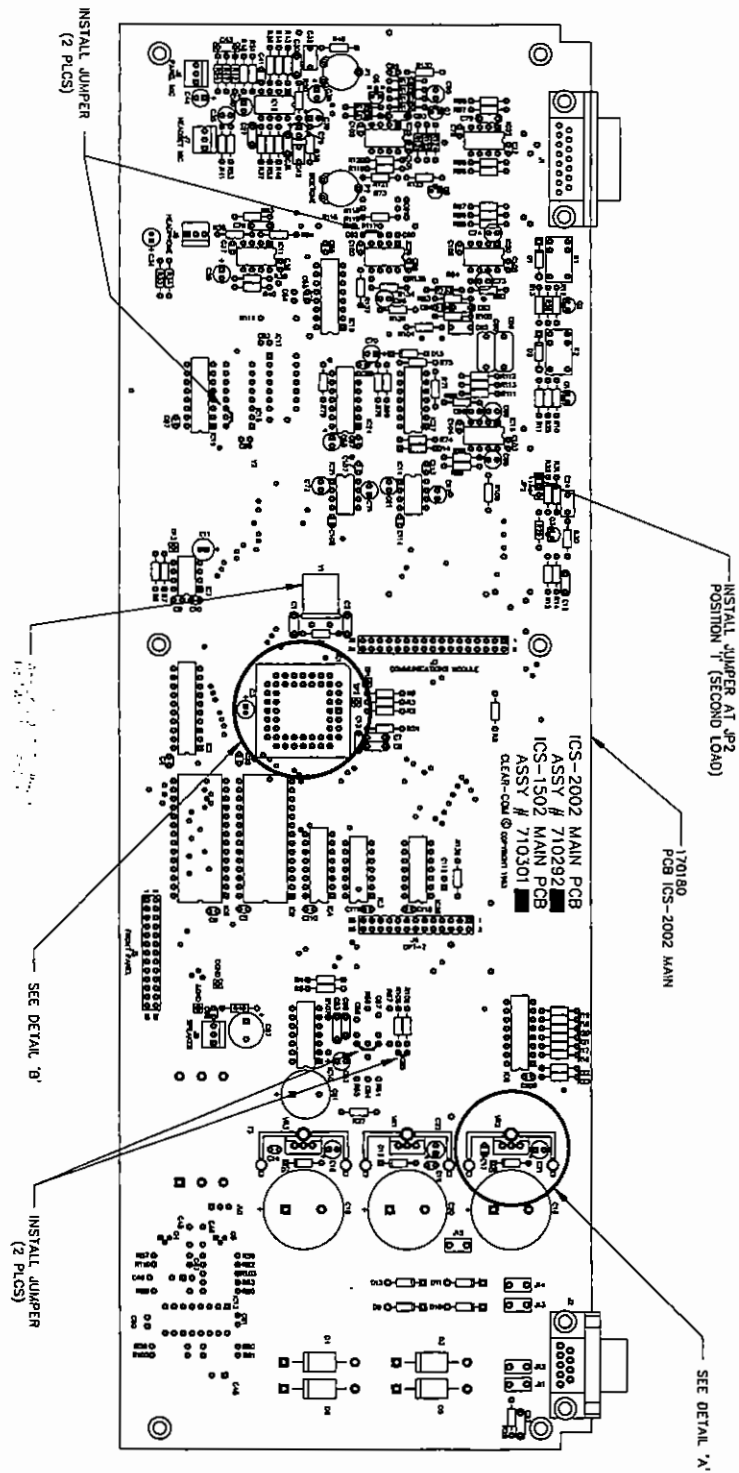


FIGURE S2-5 Assembly Drawing - ICS-1502 Main PCB Rev. A

Bill of Materials for ICS-1502 Main PCB

Capacitors

Value		Type	Volts	Tol.	Part #	Designator
27	pF	Ceramic Disc	50V	5%	150071	C1 C2
47	pF	Ceramic Disc	50V	10%	150041	C76 C79
100	pF	Ceramic Disc	50V	10%	150006	C58 C61 C62 C71 C72 C73 C74 C88 C89 C96
200	pF	Ceramic Disc	100V	5%	150063	C93
0.0022	uF	Mylar	100V	5%	150045	C30 C31 C41 C53
0.0047	uF	Mylar	50V	5%	150114	C32
0.0047	uF	Ceramic Disc	50V	10%	150016	C83
6800	pF	Ceramic Disc	50V	5%	150057	C42
0.01	uF	Ceramic Disc	30V	20%	150012	C7 C8 C12 C27
0.01	uF	Ceramic Disc	1400V	20%	150029	C23
0.022	uF	Mylar	100V	10%	150008	C24
0.047	uF	Metal Polyester	50V	10%	150005	C82
0.1	uF	Monolithic	50V	10%	150035	C4 C5 C6 C9 C10 C14 C17 C19 C25 C36 C37 C56 C65 C66 C67 C69 C77 C78 C84 C86 C94 C97 C99 C100 C101 C102 C103 C104 C105 C106 C107 C108 C109 C110 C111 C113 C114 C115
0.1	uF	Monolithic	100V	10%	150085	C43
0.22	uF	Mylar	100V	20%	150003	C59 C60
1	uF	Ceramic Disc	50V	10%	150073	C13
1	uF	Aluminum	50V	10%	150002	C35 C95
4.7	uF	Aluminum	16V	10%	150141	C3 C34
10	uF	Aluminum	50V		150064	C21 C22 C44 C52 C68 C70
22	uF	Tantalum	16V		150032	C39 C40
22	uF	Aluminum	16V		150010	C16 C28 C29 C38
47	uF	Aluminum	16V	20%	150143	C11
220	uF	Aluminum	35V		150021	C87
1000	uF	Aluminum	35V		150092	C51
4700	uF	Aluminum	25V	20%	150126	C15 C18 C20

Bill of Materials for ICS-1502 Main PCB ----- cont.**Resistors & Resistor Packs**

Value	Power	Type	Tol.	Part #	Designator
2.2 OHM	1/4	Carbon Film	5%	410113	R49
10 OHM	1/4	Carbon Film	5%	410002	R28
22 OHM	1/4	Carbon Film	5%	410004	R27 R39 R40 R95 R96
47 OHM	1/4	Carbon Film	5%	410039	R25 R26 R50 R51 R55
82 OHM	1/4	Carbon Film	5%	410038	R38
100 OHM	1/4	Carbon Film	5%	410071	R37 R48
220 OHM	1/4	Carbon Film	5%	410007	R16 R17 R18 R19 R20 R21 R36
1K OHM	1/4	Carbon Film	5%	410010	R24 R53
1.2K OHM	1/4	Carbon Film	5%	410041	R127
2.2K OHM	1/4	Carbon Film	5%	410011	R22
2.7K OHM	1/4	Carbon Film	5%	410040	R74 R75
3.0K OHM	1/4	Carbon Film	5%	410104	R87
3.3K OHM	1/4	Carbon Film	5%	410015	R2 R3 R7 R8 R9 R109 R124 R125
4.02K OHM	1/8	Metal Film	1%	410155	R43 R44 R45 R46 R52
4.7K OHM	1/4	Carbon Film	5%	410013	R32 R54 R104
10K OHM	1/4	Carbon Film	5%	410016	R4 R5 R6 R11 R13 R15 R23 R29 R35 R47 R69 R71 R76 R79 R82 R83 R85 R86 R88 R89 R115 R119 R120 R121 R122 R126 R129 R133 R134 R136
15K OHM	1/4	Carbon Film	5%	410017	R34
22K OHM	1/4	Carbon Film	5%	410018	R33 R42 R105 R106
24K OHM	1/4	Carbon Film	5%	410083	R130
33K OHM	1/4	Carbon Film	5%	410020	R94 R98 R110
39.2K OHM	1/8	Metal Film	1%	410111	R68 R111 R112 R113
47K OHM	1/4	Carbon Film	5%	410021	R41
56K OHM	1/4	Carbon Film	5%	410023	R128
100K OHM	1/4	Carbon Film	5%	410024	R10 R12 R14
150K OHM	1/4	Carbon Film	5%	410026	R93 R97
220K OHM	1/4	Carbon Film	5%	410028	R31
470K OHM	1/4	Carbon Film	5%	410030	R30 R123
1M OHM	1/4	Carbon Film	5%	410058	R132
2.2M OHM	1/4	Carbon Film	5%	410153	R131
4.7M OHM	1/4	Carbon Film	5%	410077	R138
10M OHM	1/4	Carbon Film	5%	410059	R1

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Bill of Materials for ICS-1502 Main PCB ----- cont.**Diodes and Transistors**

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D1 D2 D7 D8 D13
Diode	1N4003 RECT 1A 200PIV	480058	D9 D10 D11 D12
Diode	1N5231B ZENER 5.1V .5W 5%	480038	D14 D15
Diode	1N5401 RECT 3A 100PIV	480005	D3 D4 D5 D6
Transistor	2N2222 NPN 30V	480006	Q7 Q8
Transistor	J174 JFET PCHAN 8V VGS	480079	Q6
Transistor	MPS-A13 NPN 30V DARL	480004	Q1 Q2 Q3

Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	DG211CJ CMOS QUAD SWITCH	480092	IC18
Digital IC	DS1267-10 DUAL 10K POT	480195	IC24 IC27
Digital IC	TL7705AP RESET SUPERVISOR	480134	IC7
Logic Chip	4050B CMOS HEX BUFFER	480077	IC8
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC19
Logic Chip	74HC00 CMOS QUAD NAND	480157	IC3
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC4
Logic Chip	74HC14 CMOS HEX	480199	IC28
Logic Chip	74HC373 CMOS OCTAL D LATCH	480142	IC2
Microprocessor	68HC11AOFN CMOS MCU	480132	IC1
Op Amp	LM384 POWER 4W OP AMP	480012	IC10
Op Amp	LM833N DUAL LO NOISE OA	480175	IC12
Op Amp	NE5532 DUAL LO NOISE OA	480070	IC11 IC14 IC15 IC20 IC21 IC22 IC25 IC26
RAM Mem	GM76C256L CMOS 32K X 8	480183	IC5
Regulator	7805T POS 5V REG. TO220 PKG	480083	VR3
Regulator	7915 NEG 15V REG. IC TO-220	480149	VR1
Regulator	LM340-15 POS 15V REGULATOR	480024	VR2

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Bill of Materials for ICS-1502 Main PCB ----- cont.**Miscellaneous**

Description	Part #	Designator
CONNECTOR, DB-9F RT ANG PC MTG		210186 J2
CONNECTOR, DB-15F RT ANG PC MTG		210187 J1
Crystal, 8.000MHz PARALLEL CRYSTAL		230003 Y1
POT, 500 OHM VERTICAL SHAFT TRIM		470060 P1
POT, 5K TRIM H MTG.		470022 P2
RELAY, SPDT 12V MINI PC		450006 K1 K2

ICS-1502

ICS-1502

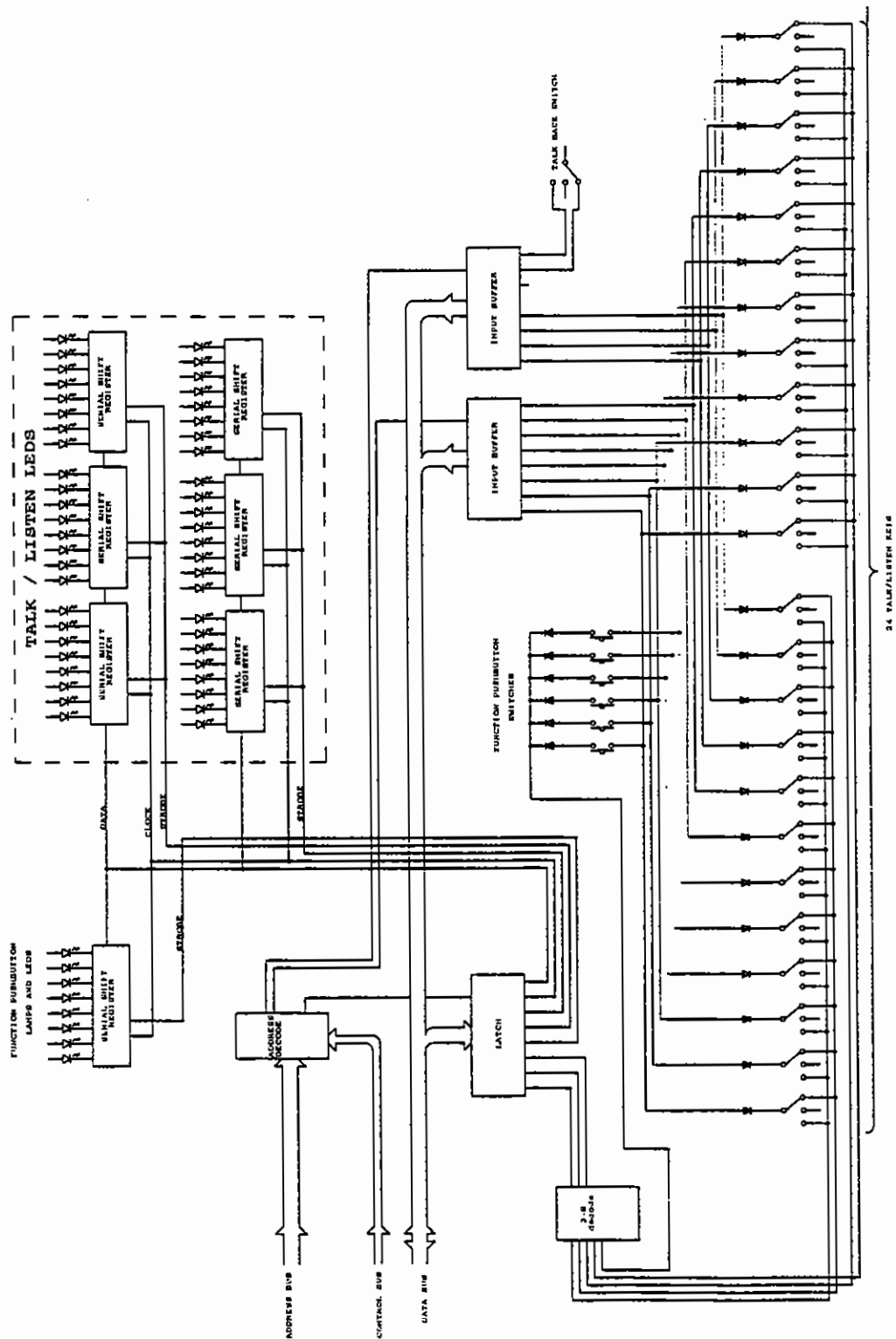


FIGURE S2-6 Block Diagram - ICS-1502 Front Panel PCB

- NOTES (UNLESS OTHERWISE SPECIFIED)
1. ALL RESISTORS ARE 1/4W 5% LISTED IN OHMS
2. ALL CAPACITORS ARE LISTED IN MICROFARADS
3. ALL DIODES ARE 1N4148

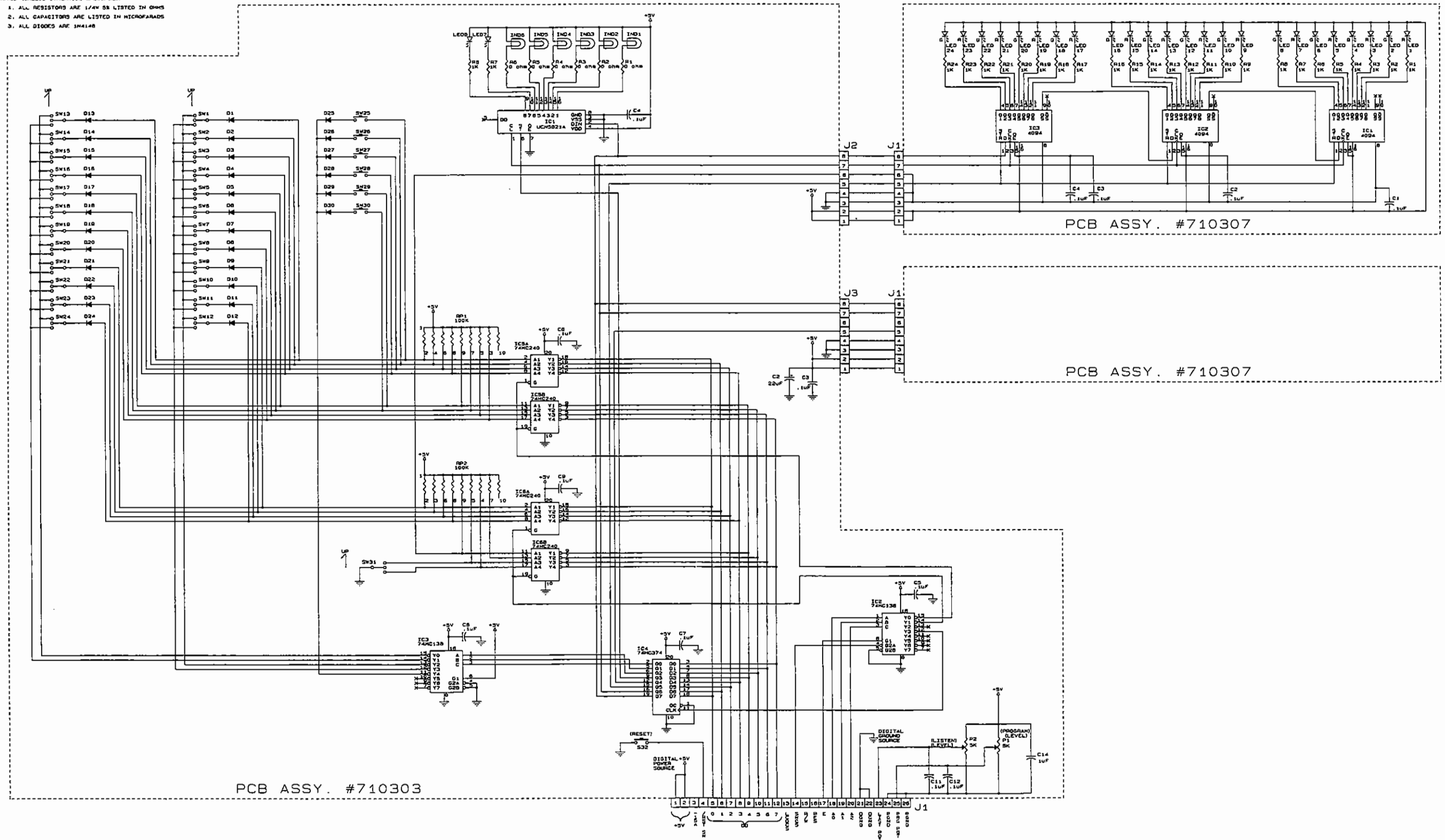


FIGURE S2-7 Schematic - ICS-1502 Front Panel PCB Rev. A

ICS-1502

ICS-1502

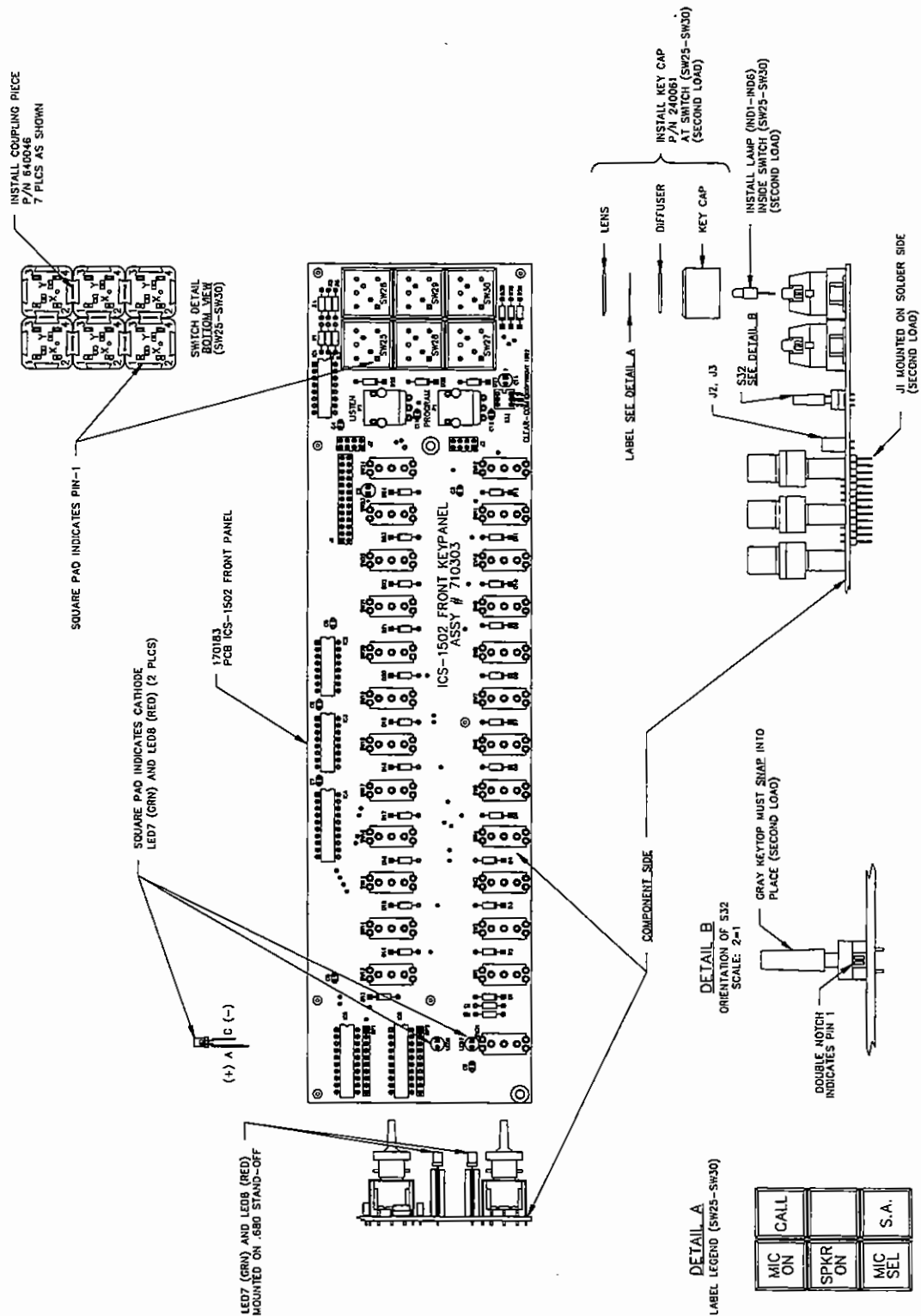


FIGURE S2-8 Assembly Drawing - ICS-1502 Front Panel PCB Rev. A

Bill of Materials for ICS-1502 Front Panel PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
0.1 uF	Monolithic	100V	20%	150112	C3 C4 C5 C6 C7 C8 C9 C11 C12
1 uF	Tantalum	35V	20%	150116	C14
22 uF	Tantalum	16V		150032	C2

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R7 R8
100K OHM		X 9 SIP bussed		415002	RP1 RP2

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 D20 D21 D22 D23 D24 D25 D26 D27 D28 D29 D30

Integrated Circuits

Device	Description	Part #	Designator
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC2 IC3
Logic Chip	74HC240 CMOS INV BUFFER	480121	IC5 IC6
Logic Chip	74HC374 CMOS OCTAL D FF	480143	IC4
Logic Chip	UCN5821A SHIFT REG	480164	IC1

Bill of Materials for ICS-1502 Front Panel PCB ----- cont.**Miscellaneous**

Description	Part #	Designator
CAP, EAO LENS & DIFFUSER #99-901.9	240061	SW25 SW26 SW27 SW28 SW29 SW30
LAMP, 5V 21MA T1 BI-PIN OSHINO# OL3020BPE	390034	IND1 IND2 IND3 IND4 IND5 IND6
LED, GREEN, ROUND, FLAT TOP	390045	LED7
LED, RED, ROUND, FLAT TOP	390044	LED8
POT, 5K LINEAR POT PC MOUNT	470068	P1 P2
SPACER, EAO SWITCH SPACER PT#99-910	640046	
SWITCH, PUSHBUTTON, DPDT MOMENTARY	510102	S32
SWITCH, PUSHBUTTON PC MTG EAO #99-455	510085	SW25 SW26 SW27 SW28 SW29 SW30
SWITCH, SP3T MOM-OFF-MOM PC MTG	510080	SW1 SW2 SW3 SW4 SW5 SW6 SW7 SW8 SW9 SW10 SW11 SW12 SW13 SW14 SW15 SW16 SW17 SW18 SW19 SW20 SW21 SW22 SW23 SW24 SW31

ICS-1502

ICS-1502

ICS-1502

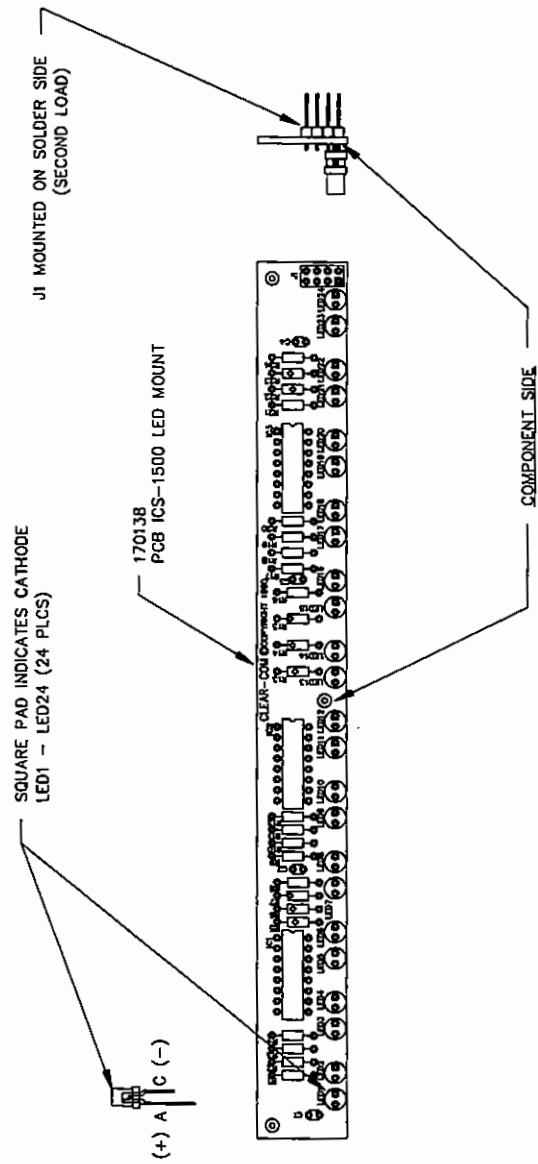


FIGURE S2-9 Assembly Drawing - ICS-1502 LED Front Panel PCB Rev. A

Bill of Materials for ICS-1502 LED PCB

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
0.1 uF	Monolithic	100V	20%	150112	C1 C2 C3 C4

Resistors & Resistor Packs

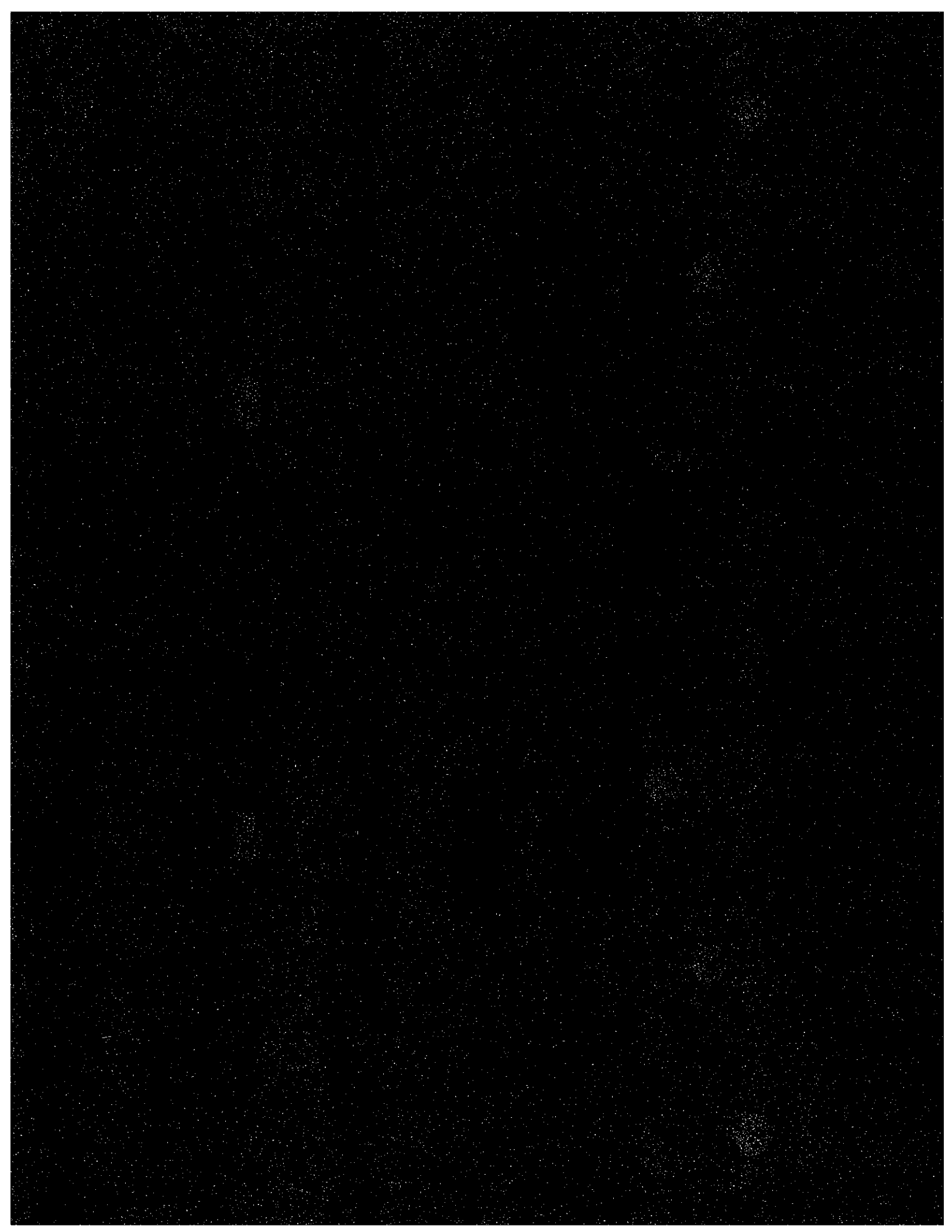
Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R1-R24(24)

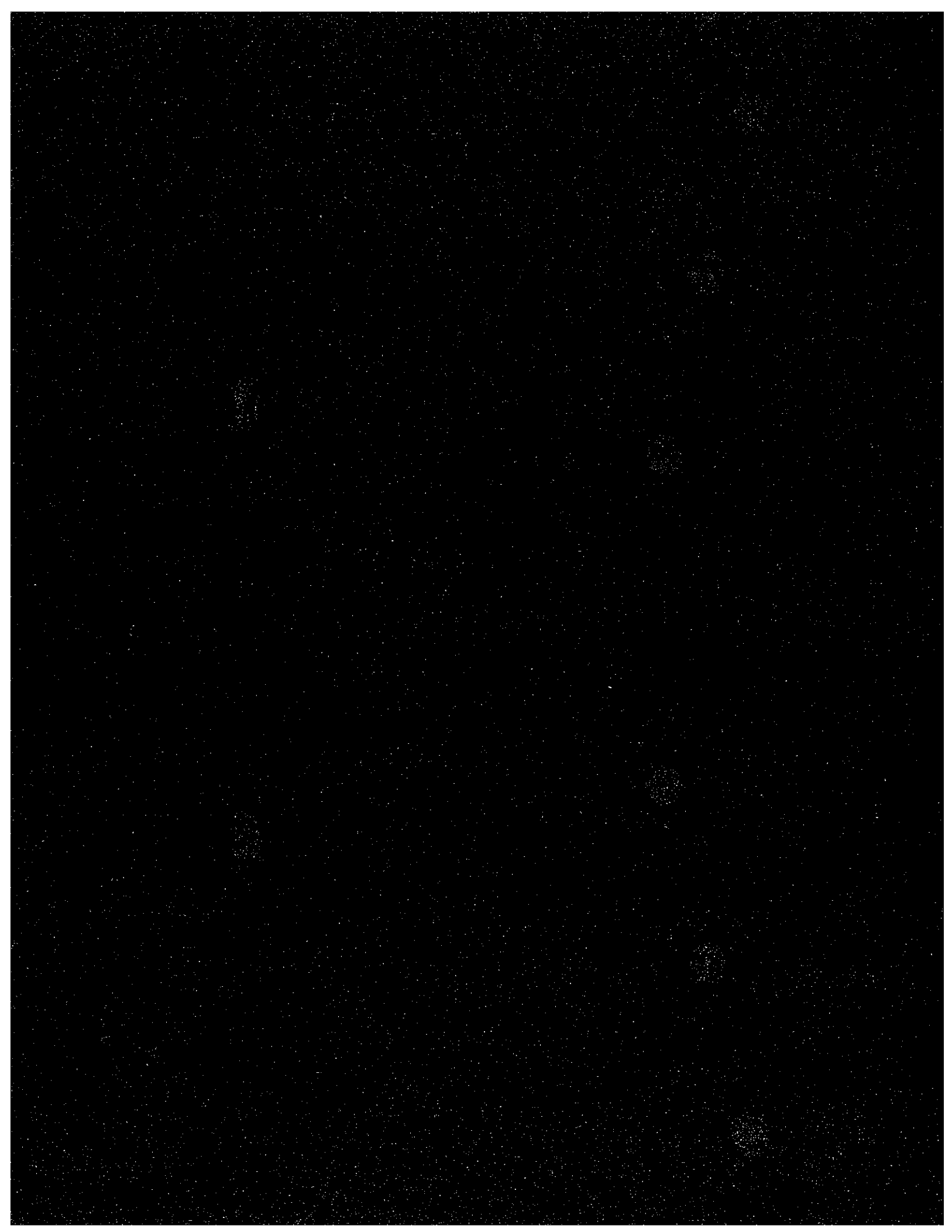
Integrated Circuits

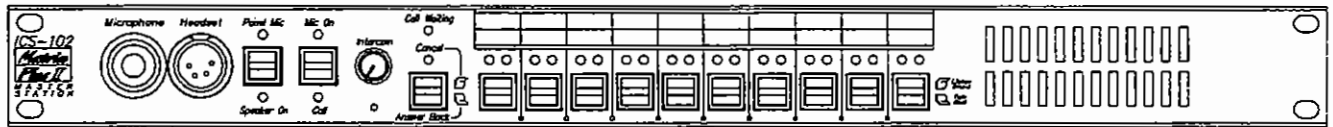
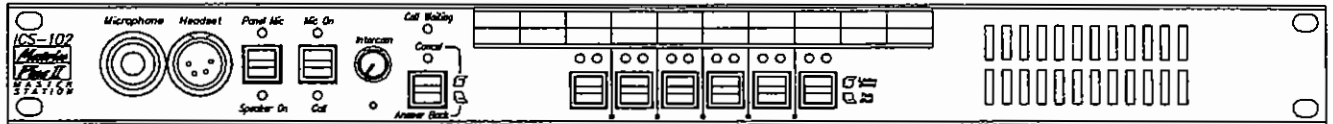
Device	Description	Part #	Designator
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC1 IC2 IC3

Miscellaneous

Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP LED	390045	LED2 LED4 LED6 LED8 LED10 LED12 LED14 LED16 LED18 LED20 LED22 LED24
LED	RED, ROUND, FLAT TOP LED	390044	LED1 LED3 LED5 LED7 LED9 LED11 LED13 LED15 LED17 LED19 LED21 LED23







**Matrix Plus II System ICS-62/ICS-102
MASTER STATION INTERCOM STATION**

Introduction

This Section provides instructions on resetting the station's microprocessor, trouble shooting information, schematics, assembly drawings and component lists for the ICS-62, ICS-62D, ICS-102, and ICS-102D Intercom Stations. Information on the XP-12 and XP-22 Expansion Key Panels and the OPT-100 are included in the ICS-2002 Master Intercom Station Section in this Maintenance Manual.

The only difference between the ICS-102 and ICS-62 is the number of talk and listen keys on the front panel. Internally the stations are identical including having identical programs. The ICS-62 has two jumpers on its Talk/Listen key panel to identify the station type.

The difference between the ICS-102/62 and the ICS-102/62D is which communication module is used. The communications portion of the circuit is separated from the main PCB and is mounted on the rear panel of the station. The program EPROM is also different for the two stations.

These stations operate on 14 VAC supplied from an external transformer. Transformers can be ordered for either 117 VAC or 220 VAC. Refer to the Miscellaneous Bill of Material in this section for ordering information.

Station Reset

The microprocessor in the station has a RESET switch accessible from the front panel of the unit. This pushbutton switch is located behind an unmarked hole just below the INTERCOM volume control. If the station is acting erratically, try resetting the station.

To reset the station use a small screwdriver or a stiff piece of wire to activate the pushbutton switch behind the RESET hole. Unplugging and reconnecting the AC power to unit will also reset it.

Troubleshooting

To help isolate a problem you are trying to resolve, a list of possible symptoms and possible solutions that are peculiar to the station has been provided.

The Overview chapter of the manual also contains troubleshooting guidelines for the entire system.

1. No LEDs or pushbutton lights come on.
 - Check mains AC power.
 - Replace the station.
2. LED indicator above selector key does not light when key is pressed.
 - Note that selector key LED indicators do not light if the selector key has no labels assigned to it.
 - Reset the station.
 - Replace the station.
3. Station appears to activate talk paths, but station operator cannot be heard by other stations.
 - Check Mic ON/OFF and PANEL MIC buttons to make sure the microphone they are using is selected and turned on.
 - If the correct mic is turned on, confirm that the station audio has not been muted externally through the logic inputs.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station.

4. All red LEDs flash slowly, station is inoperative.
 - Check that the cable that connects the station to the matrix is plugged in both at the station and at the matrix frame.
 - Reset the station.
 - Reset the associated crosspoint card in the matrix frame.
 - Check the Configuration Program to ensure that the station is assigned the correct port type (ICS-102/62 Intercom Station).
 - If 3/4 pair transmission mode is being used, check the integrity of the RS-422 data paths. Polarity is important in this transmission scheme.
 - If Digital 2 Wire transmission mode is being used, check for a solid DC path between the station and the matrix frame.
 - Confirm that the Matrix card type matches the station.
 - Replace the station.
 - Replace the crosspoint card that the station is connected to.
5. No audio from station's speaker.
 - Check to see if audio can be heard in a headphone.
 - Be sure the Intercom volume control on the front of the station is turned up.
 - Be sure the Speaker On/Off button is set to ON.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station,
 - Reset or replace the crosspoint card that the station is connected to.
6. Cannot hear page from another station.
 - Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.

7. No announce tones (call signal beeps, eavesdropping indication, etc.) at the station.

- Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.
- Check the station's Configuration menu to be sure that the monitoring tones are enabled.

8. No audio from external program feed in speaker.

- Check the Program volume control on the front of the station.
- Check the program source.
- Reset the station by powering it OFF and then ON.
- Replace the station.

9. Station does not receive call signals, answerback indication, or other communications from other stations (except for audio on active talk paths).

- Check that the Frame Ser LED indicators are blinking in the crosspoint cards in the matrix frame, indicating that the CPU-100 is able to coordinate communication between the crosspoint cards.
- If they are not blinking, reset the CPU-100 card.
- If that does not initiate the cycling of the LED indicators, replace the CPU-100.

10. Expansion key panel keys do not function.

- Check connection of expansion key panel on rear of station.
- Check the Configuration with the Configuration Software

12. Stations receive call signals, answer backs and other communication but cannot send any talks, call signals or other communication.

- If two frames are connected and this symptom is true only in the second (SCF-101) frame, reset or replace the CPU-150 in the second frame.

Miscellaneous Bill of Materials for the ICS-62/62D/102/102D

Device	Description	Part #
CABLE	10-PIN FLAT CABLE	770001
CABLE	16-PIN FLAT CABLE	770008
CABLE	34-PIN FLAT CABLE	730181
CLAMP	CABLE CLAMP, 3/16IN PLASTIC	640054
EPROM MEM.	ICS-102 PROGRAM	710305
EPROM MEM.	ICS-102D PROGRAM	710313
SPEAKER	3 INCH ROUND	500089
TRANSFORMER	POWER PLUG-IN 117/14VAC	400008
TRANSFORMER	POWER PLUG-IN 220/14VAC	400011

ICS-62/ICS-102

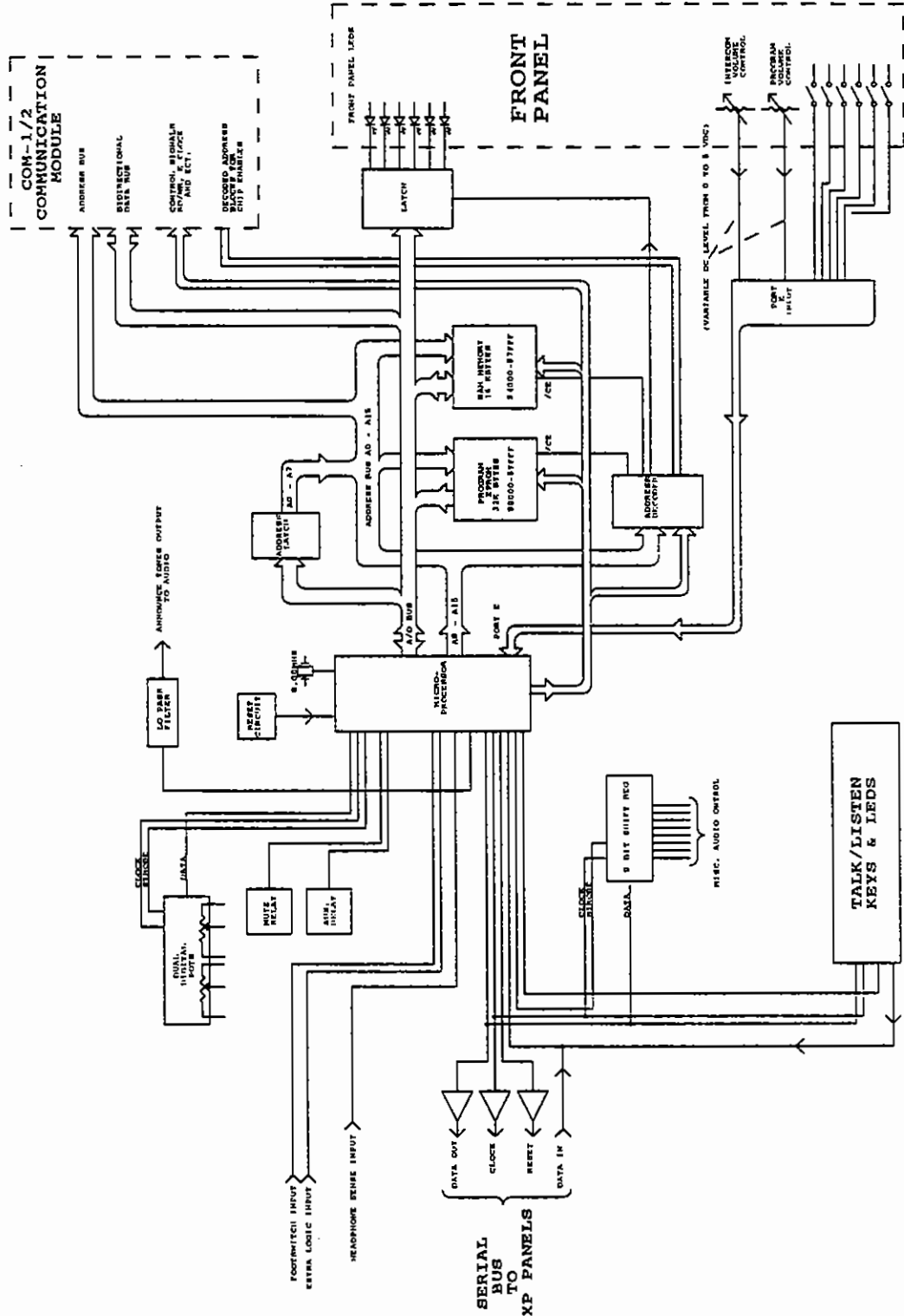


FIGURE S3-1 Digital Block Diagram - ICS-62/ICS-102 Main PCB

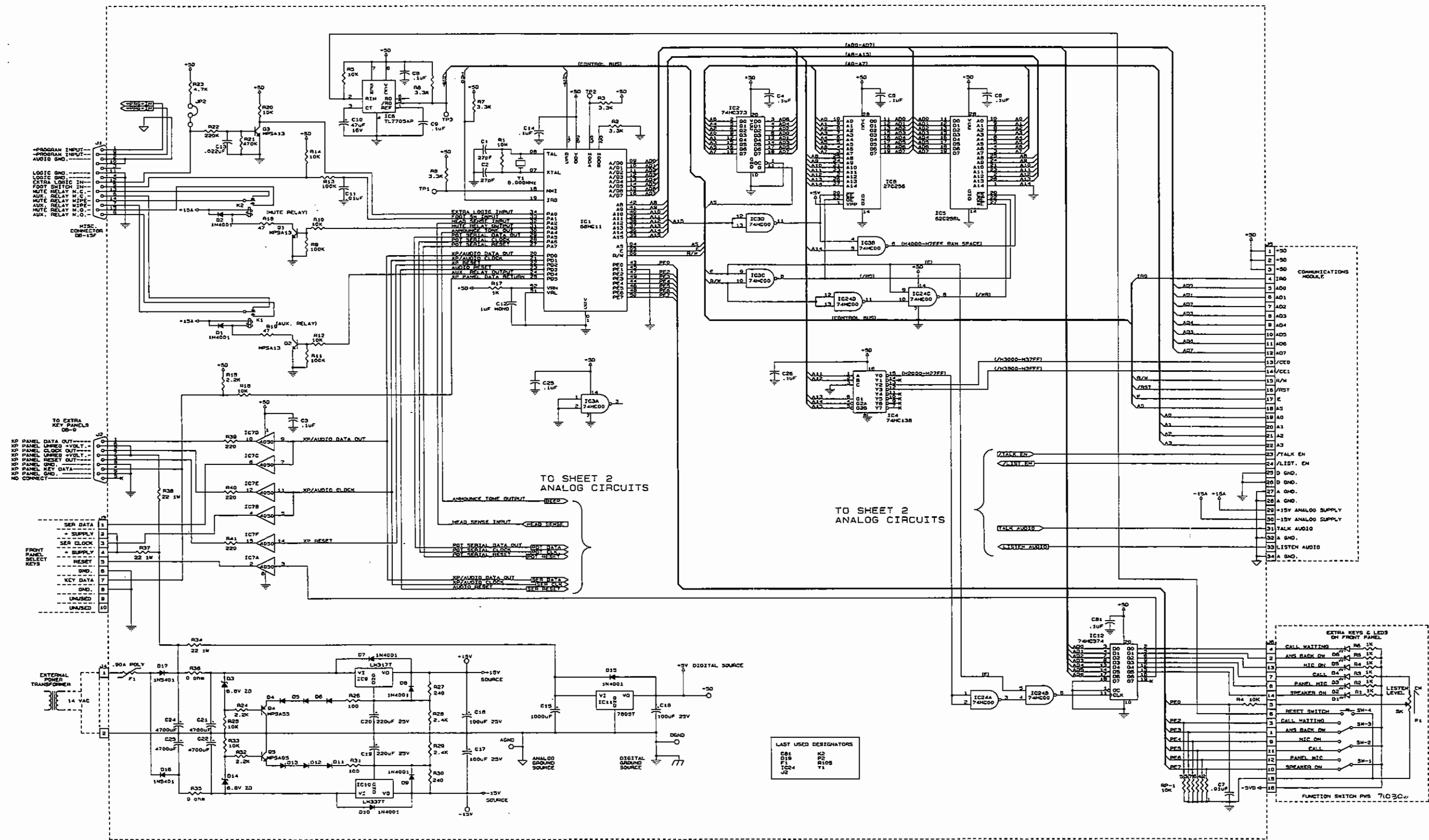


FIGURE S3-2 Schematic - ICS-62/ICS-102 Main PCB Sheet 1 Rev. B

ICS-62/ICS-102

ICS-62/ICS-102

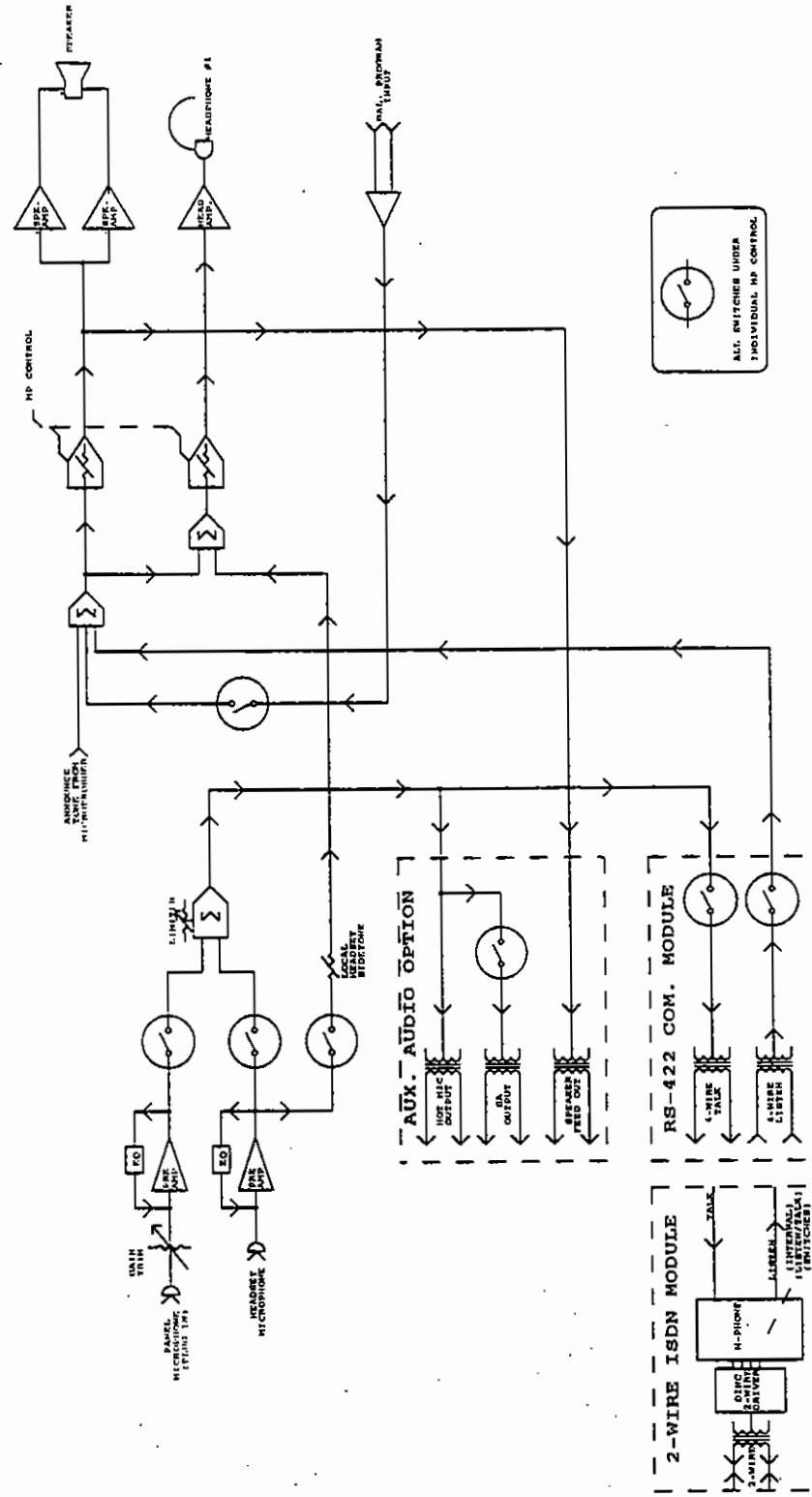


FIGURE S3-3 Analog Block Diagram - ICS-62/ICS-102 Main PCB

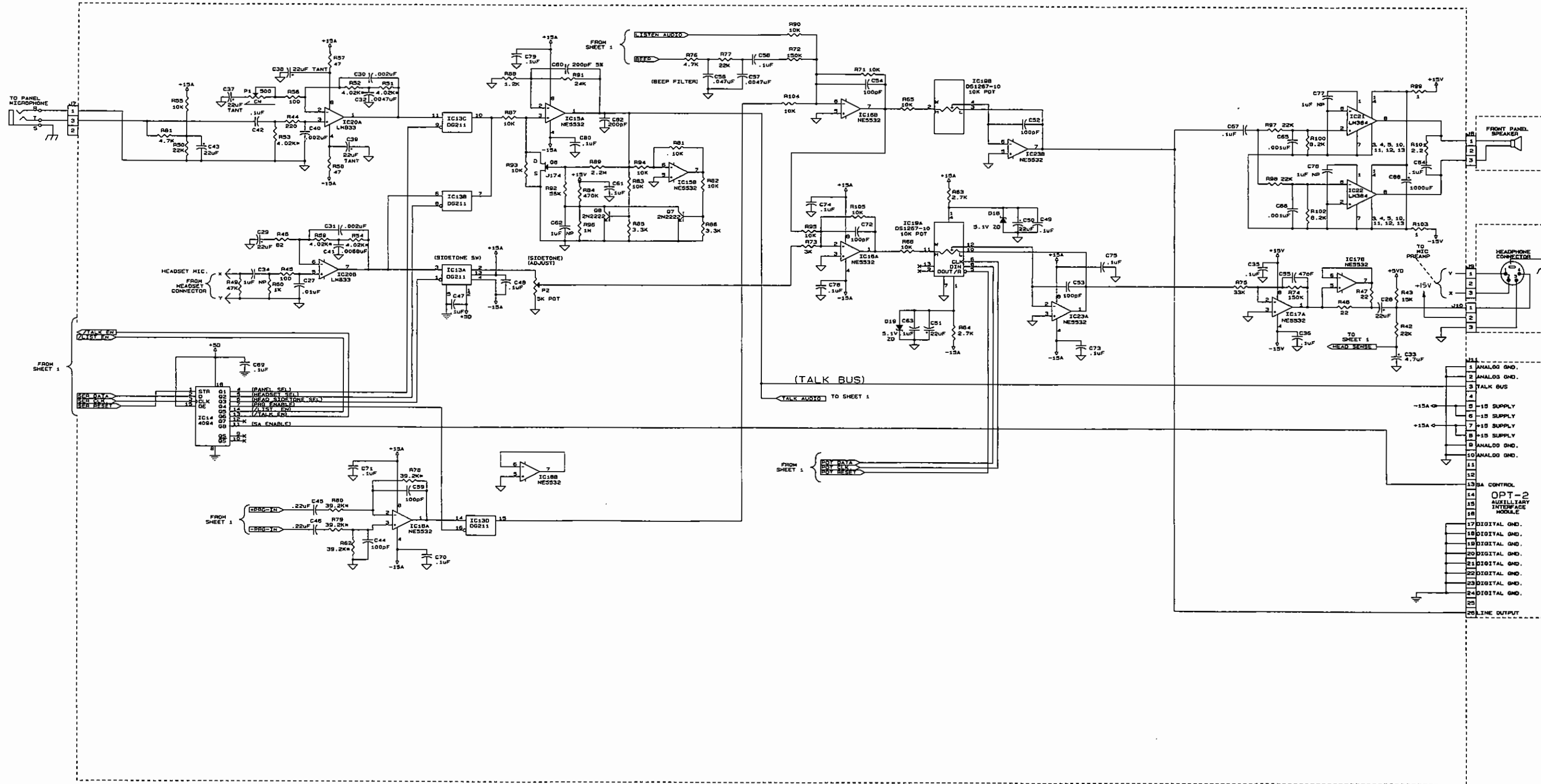


FIGURE S3-4 Schematic - ICS-62/ICS-102 Main PCB Sheet 2 Rev. B

ICS-62/ICS-102

ICS-62/ICS-102

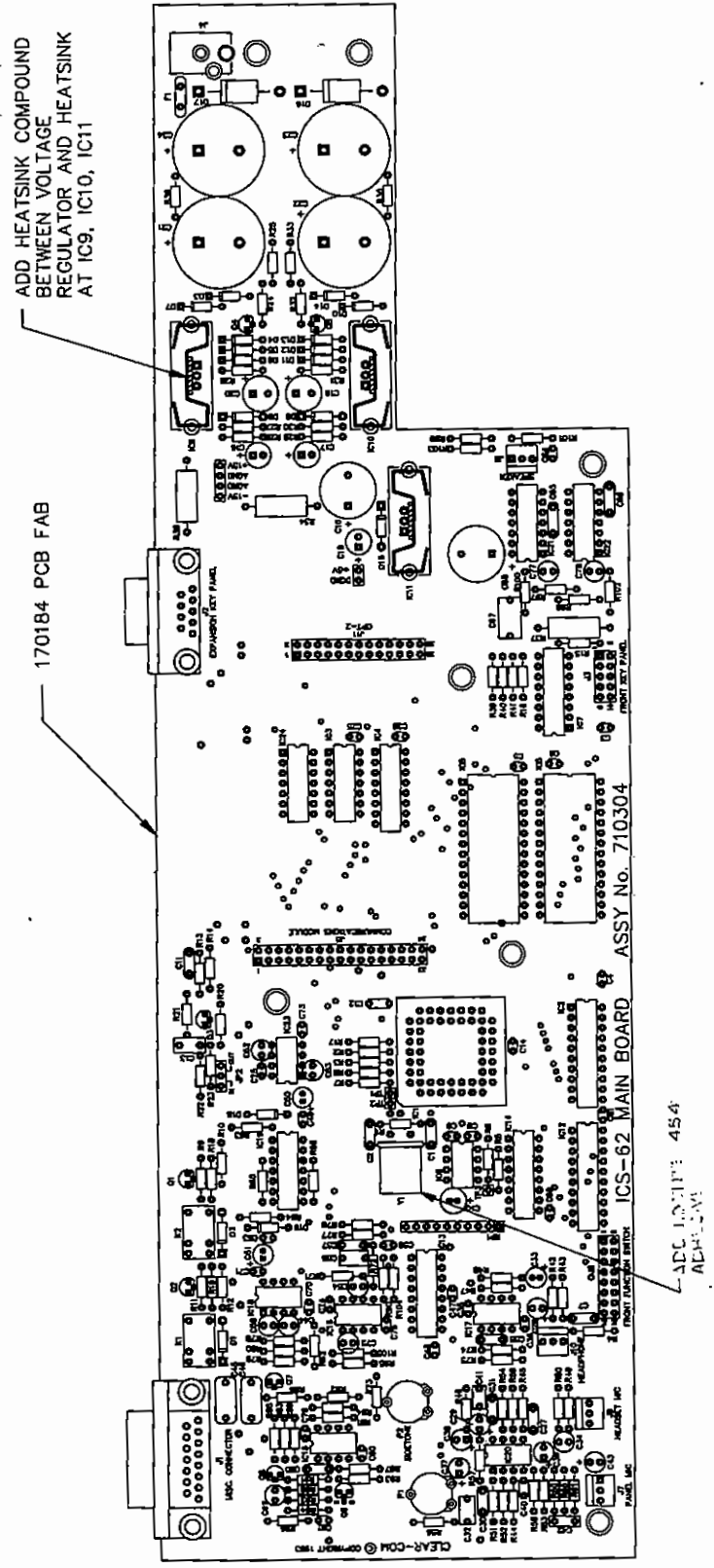


FIGURE S3-5 Assembly Drawing - ICS-62/ICS-102 Main PCB Rev. A

Bill of Materials for ICS-102 Main PCB

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
27 pF	Ceramic Disc	50V	5%	150071	C1 C2
47 pF	Ceramic Disc	50V	10%	150041	C55
100 pF	Ceramic Disc	50V	10%	150006	C44 C52 C53 C54 C59 C72
200 pF	Ceramic Disc	100V	5%	150063	C60
0.001 uF	Ceramic Disc	30V	20%	150052	C65 C66
0.0022 uF	Mylar	100V	5%	150045	C30 C31 C40
0.0047 uF	Mylar	50V	5%	150114	C32 C57
6800 pF	Ceramic Disc	50V	5%	150057	C41
0.01 uF	Ceramic Disc	30V	20%	150012	C7 C11 C27
0.022 uF	Mylar	100V	10%	150008	C13
0.047 uF	Metal Polyester	50V	10%	150005	C56
0.1 uF	Monolithic	50V	10%	150035	C3 C4 C5 C6 C8 C9 C14 C25 C26 C35 C36 C47 C48 C49 C58 C61 C63 C64 C69 C70 C71 C73 C74 C75 C76 C79 C80 C81
0.1 uF	Monolithic	100V	10%	150085	C42
0.22 uF	Mylar	100V	20%	150003	C45 C46 C67
1 uF	Ceramic Disc	50V	10%	150073	C12
1 uF	Aluminum	50V	10%	150002	C34 C62 C77 C78
2.2 uF	Aluminum	50V		150065	C33
10 uF	Aluminum	50V		150064	C43
22 uF	Aluminum	16V		150010	C28 C29
22 uF	Tantalum	16V		150032	C37 C38 C39
22 uF	Aluminum	16V	20%	150142	C50 C51
47 uF	Aluminum	16V	20%	150143	C10
100 uF	Aluminum	25V	20%	150099	C16 C17 C18
220 uF	Aluminum	25V		150137	C19 C20
1000 uF	Aluminum	35V		150092	C15 C68
4700 uF	Aluminum	25V		150139	C21 C22 C23 C24

Bill of Materials for ICS-102 Main PCB ----- cont.**Resistors & Resistor Packs**

Value	Power	Type	Tol.	Part #	Designator
1 OHM	1/4	Carbon Film	5%	410139	R99 R103
2.2 OHM	1/4	Carbon Film	5%	410113	R101
22 OHM	1/4	Carbon Film	5%	410004	R47 R48
22 OHM	1	Carbon Film	5%	410174	R34 R37 R38
47 OHM	1/4	Carbon Film	5%	410039	R18 R19 R57 R58
82 OHM	1/4	Carbon Film	5%	410038	R46
100 OHM	1/4	Carbon Film	5%	410071	R26 R31 R45 R56
220 OHM	1/4	Carbon Film	5%	410007	R39 R40 R41 R44
240 OHM	1/4	Carbon Film	5%	410060	R27 R30
1K OHM	1/4	Carbon Film	5%	410010	R17 R60
1.2K OHM	1/4	Carbon Film	5%	410041	R88
2.2K OHM	1/4	Carbon Film	5%	410011	R15 R24 R32
2.4K OHM	1/4	Carbon Film	5%	410103	R28 R29
2.7K OHM	1/4	Carbon Film	5%	410040	R63 R64
3.0K OHM	1/4	Carbon Film	5%	410104	R73
3.3K OHM	1/4	Carbon Film	5%	410015	R2 R3 R6 R7 R8 R85 R86
4.02K OHM	1/8	Metal Film	1%	410155	R51 R52 R53 R54 R59
4.7K OHM	1/4	Carbon Film	5%	410013	R23 R61 R76
8.2K OHM	1/4	Carbon Film	5%	410037	R100 R102
10K OHM		X 9 SIP bussed		415001	RP1
10K OHM	1/4	Carbon Film	5%	410016	R4 R5 R10 R12 R14 R16 R20 R25 R33 R55 R65 R68 R71 R72 R81 R82 R83 R87 R90 R93 R94 R95 R104 R105
15K OHM	1/4	Carbon Film	5%	410017	R43
22K OHM	1/4	Carbon Film	5%	410018	R42 R50 R77 R97 R98
24K OHM	1/4	Carbon Film	5%	410083	R91
33K OHM	1/4	Carbon Film	5%	410020	R75
39.2K OHM	1/8	Metal Film	1%	410111	R62 R78 R79 R80
47K OHM	1/4	Carbon Film	5%	410021	R49
56K OHM	1/4	Carbon Film	5%	410023	R92
100K OHM	1/4	Carbon Film	5%	410024	R9 R11 R13
150K OHM	1/4	Carbon Film	5%	410026	R74
220K OHM	1/4	Carbon Film	5%	410028	R22
470K OHM	1/4	Carbon Film	5%	410030	R21 R84
1M OHM	1/4	Carbon Film	5%	410058	R96
2.2M OHM	1/4	Carbon Film	5%	410153	R89
10M OHM	1/4	Carbon Film	5%	410059	R1

ICS-62/ICS-102

Bill of Materials for ICS-102 Main PCB ----- cont.**Diodes and Transistors**

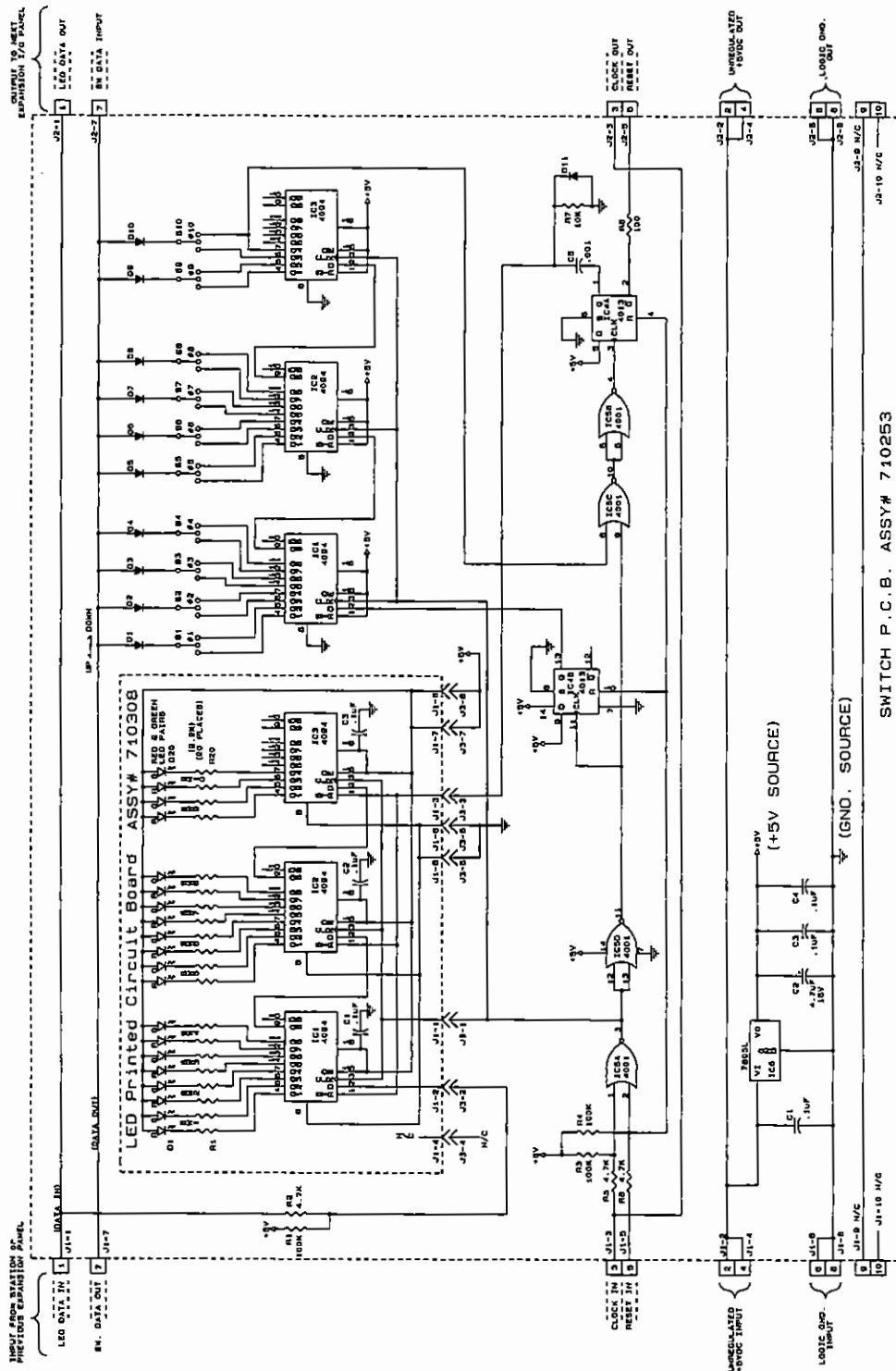
Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D1 D2 D7 D8 D9 D10 D15
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D4 D5 D6 D11 D12 D13
Diode	1N5231B ZENER 5.1V .5W 5%	480038	D18 D19
Diode	1N5401 RECT 3A 100PIV	480005	D16 D17
Diode	1N957B ZENER 6.8V .4W 5%	480026	D3 D14
Transistor	2N2222 NPN 30V	480006	Q7 Q8
Transistor	J174 JFET PCHAN 8V VGS	480079	Q6
Transistor	MPS-A05 NPN 60V	480052	Q5
Transistor	MPS-A13 NPN 30V DARL	480004	Q1 Q2 Q3
Transistor	MPS-A55 PNP 60V	480050	Q4

Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	DG211CJ CMOS QUAD SWITCH	480092	IC13
Digital IC	DS1267-10 DUAL 10K POT	480195	IC19
Digital IC	TL7705AP RESET CCT	480134	IC6
Logic Chip	4050B CMOS HEX BUFFER	480077	IC7
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC14
Logic Chip	74HC00 CMOS QUAD NAND	480157	IC3 IC24
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC4
Logic Chip	74HC373 CMOS OCTAL LATCH	480142	IC2
Logic Chip	74HC374 CMOS OCTAL FL/FLOP	480143	IC12
Microprocessor	68HC11AOFN CMOS MCU	480132	IC1
Op Amp	LM384 POWER 4W OP AMP	480012	IC21 IC22
Op Amp	LM833N DUAL LO NOISE OA	480175	IC20
Op Amp	NE5532 DUAL LO NOISE OA	480070	IC15 IC16 IC17 IC18 IC23
RAM Memory	GM76C256L CMOS RAM 32K X 8	480183	IC5
Regulator	7805T POS 5V REG. TO220 PKG	480083	IC11
Regulator	LM317T POS ADJ REG. TO-220	480167	IC9
Regulator	LM337T NEG ADJ REG. TO-220	480177	IC10

Bill of Materials for ICS-102 Main PCB ----- cont.**Miscellaneous**

Device	Description	Part #	Designator
POLY FUSE	0.90A RAYCHEM#RXE 090	520036	F1
CONNECTOR	DB-15F RT ANG PC MTG	210187	J1
CONNECTOR	2.1MM CO-AX POWER CON	210213	J4
POT	500 OHM TRIM POT	470060	P1
POT	5K TRIM POT	470022	P2
CONNECTOR	DB-9F RT ANG PC MTG	210186	J2
RELAY	SPDT 12V MINI PC RELAY	450006	K1 K2
Crystal	8.000MHz PARALLEL	230003	Y1



ICS-62/ICS-102

FIGURE S3-6 Schematic - ICS-102 Selector Switch PCB Rev. A

ICS-62/ICS-102

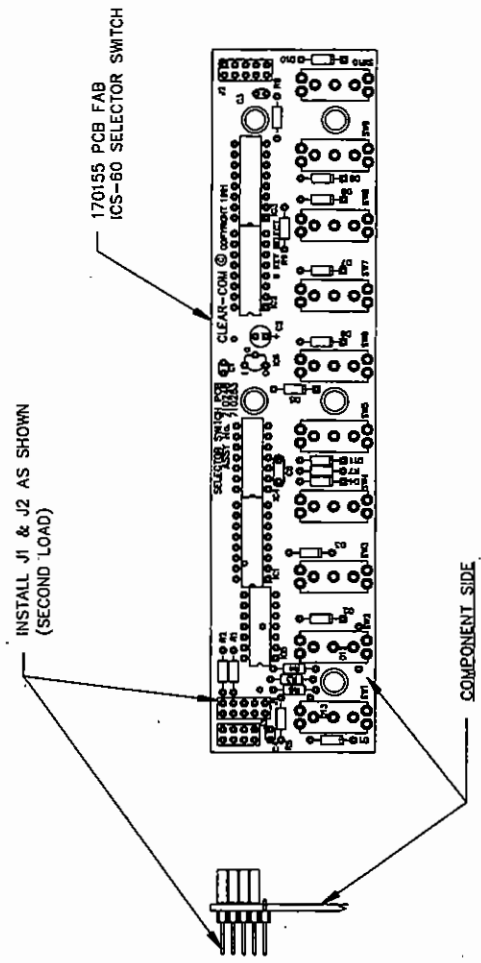


FIGURE S3-7 Assembly Drawing - ICS-102 Selector Switch PCB Rev. A

Bill of Materials for ICS-102 Selector Switch PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
0.001 uF	Ceramic Disc	30V	20%	150052	C5
0.1 uF	Monolithic	50V	10%	150035	C1 C3 C4
4.7 uF	Aluminum	50V		150087	C2

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100 OHM	1/4	Carbon Film	5%	410071	R8
4.7K OHM	1/4	Carbon Film	5%	410013	R2 R5 R6
10K OHM	1/4	Carbon Film	5%	410016	R7
100K OHM	1/4	Carbon Film	5%	410024	R1 R3 R4

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11

Integrated Circuits

Device	Description	Part #	Designator
Logic Chip	4001 CMOS 4 2 IN NOR GATE	480112	IC5
Logic Chip	4013 CMOS DUAL D FF	480171	IC4
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC1 IC2 IC3
Regulator	7805L POS 5V REG. TO-92 PKG	480088	IC6

Miscellaneous

Device	Description	Part #	Designator
SWITCH	SP3T MOM-OFF-MOM PC MTG	510080	S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S10

ICS-62/ICS-102

ICS-62/ICS-102

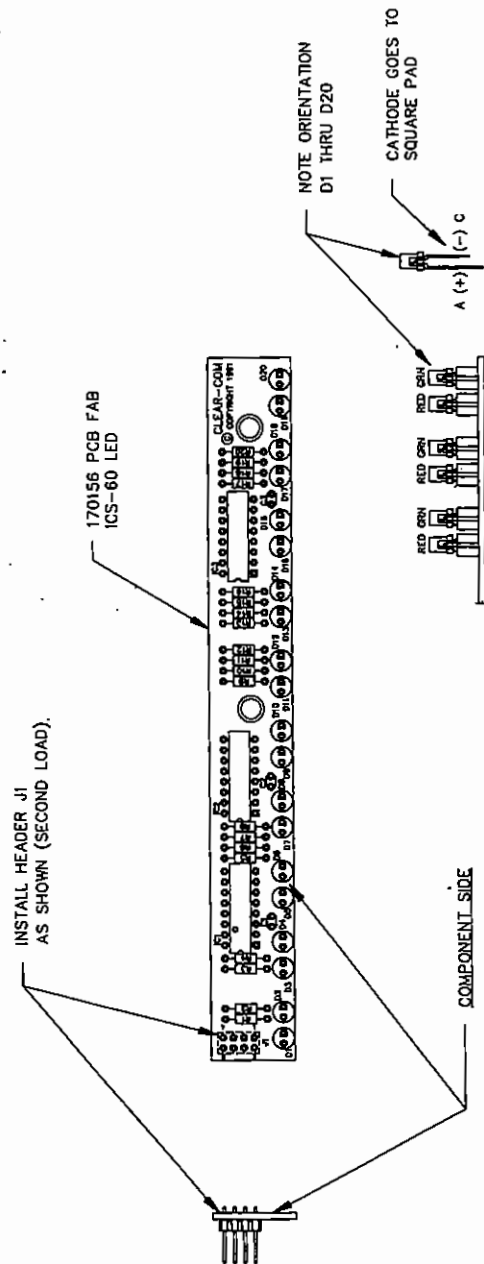


FIGURE S3-8 Assembly Drawing - ICS-102 Selector Switch LED PCB Rev. A

Bill of Materials for ICS-102 Selector Switch LED PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
0.1 uF	Monolithic	50V	10%	150035	C1 C2 C3

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R1-R20(20)

Integrated Circuits

Device	Description	Part #	Designator
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC1 IC2 IC3

Miscellaneous

Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP LED	390045	D2 D4 D6 D8 D10 D12 D14 D16 D18 D20
LED	RED, ROUND, FLAT TOP LED	390044	D1 D3 D5 D7 D9 D11 D13 D15 D19

ICS-62/ICS-102

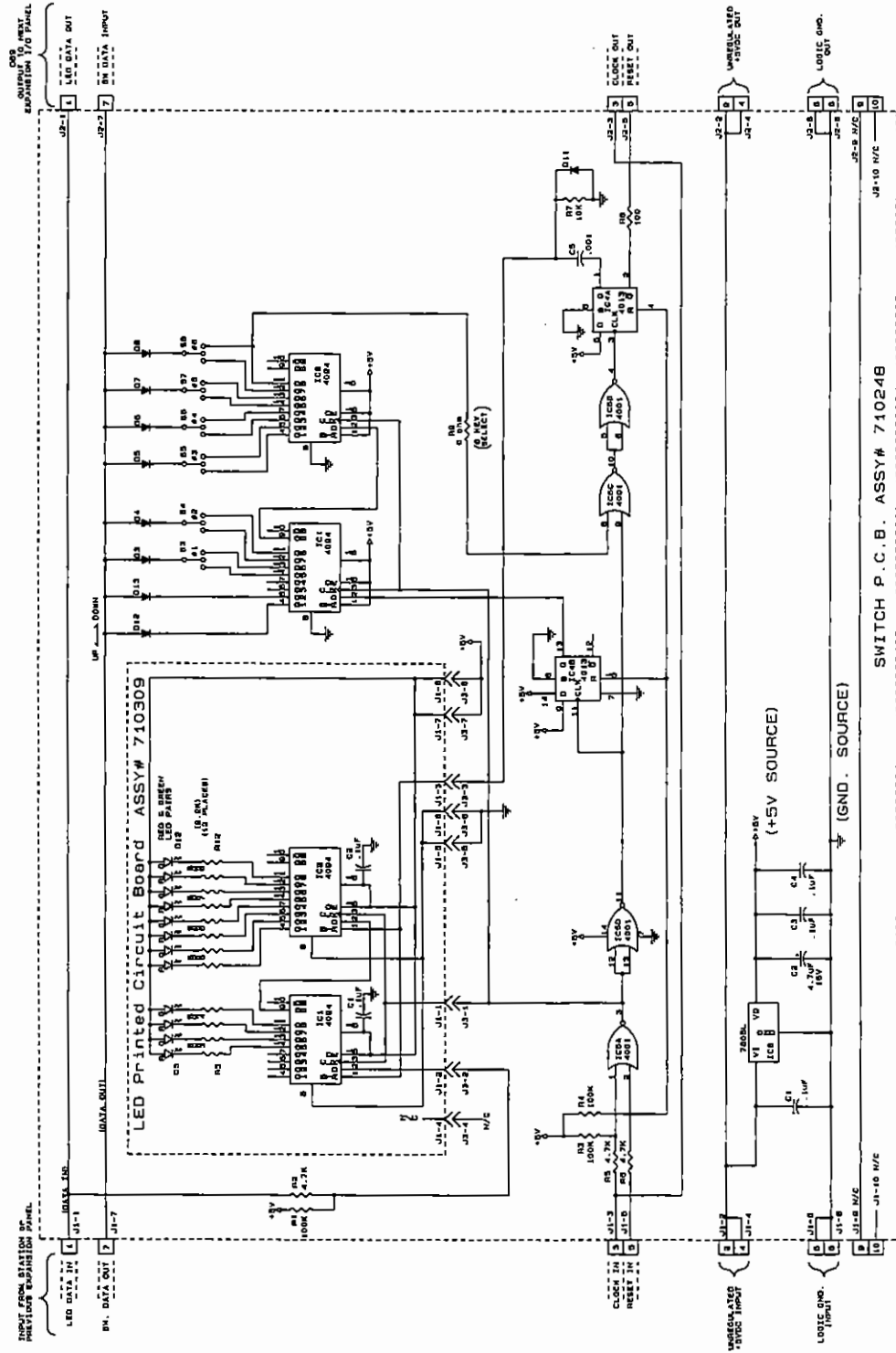


FIGURE S3-9 Schematic - ICS-62 Selector Switch PCB Rev. A

ICS-62/ICS-102

ICS-62/ICS-102

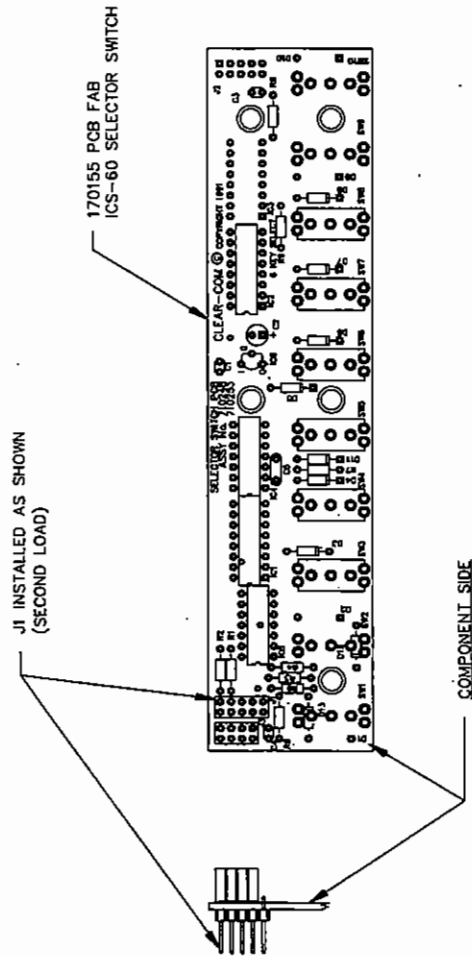


FIGURE S3-10 Assembly drawing - ICS-62 Selector Switch PCB Rev. A

Bill of Materials for ICS-62 Selector Switch PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
0.001 uF	Ceramic Disc	30V	20%	150052	C5
0.1 uF	Monolithic	50V	10%	150035	C1 C3 C4
4.7 uF	Aluminum	50V		150087	C2

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100 OHM	1/4	Carbon Film	5%	410071	R8
4.7K OHM	1/4	Carbon Film	5%	410013	R2 R5 R6
10K OHM	1/4	Carbon Film	5%	410016	R7
100K OHM	1/4	Carbon Film	5%	410024	R1 R3 R4

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D3 D4 D5 D6 D7 D8 D11 D12 D13

Integrated Circuits

Device	Description	Part #	Designator
Logic Chip	4001 CMOS 4 2 IN NOR GATE	480112	IC5
Logic Chip	4013 CMOS DUAL D FF	480171	IC4
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC1 IC2
Regulator	7805L POS 5V REG. TO-92	480088	IC6

Miscellaneous

Device	Description	Part #	Designator
SWITCH	SP3T MOM-OFF-MOM PC MTG	510080	S3 S4 S5 S6 S7 S8

ICS-62/ICS-102

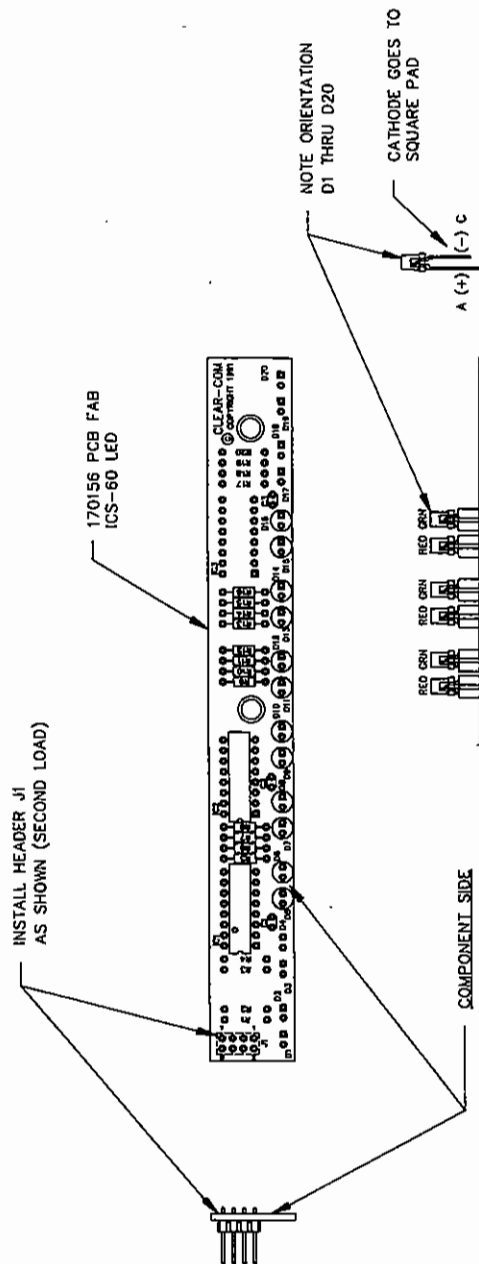


FIGURE S3-11 Assembly Drawing - ICS-62 Selector Switch LED PCB Rev. A

Bill of Materials for ICS-62 Selector Switch LED PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
0.1 uF	Monolithic	50V	10%	150035	C1 C2

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R5-R16(12)

Integrated Circuits

Device	Description	Part #	Designator
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC1 IC2

Miscellaneous

Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP LED	390045	D6 D8 D10 D12 D14 D16
LED	RED, ROUND, FLAT TOP LED	390044	D5 D7 D9 D11 D13 D15

ICS-62/ICS-102

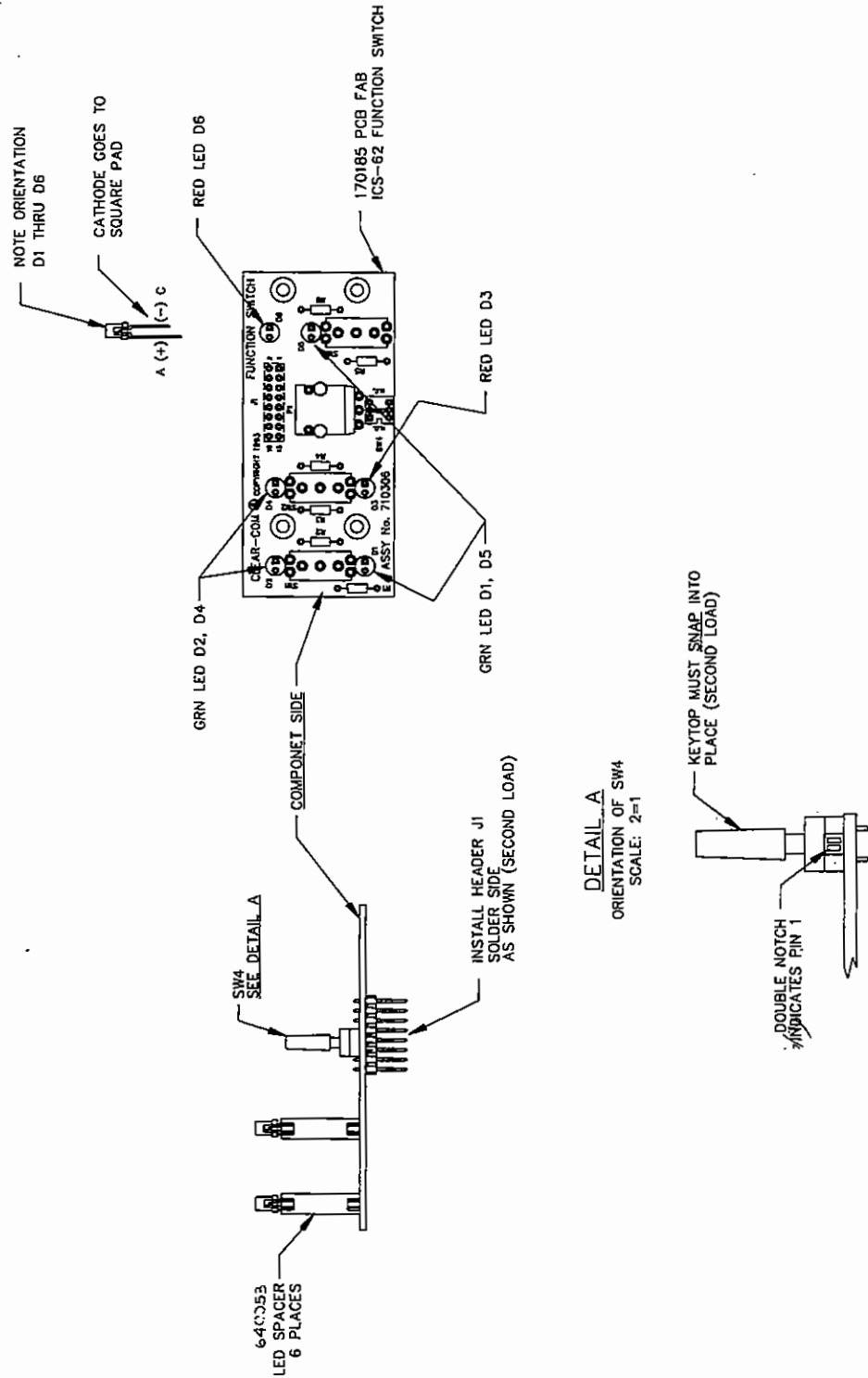


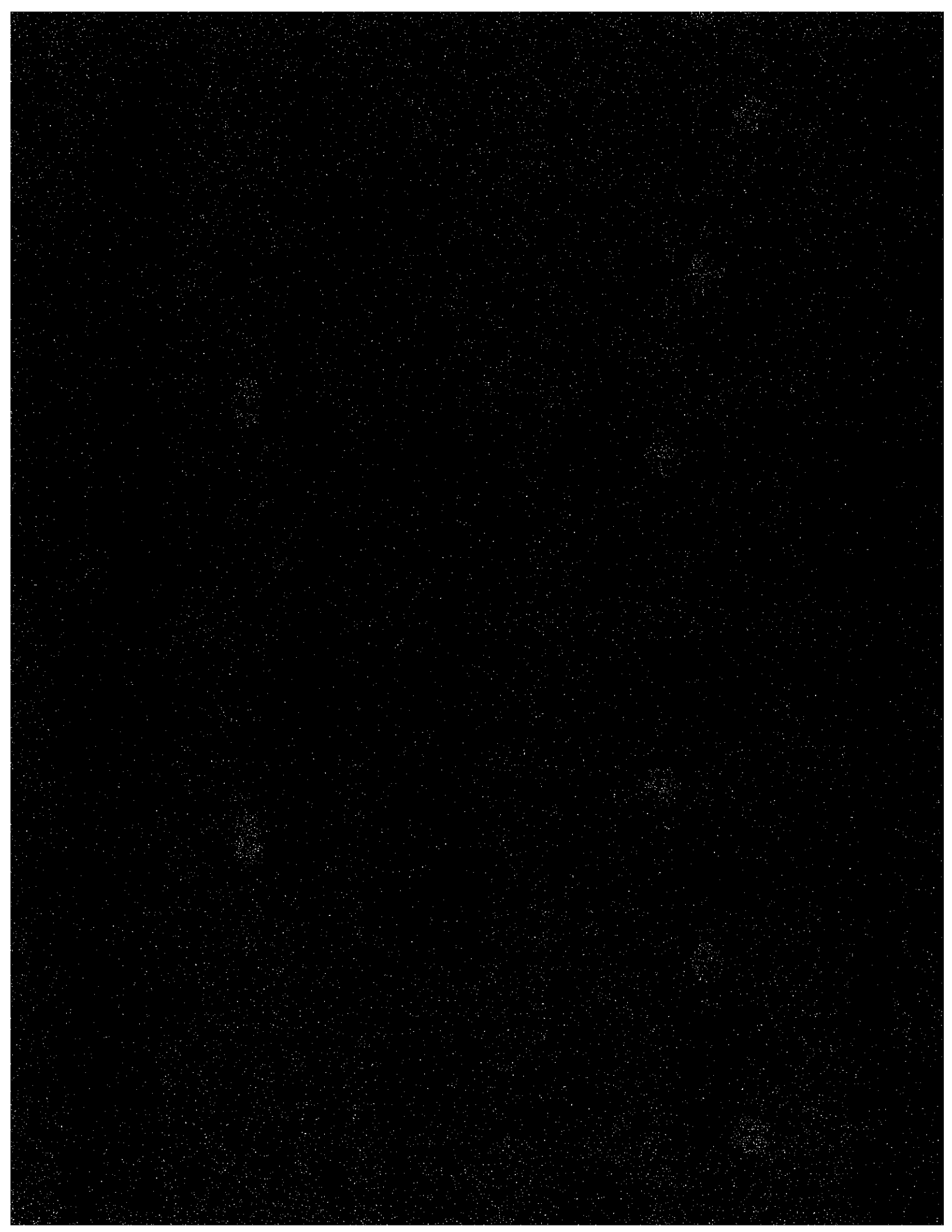
FIGURE S3-12 Assembly Drawing - ICS-62 Function Switch PCB Rev. A

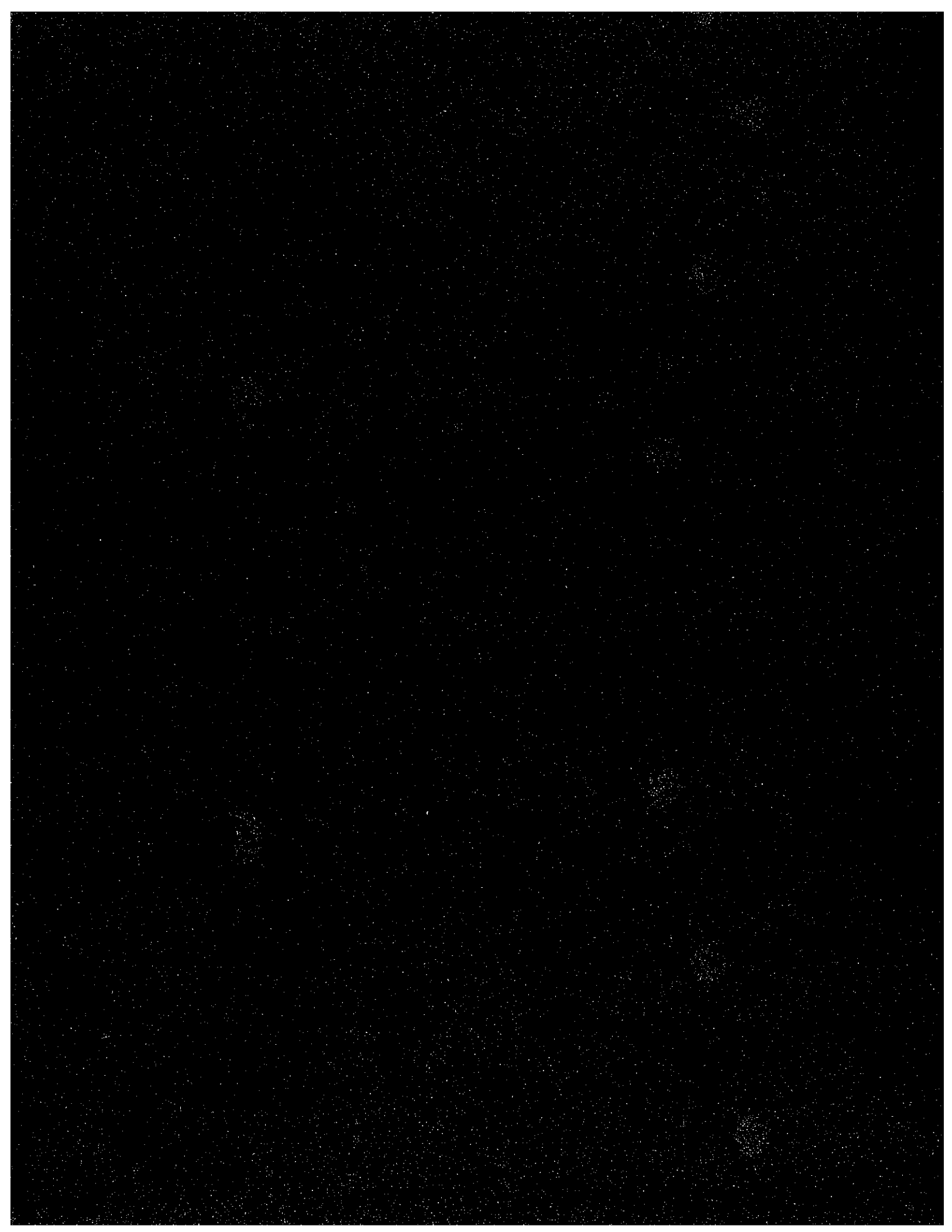
Bill of Materials for ICS-62 Function Switch PCB**Resistors & Resistor Packs**

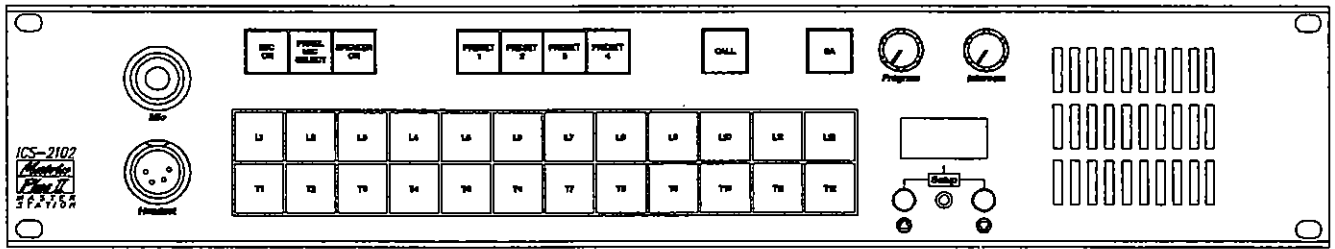
Value	Power	Type	Tol.	Part #	Designator
1K OHM	1/4	Carbon Film	5%	410010	R1-R6(6)

Miscellaneous

Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP LED	390045	D1 D2 D4 D5
LED	RED, ROUND, FLAT TOP LED	390044	D3 D6
POT	5K LINEAR	470067	P1
SWITCH	PUSHBUTTON, DPDT MOM.	510102	SW4
SWITCH	SP3T MOM-OFF-MOM PC MTG	510080	SW1 SW2 SW3







Matrix Plus II System ICS-2102
 MASTER STATION INTERCOM STATION

Introduction

This Section provides instructions on resetting the station's microprocessor, troubleshooting information, schematics, assembly drawings and component lists for the ICS-2102 and ICS-2102D Intercom Stations. Information on the XP-12 and XP-22 Expansion Key Panels and the OPT-100 are included in the ICS-2002 Master Intercom Station Section in this Maintenance Manual.

The "D" version of the ICS-2102 is the same except for the transmission method to the Matrix frame. The standard version station uses a 2-wire RS-422 data path and 4-wire analog audio paths to the Matrix Frame. The "D" version uses a single 2-wire digital transmission scheme for both data and audio. The difference between the two stations is which communication module is used. The communications portion of the circuit is separated from the main PCB and is mounted on the rear panel of the station. The program EPROM is also different for the two stations. Schematics, assembly drawings, and bills of materials for these communication modules are provided in the ICS-2002 Master Intercom Station Section in this Maintenance Manual.

The ICS-2102 uses the same basic printed circuit board as the ICS-2002. Some portions of the ICS-2002 are not used such as the EL Driver circuitry and the DTMF tone generator so these components are omitted. The equalizer used to tailor the frequency response of the speaker in the ICS-2002 has been eliminated because of the different speaker mounting arrangement. All other features and functions supported by the main PCB are operational in the ICS-2102. The ICS-2102 has a different +5 Volt regulator to power the lamps on the front panel.

Station Reset

The microprocessor in the station has a RESET switch accessible from the front panel of the unit. This pushbutton switch is located behind an unmarked hole just below the LCD display between the UP and DOWN pushbuttons. If the station is acting erratically, try resetting the station.

To reset the station use a small screwdriver or a stiff piece of wire to activate the pushbutton switch behind the RESET hole. Unplugging and reconnecting the AC power to unit will also reset it.

Troubleshooting

To help isolate a problem you are trying to resolve, a list of possible symptoms and possible solutions that are peculiar to the station has been provided. The Overview chapter of the manual also contains troubleshooting guidelines for the entire system.

1. No LEDs or pushbutton lights come on. The lamps inside the pushbuttons should be on dim when their function is not active.
 - Check mains AC power.
 - Check the mains AC fuse on the rear of station.
 - If the fuse is blown, then replacing it is unlikely to fix the station since whatever caused the fuse to blow is still broken.
 - Replace the station.
2. LAMPS inside each selector key does not light when key is pressed.
 - Note that selector key indicators do not light if the selector key has no labels assigned to it.
 - Reset the station.
 - Replace the station.
3. Station appears to activate talk paths, but station operator cannot be heard by other stations.
 - Check Mic ON/OFF and PANEL MIC buttons to make sure the microphone they are using is selected and turned on.
 - If the correct mic is turned on, confirm that the station audio has not been muted externally through the logic inputs.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station.

4. All pushbutton lamps flash slowly, station is inoperative.
 - Check that the cable that connects the station to the matrix is plugged in both at the station and at the matrix frame.
 - Reset the station.
 - Reset the associated crosspoint card in the matrix frame.
 - Check the Configuration Program to ensure that the station is assigned the correct port type (ICS-2102 Intercom Station).
 - If 3/4 pair transmission mode is being used, check the integrity of the RS-422 data paths. Polarity is important in this transmission scheme.
 - If Digital 2 Wire transmission mode is being used, check for a solid DC path between the station and the matrix frame.
 - Confirm that the Matrix card type matches the station.
 - Replace the station.
 - Replace the crosspoint card that the station is connected to.
5. No audio from station's speaker.
 - Check to see if audio can be heard in a headphone.
 - Be sure the Intercom volume control on the front of the station is turned up.
 - Be sure the Speaker On/Off button is set to ON.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station,
 - Reset or replace the crosspoint card that the station is connected to.
6. Cannot hear page from another station.
 - Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.

ICS-2102

7. No announce tones (call signal tones, eavesdropping indication, etc.) at the station.
 - Check and adjust the Page Volume level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.
 - Check the station's Configuration menu to be sure that the monitoring tones are enabled.
8. No audio from external program feed in speaker.
 - Check the Program volume control on the front of the station.
 - Check the program source.
 - Reset the station by powering it OFF and then ON.
 - Replace the station.
9. No audio from external program feed in headphone.
 - If there is program in the speaker check the Configuration of the station with the Configuration Program to make sure the program was not disabled for 2nd earphone feed mode.
10. Station does not receive call signals, answerback indication, or other communications from other stations (except for audio on active talk paths).
 - Check that the Frame Ser LED indicators are blinking in the crosspoint cards in the matrix frame, indicating that the CPU-100 is able to coordinate communication between the crosspoint cards.
 - If they are not blinking, reset the CPU-100 card.
 - If that does not initiate the cycling of the LED indicators, replace the CPU-100.
11. Expansion key panel keys do not function.
 - Check connection of expansion key panel on rear of station.
 - Check the Configuration with the Configuration Software
12. Stations receive call signals, answer backs and other communication but cannot send any talks, call signals or other communication.
 - If two frames are connected and this symptom is true only in the second (SCF-101) frame, reset or replace the CPU-150 in the second frame.

Miscellaneous Bill of Materials for the ICS-2102/2102D

Description		Part #	Designator
CABLE	RIBBON, 26 PIN 6 IN.	730016	
CABLE	RIBBON, 34 PIN	730181	
CONNECTOR	FILTRD AC LINE W/FUSE	210176	
EPROM	ICS-2102 PROGRAM	710327	
EPROM	ICS-2102D PROGRAM	710331	
FUSE	1/2A SLO-BLO 20MM	520030	
POWER CORD		610022	
TRANSFORMER	POWER	560025	

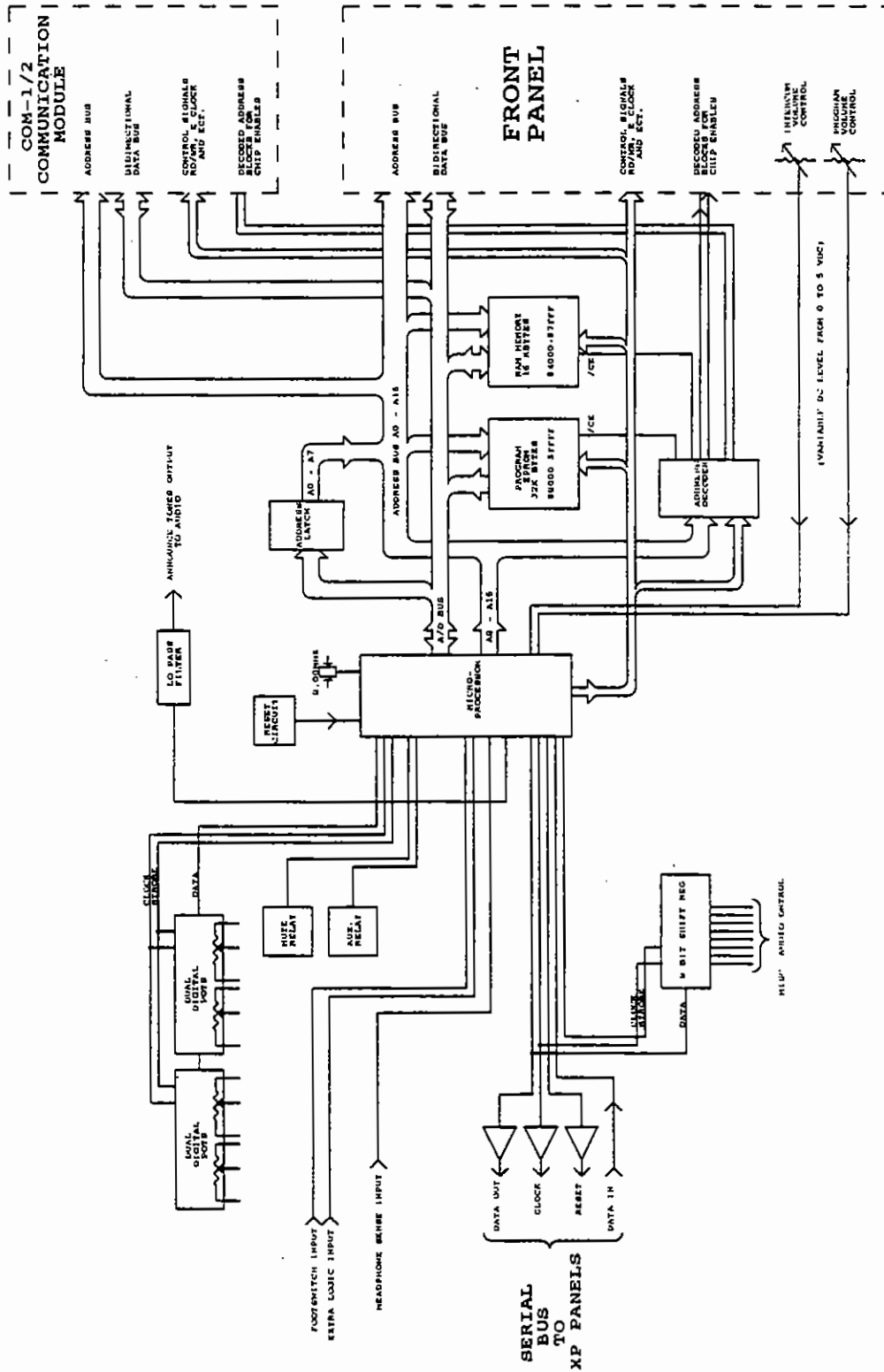


FIGURE S4-1 Digital Block Diagram - ICS-2102 Main PCB

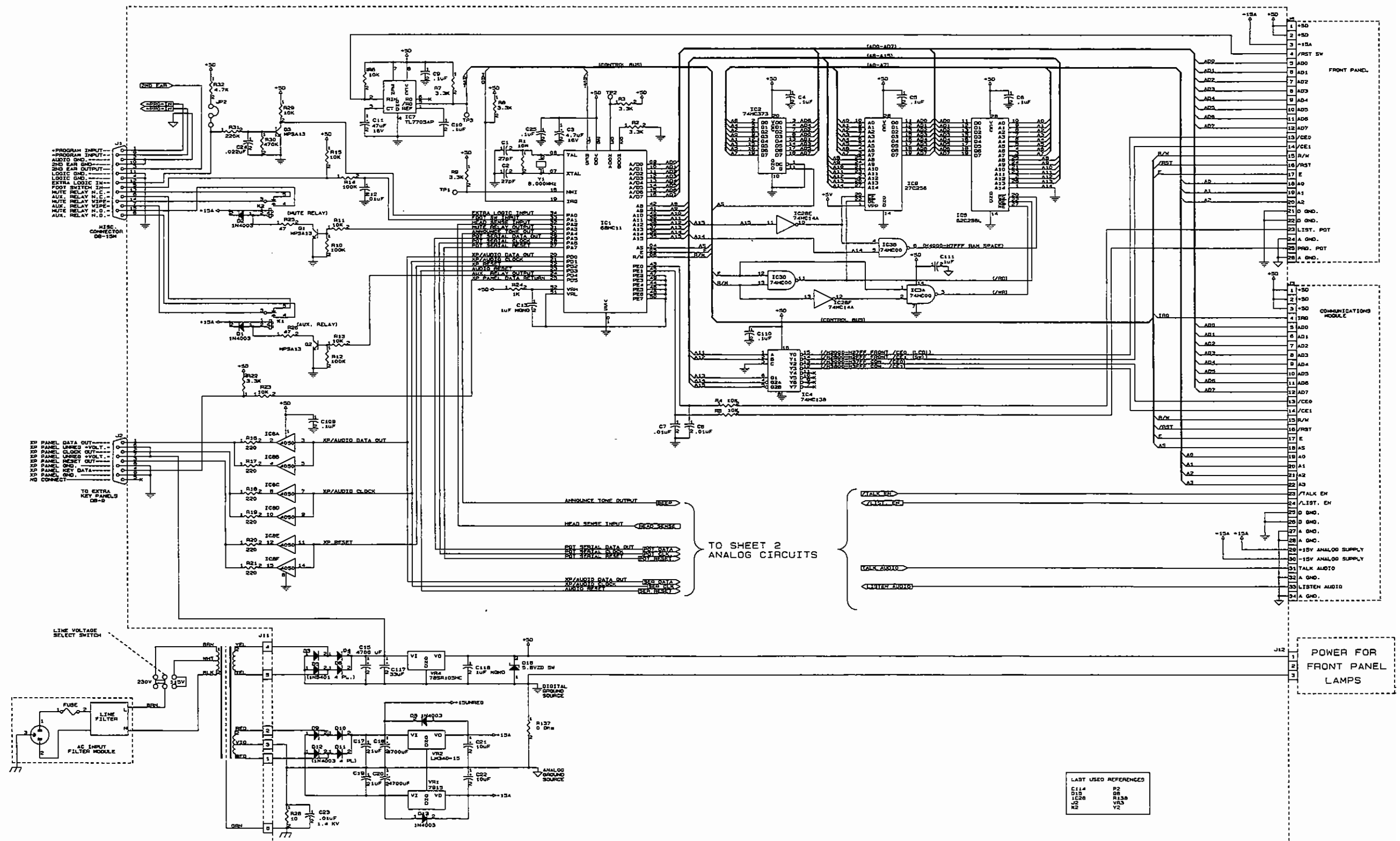


FIGURE S4-2 Schematic - ICS-2102 Main PCB Sheet 1 Rev. B

ICS-2102

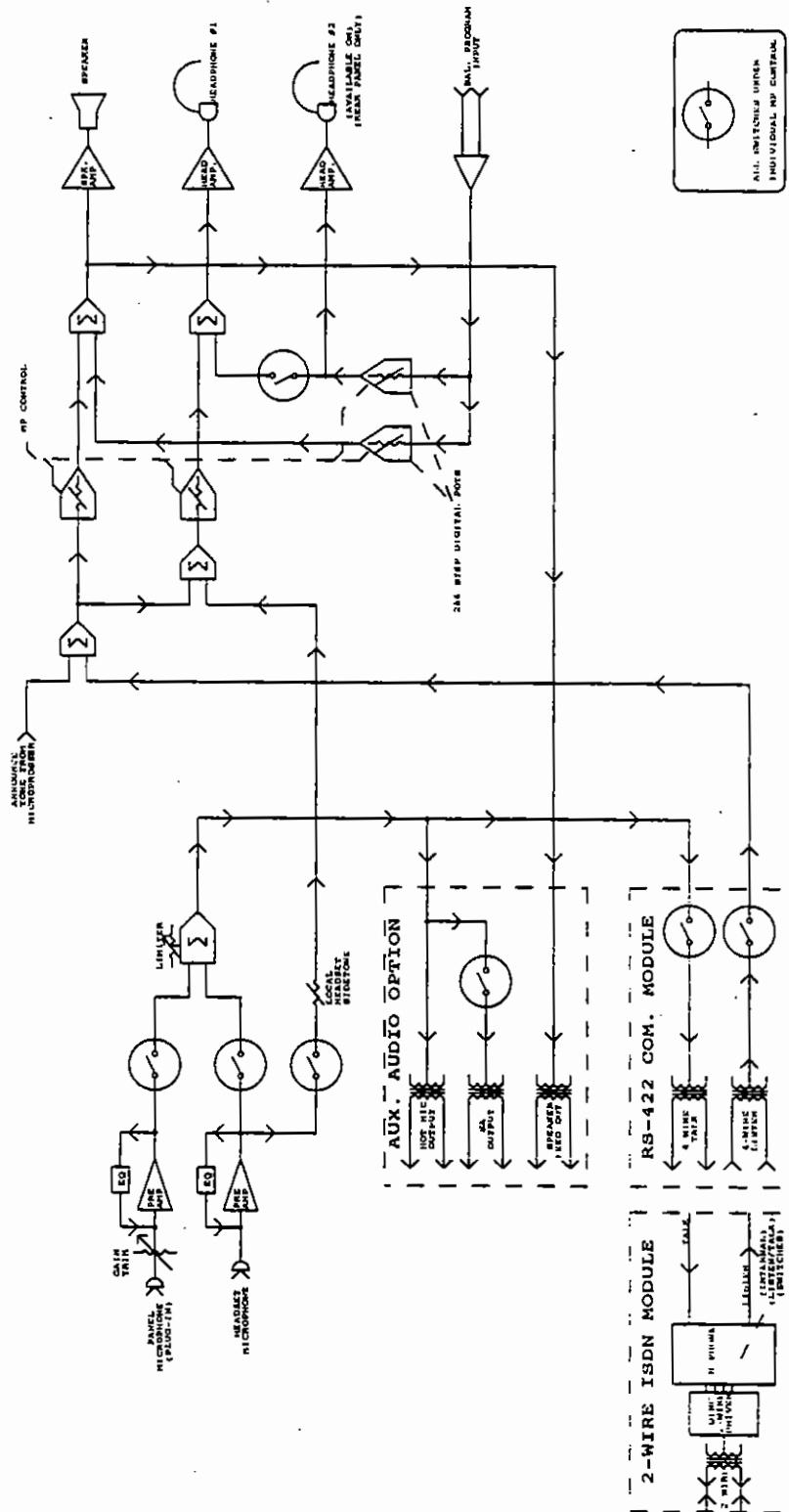


FIGURE S4-3 Analog Block Diagram - ICS-2102 Main PCB

ICS-2102

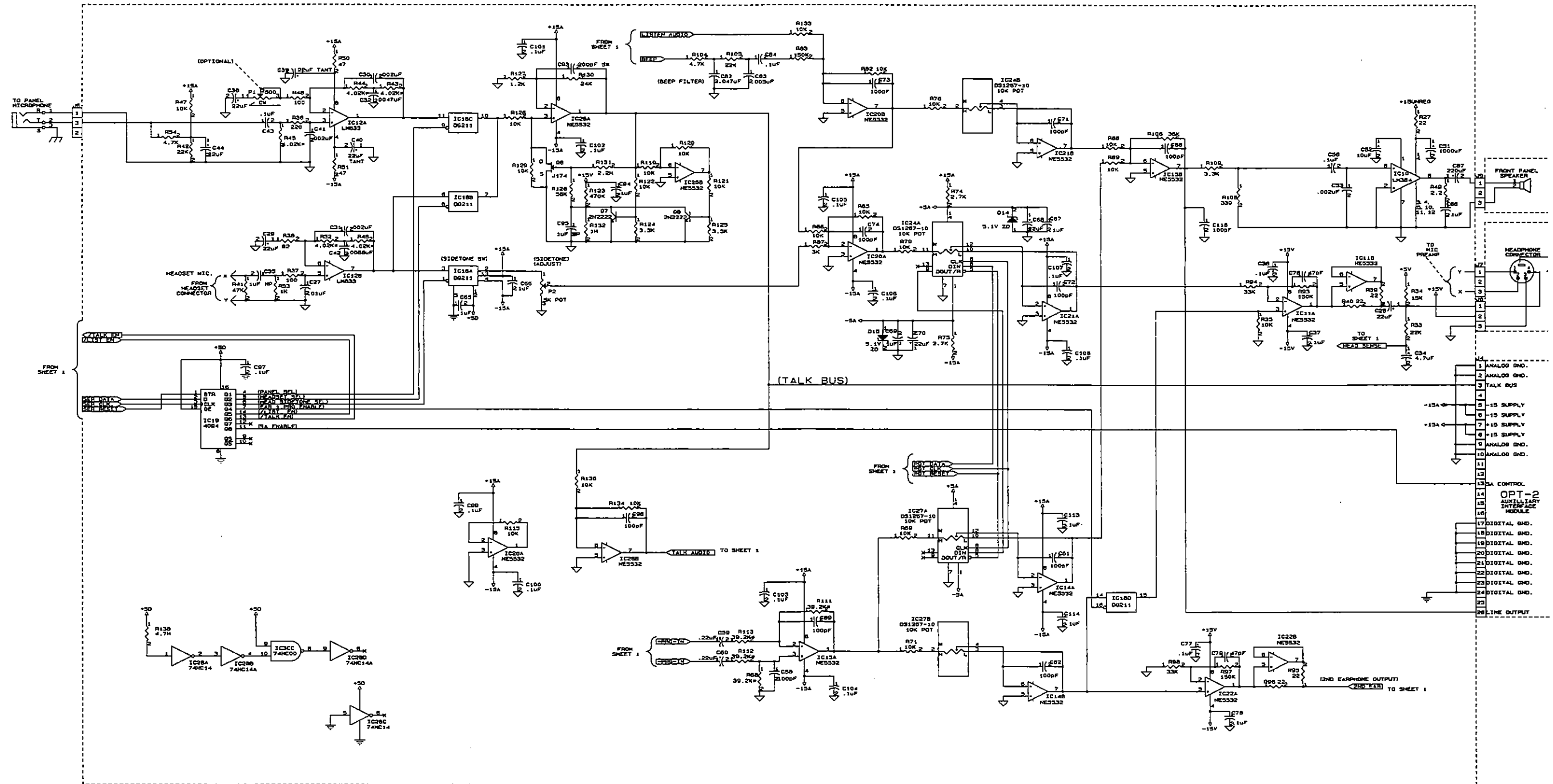


FIGURE S4-4 Schematic - ICS-2102 Main PCB Sheet 2 Rev. B

ICS-2102

ICS-2102

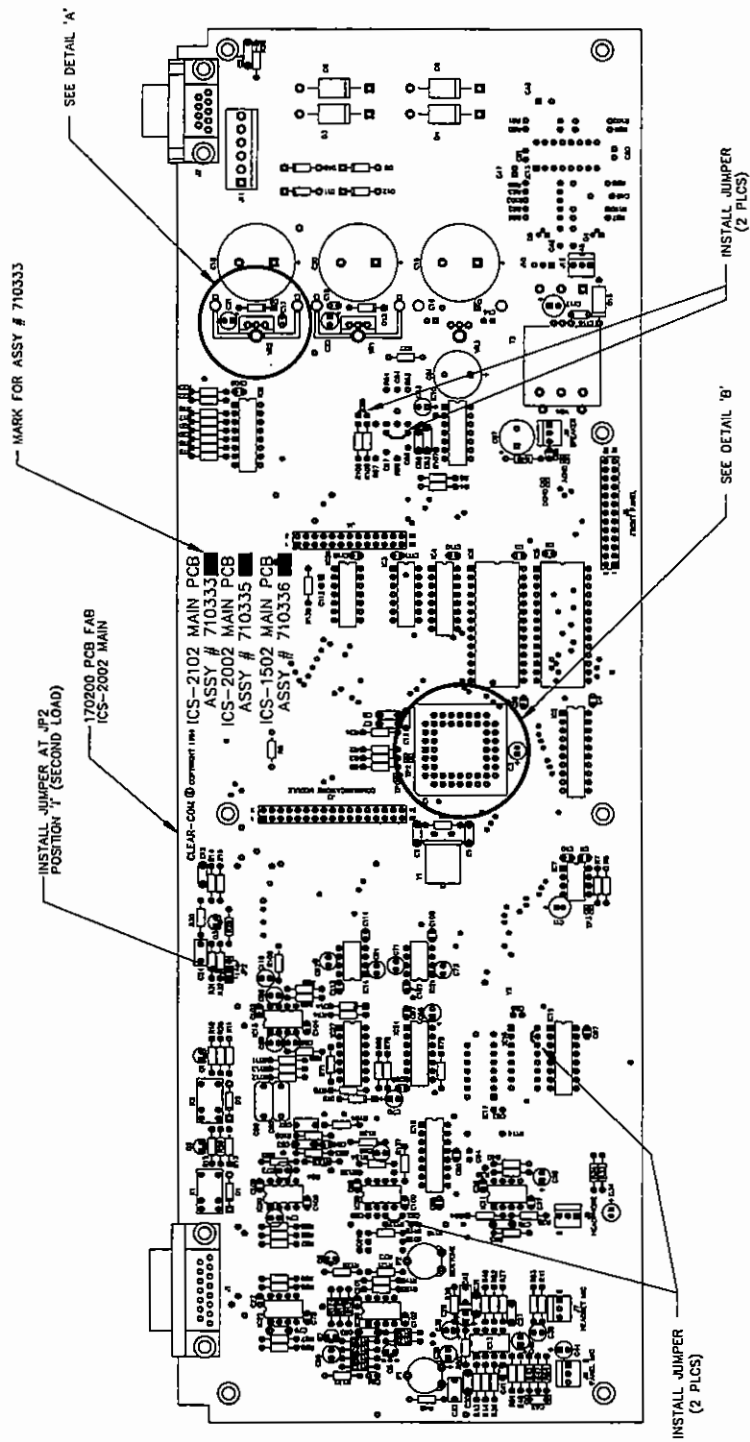


FIGURE S4-5 Assembly Drawing - ICS-2102 Main PCB Rev. B

Bill of Materials for ICS-2102 Main PCB

Capacitors

Value		Type	Volts	Tol.	Part #	Designator
27	PF	CERAMIC	50V	5%	150071	C1,C2
47	PF	CERAMIC	50V	10%	150041	C6,C79
100	PF	CERAMIC	50V	10%	150006	C58,C61,C62,C71,C72, C73,C74,C88 C89,C96,C116
200	PF	CERAMIC	100V	5%	150063	C93
.0022	UF	MYLAR	100V	5%	150045	C0,C31,C41,C53
.0047	UF	MYLAR	50V	5%	150114	C32
.0047	UF	CERAMIC	50V	10%	150016	C83
6800	PF	CERAMIC	50V	5%	150057	C2
.01	UF	CERAMIC	30V	20%	150012	C7,C8,C12,C27
.01	UF	CERAMIC	1.4KV	20%	150029	C23
.022	UF	MYLAR	100V	10%	150008	C24
.047	UF	MYLAR	50V	10%	150005	C82
.1	UF	MONO	50V	10%	150035	C4,C5,C6,C9,C10,C15,C17, C19,C25,C36,C37,C56,C65, C66,C67,C69,C77,C78,C84, C86,C94,C97,C99,C100, C101,C102,C103,C104, C105,C106,C107,C108, C109,C110,C111,C113, C114
.1	UF	MONO	100V	10%	150085	C43
.22	UF	MYLAR	100V	20%	150003	C59,C60
1	UF	CERAMIC	50V	10%	150073	C13,C118
1	UF	ALUMINUM NP	50V	10%	150002	C35,C95
4.7	UF	ALUMINUM	16V	10%	150141	C3,C34
10	UF	ALUMINUM	50V		150064	C21,C22,C52,C68,C70
22	UF	ALUMINUM	16V	20%	150142	C29,C38,C44
22	UF	ALUMINUM	16V		150010	C28
22	UF	TANTALUM	16V		150032	C39,C40
33	UF	ALUM. LO ESR	35V	20%	150130	C117
47	UF	ALUMINUM	16V	20%	150143	C11
220	UF	ALUMINUM	35V		150021	C87
4700	UF	ALUMINUM RAD.	25V		150139	C15,C18,C20

Bill of Materials for ICS-2102 Main PCB ----- cont.**Resistors & Resistor Packs**

Value		Power	Type	Tol.	Part #	Designator
4.02K	OHMS	1/8W	METAL FILM	1%	410155	R43,R44,R45,R46,R52
39.2K	OHMS	1/8W	METAL FILM	1%	410111	R68,R111,R112,R113
2.2	OHMS	1/4W	CARBON FILM	5%	410113	R49
10	OHMS	1/4W	CARBON FILM	5%	410002	R28
22	OHMS	1/4W	CARBON FILM	5%	410004	R27,R39,R40,R95,R96
47	OHMS	1/4W	CARBON FILM	5%	410039	R25,R26,R50,R51
82	OHMS	1/4W	CARBON FILM	5%	410038	R38
100	OHMS	1/4W	CARBON FILM	5%	410071	R37,R48
220	OHMS	1/4W	CARBON FILM	5%	410007	R16,R17,R18,R19,R20, R21,R36
330	OHMS	1/4W	CARBON FILM	5%	410061	R108
1K	OHMS	1/4W	CARBON FILM	5%	410010	R24,R53
1.2K	OHMS	1/4W	CARBON FILM	5%	410041	R127
2.7K	OHMS	1/4W	CARBON FILM	5%	410040	R74,R75
3.0K	OHMS	1/4W	CARBON FILM	5%	410104	R87
3.3K	OHMS	1/4W	CARBON FILM	5%	410015	R2,R3,R7,R8,R9,R22,R109, R124,R125
4.7K	OHMS	1/4W	CARBON FILM	5%	410013	R32,R54,R104
10K	OHMS	1/4W	CARBON FILM	5%	410016	R4,R5,R6,R11,R13,R15, R23,R29,R35,R47,R69,R71, R76,R79,R82,R85,R86 R88,R89,R115,R119,R120, R121,R122,R126,R129,R133, R134,R136
15K	OHMS	1/4W	CARBON FILM	5%	410017	R34
22K	OHMS	1/4W	CARBON FILM	5%	410018	R33,R42,R105
24K	OHMS	1/4W	CARBON FILM	5%	410083	R130
33K	OHMS	1/4W	CARBON FILM	5%	410020	R94,R98
36K	OHMS	1/4W	CARBON FILM	5%	410163	R106
47K	OHMS	1/4W	CARBON FILM	5%	410021	R41
56K	OHMS	1/4W	CARBON FILM	5%	410023	R128
100K	OHMS	1/4W	CARBON FILM	5%	410024	R10,R12,R14
150K	OHMS	1/4W	CARBON FILM	5%	410026	R83,R93,R97
220K	OHMS	1/4W	CARBON FILM	5%	410028	R31
470K	OHMS	1/4W	CARBON FILM	5%	410030	R30,R123
1M	OHMS	1/4W	CARBON FILM	5%	410058	R132
2.2M	OHMS	1/4W	CARBON FILM	5%	410153	R131
4.7M	OHMS	1/4W	CARBON FILM	5%	410077	R138
10M	OHMS	1/4W	CARBON FILM	5%	410059	R1

Bill of Materials for ICS-2102 Main PCB ----- cont.**Diodes and Transistors**

Device	Description	Part #	Designator
DIODE	1N4003 RECT 1A 200PIV	480058	D1,D2,D8,D9,D10,D11, D12,D13
DIODE	1N5231B ZENER 5.1V .5W 5%	480038	D14,D15
DIODE	1N5339 ZENER 5.6V 5W	480182	D16
DIODE	1N5401 RECT 3A 100PIV	480005	D3,D4,D5,D6
TRASISTOR	2N2222 NPN 30V	480006	Q7,Q8
TRASISTOR	J174 JFET PCHAN 8V VGS	480079	Q6
TRASISTOR	MPS-A13 NPN 30V DARL	480004	Q1,Q2,Q3

Integrated Circuits

Device	Description	Part #	Designator
ANALOG SW	DG211CJ QUAD ANALOG	480092	IC18
CMOS LOGIC	4050B HEX BUFFER	480077	IC8
CMOS LOGIC	4094B 8 BIT SHIFT REGISTER	480107	IC19
CMOS LOGIC	74HC00 QUAD NAND GATE	480157	IC3
CMOS LOGIC	74HC14 HEX SCHMITT INV. BUF.	480199	IC28
CMOS LOGIC	74HC138 3 TO 8 LINE DECODER	480120	IC4
CMOS LOGIC	74HC373 OCTAL D LATCH	480142	IC2
CMOS MEMORY	GM76C256L SRAM 32K X 8 100NS	480183	IC5
MICRO-P	68HC11AOFN 52 PIN PLCC	480132	IC1
OP-AMP	LM384 POWER 4W	480012	IC10
OP-AMP	LM833N DUAL 8 PIN DIP	480175	IC12
OP-AMP	NE5532 DUAL LO NOISE	480070	IC11,IC14,IC15,IC20, IC21,IC22,IC25,IC26
REGULATOR	78SR105HC POS 5V SWITCHER	480206	VR4
REGULATOR	7915 NEG 15V 1.5A TO-220	480149	VR1
REGULATOR	LM340-15 POS 15V TO-220	480024	VR2
SPECIAL	DS1267-10 DUAL DIG. 10K POT	480195	IC24,IC27
SPECIAL	TL7705AP SUPERVISOR/RESET	480134	IC7

Miscellaneous

Description		Part #	Designator
CONNECTOR	DB-9 RT ANG PC MTG	210186	J2
CONNECTOR	DB-15 RT ANG PC MTG	210187	J1
CRYSTAL	8.000MHZ PARALLEL HC-49U	230003	Y1
JMP JACK	SEAELECTRO#0264810	210103	JP2
RELAY	SPDT 12V MINI PC RELAY	450006	K1,K2
POT	500 OHM VERT SHAFT TRIM POT	470060	P1
POT	5K OHMS H MTG. TRIM POT	470022	P2

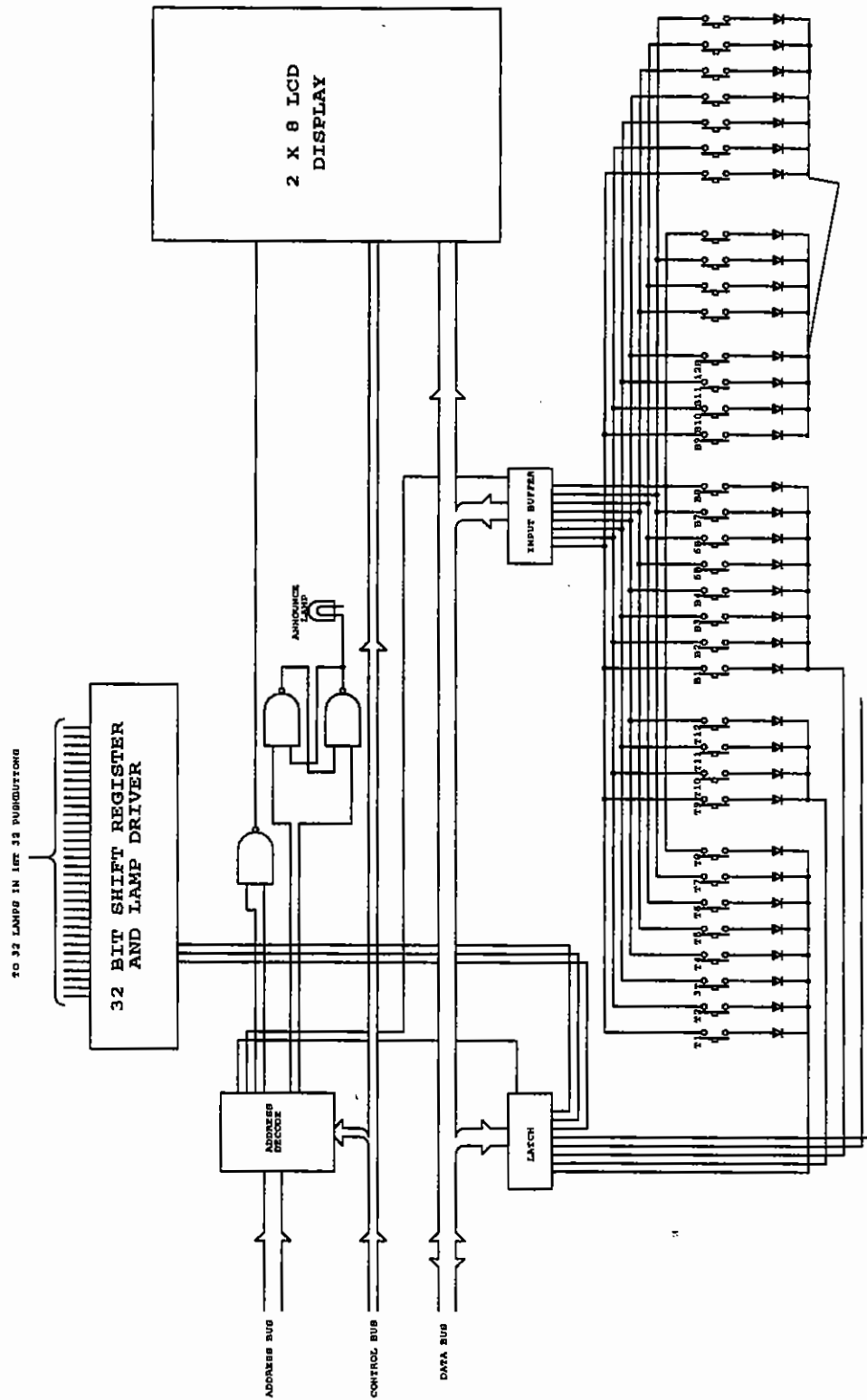


FIGURE S4-6 Block Diagram - ICS-2102 Front Panel PCB

ICS-2102

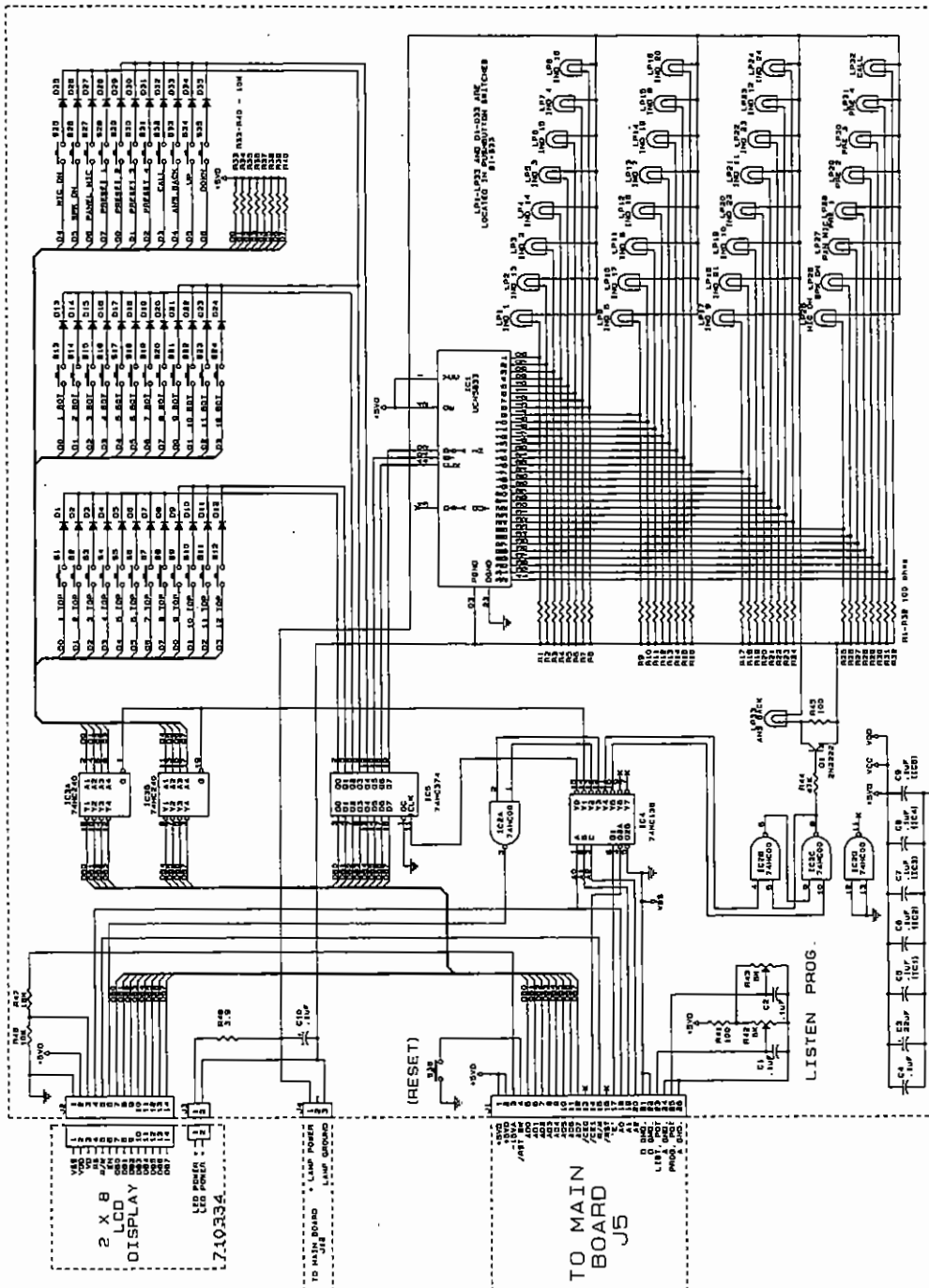


FIGURE S4-7 Schematic - ICS-2102 Front Panel PCB Rev. B

ICS-2102

ICS-2102

ICS-2102

ICS-2102

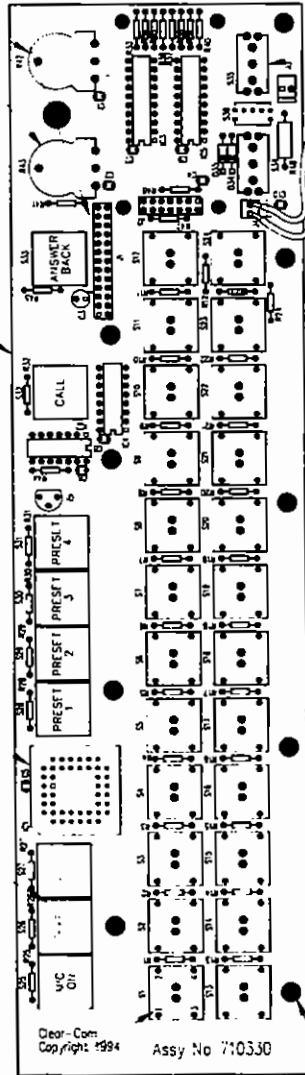
2504/B
400 N/CAP LABELS 9 PLCS.
SEE DETAIL 'C' FOR ALL R1 YCAPS
(SECOND LOAD)

100% SWITCH PIN NUMBERS
AS SHOWN AT THE INSTALLATION
IN 33 PLACES

SEE DETAIL 'JF'
710728
44 PIN SOCKET

10198 PCB 14B
FRONT PANEL (CS 202)

INSTALL BAY BUTTONS ON:
SW34, SW35. (BUTTONS
INCLUDED WITH SWITCH)



MASK HOLES
13 PLACES

FIGURE S4-8 Assembly Drawing - ICS-2102 Front Panel PCB Rev. B

Bill of Materials for ICS-2102 Front Panel PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator	
.1	UF	MONO	50V	10%	150035	C1,C2,C4,C5,C6,C7,C8, C9,C10
22	UF	ALU	16V		150010	C3

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100	OHMS	1/4W CARBON FILM	5%	410071	R1-R32,R41,R45
10K	OHMS	1/4W CARBON FILM	5%	410016	R33-R40,R46
18K	OHMS	1/4W CARBON FILM	5%	410032	R47
47K	OHMS	1/4W CARBON FILM	5%	410021	R44
3.9	OHMS	1/2W CARBON FILM	5%	410185	R48

Diodes and Transistors

Device	Description	Part #	Designator
DIODE	1N4148 SIGNAL 10MA 75PIV	480000	D34,D35
TRANSISTOR	2N2222 NPN 30V	480006	Q1

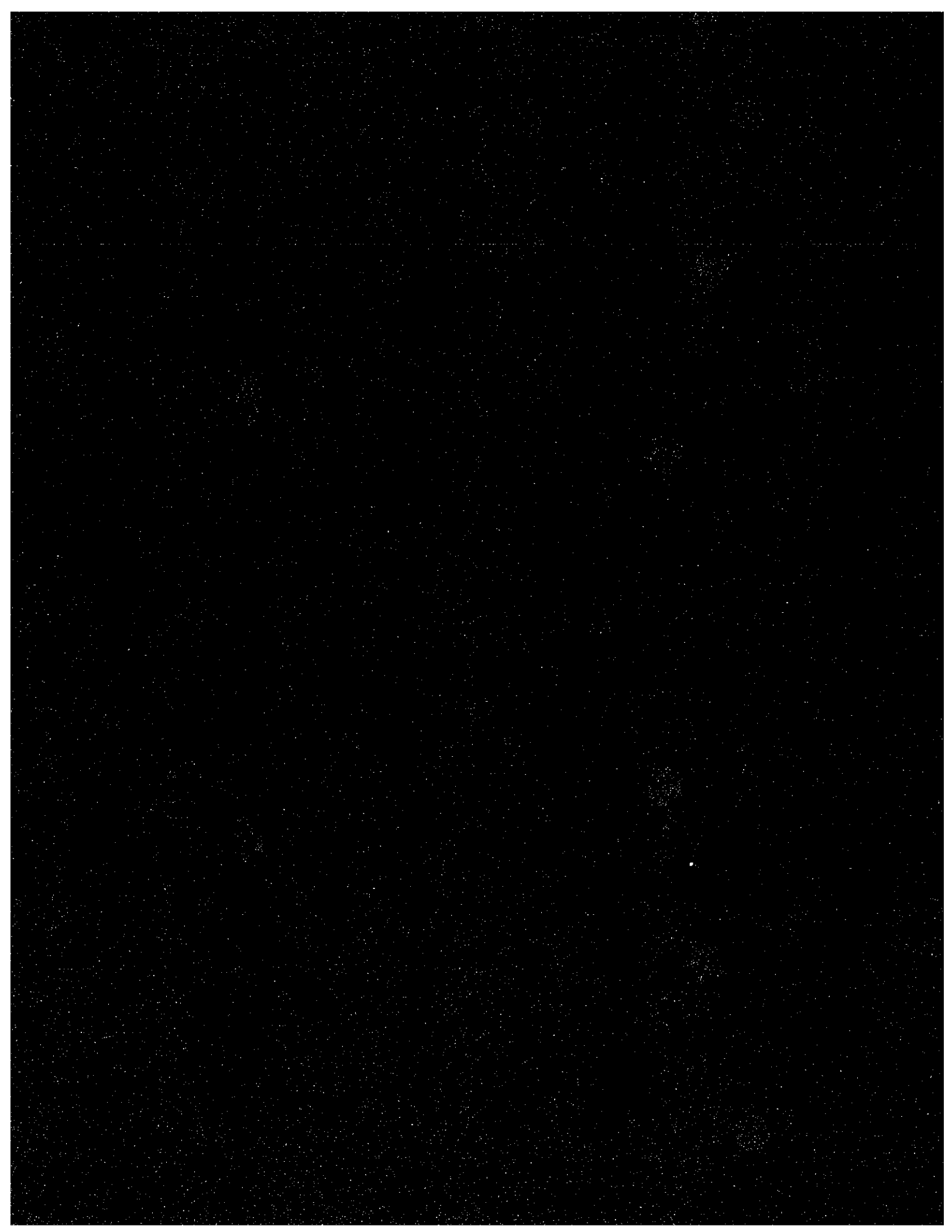
Integrated Circuits

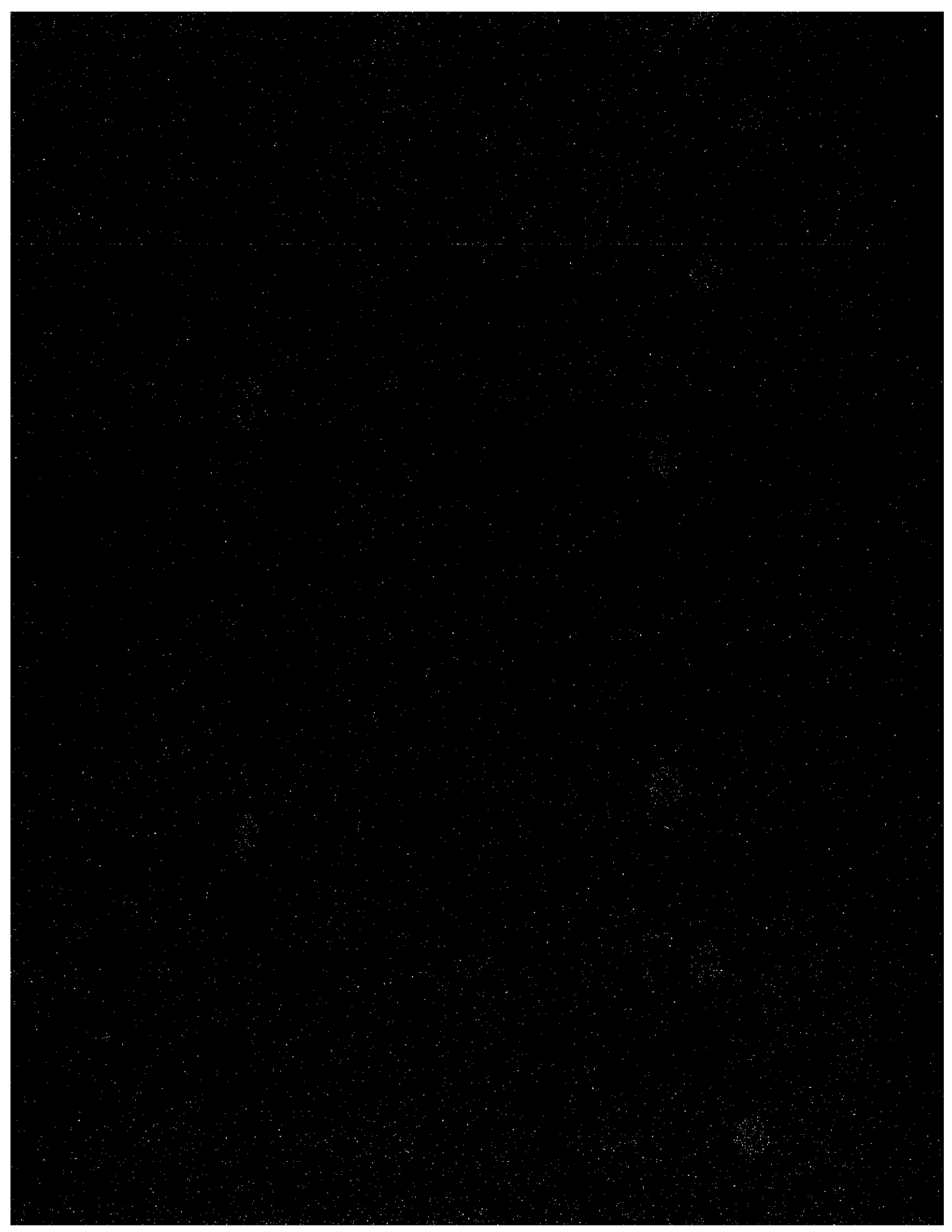
Device	Description	Part #	Designator
CMOS LOGIC	74HC00 CMOS QUAD NAND	480157	IC2
CMOS LOGIC	74HC138 3 TO 8 LINE DECODER	480120	IC4
CMOS LOGIC	74HC240 TRI-STATE INV BUFFER	480121	IC3
CMOS LOGIC	74HC374 TRISTATE OCTAL D F/F	480143	IC5
CMOS LOGIC	UCN5833 32 BIT SHFT	480169	IC1

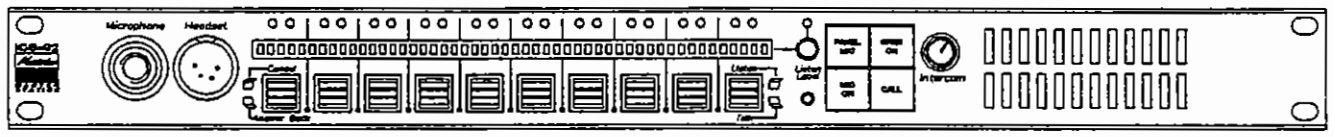
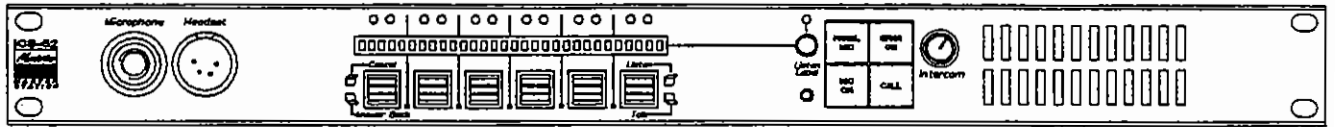
Miscellaneous

Description	Part #	Designator	
DISPLAY	2X8 LCD MODULE LED B/L	390048	
LAMP	5 VOLT T1-3/4 30 ma.	390036	S1-S33(33)
POT	5K POT PC MOUNT	470071	R42,R43
SOCKET	44 PIN PLCC SOCKET	210228	IC1
SWITCH	PUSHBUTTON SWITCH	510088	S34,S35
SWITCH	PUSHBUTTON SWITCH	510089	S36
SWITCH	PUSHBUTTON SWITCH	510108	S1-S33(33)

ICS-2102







Matrix Plus II System ICS-92/ICS-52
MASTER STATION INTERCOM STATION

Introduction

This Section provides instructions on resetting the station's microprocessor, trouble shooting information, schematics, assembly drawings and component lists for the ICS-52, ICS-52D, ICS-92, and ICS-92D Intercom Stations. Information on the XP-12, XP-22 XPL-12, and XPL-22 Expansion Key Panels and the OPT-100 are included in the ICS-2002 Master Intercom Station Section in this Maintenance Manual.

The only difference between the ICS-92 and ICS-52 is the number of talk and listen keys on the front panel. Internally the stations are identical including having identical programs. The ICS-52 has two jumpers on its Talk/Listen key panel to identify the station type to the program.

The difference between the ICS-92/52 and the ICS-92D/52D is which communication module is used. The communications portion of the circuit is separated from the main PCB and is mounted on the rear panel of the station. The program EPROM is also different for the two stations.

These stations operate on 14 VAC supplied from an external transformer. Transformers can be ordered for either 117 VAC or 220 VAC. Refer to the Miscellaneous Bill of Material in this section for ordering information.

Station Reset

The microprocessor in the station has a RESET switch accessible from the front panel of the unit. This pushbutton switch is located behind an unmarked hole just below the Listen Label Pushbutton. If the station is acting erratically, try resetting the station.

To reset the station use a small screwdriver or a stiff piece of wire to activate the pushbutton switch behind the RESET hole. Unplugging and reconnecting the AC power to unit will also reset it.

Troubleshooting

To help isolate a problem you are trying to resolve, a list of possible symptoms and possible solutions that are peculiar to the station has been provided.

The Overview chapter of the manual also contains troubleshooting guidelines for the entire system.

1. No LEDs or pushbutton lights come on.
 - Check mains AC power.
 - Replace the station.
2. LED indicator above selector key does not light when key is pressed.
 - Note that selector key LED indicators do not light if the selector key has no labels assigned to it.
 - Reset the station.
 - Replace the station.
3. Station appears to activate talk paths, but station operator cannot be heard by other stations.
 - Check Mic ON/OFF and PANEL MIC buttons to make sure the microphone they are using is selected and turned on.
 - If the correct mic is turned on, confirm that the station audio has not been muted externally through the logic inputs.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station.

4. All red LEDs flash slowly, station is inoperative.
 - Check that the cable that connects the station to the matrix is plugged in both at the station and at the matrix frame.
 - Reset the station.
 - Reset the associated crosspoint card in the matrix frame.
 - Check the Configuration Program to ensure that the station is assigned the correct port type (ICS-92/52 Intercom Station).
 - If 3/4 pair transmission mode is being used, check the integrity of the RS-422 data paths. Polarity is important in this transmission scheme.
 - If Digital 2 Wire transmission mode is being used, check for a solid DC path between the station and the matrix frame.
 - Confirm that the Matrix card type matches the station.
 - Replace the station.
 - Replace the crosspoint card that the station is connected to.
5. No audio from station's speaker.
 - Check to see if audio can be heard in a headphone.
 - Be sure the Intercom volume control on the front of the station is turned up.
 - Be sure the Speaker On/Off button is set to ON.
 - Check the audio paths to the matrix. Using either the Configuration computer or an ICS-2002 station's programming feature, at another location, set a forced crosspoint to yourself creating a matrix loop-back. Eavesdropping must be enabled on the station being tested.
 - Reset the station.
 - Replace the station,
 - Reset or replace the crosspoint card that the station is connected to.
6. Cannot hear page from another station.
 - Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.

7. No announce tones (call signal beeps, eavesdropping indication, etc.) at the station.
- Check and adjust the Preset Page Level control of the station using the Configuration Program refer to the Configuration Chapter in Volume I, OPERATION MANUAL.
 - Check the station's Configuration menu to be sure that the monitoring tones are enabled.
8. No audio from external program feed in speaker.
- Check the Program volume control on the front of the station.
 - Check the program source.
 - Reset the station by powering it OFF and then ON.
 - Replace the station.
9. Station does not receive call signals, answerback indication, or other communications from other stations (except for audio on active talk paths).
- Check that the Frame Ser LED indicators are blinking in the crosspoint cards in the matrix frame, indicating that the CPU-100 is able to coordinate communication between the crosspoint cards.
 - If they are not blinking, reset the CPU-100 card.
 - If that does not initiate the cycling of the LED indicators, replace the CPU-100.
10. Expansion key panel keys do not function.
- Check connection of expansion key panel on rear of station.
 - Check the Configuration with the Configuration Software
12. Stations receive call signals, answer backs and other communication but cannot send any talks, call signals or other communication.
- If two frames are connected and this symptom is true only in the second (SCF-101) frame, reset or replace the CPU-150 in the second frame.

Miscellaneous Bill of Materials for the ICS-52/52D/92/92D

Device	Description	Part #
CABLE	10-PIN FLAT CABLE	770011
CABLE	16-PIN FLAT CABLE (SPLIT)	770010
CABLE	34-PIN FLAT CABLE	730181
CLAMP	CABLE CLAMP, 3/16IN PLASTIC	640054
EPROM MEM.	ICS-92 PROGRAM	710341
EPROM MEM.	ICS-92D PROGRAM	710348
SPEAKER	3 INCH ROUND	500089
TRANSFORMER	POWER PLUG-IN 117/14VAC	400008
TRANSFORMER	POWER PLUG-IN 220/14VAC	400011

ICS-52/ICS-92

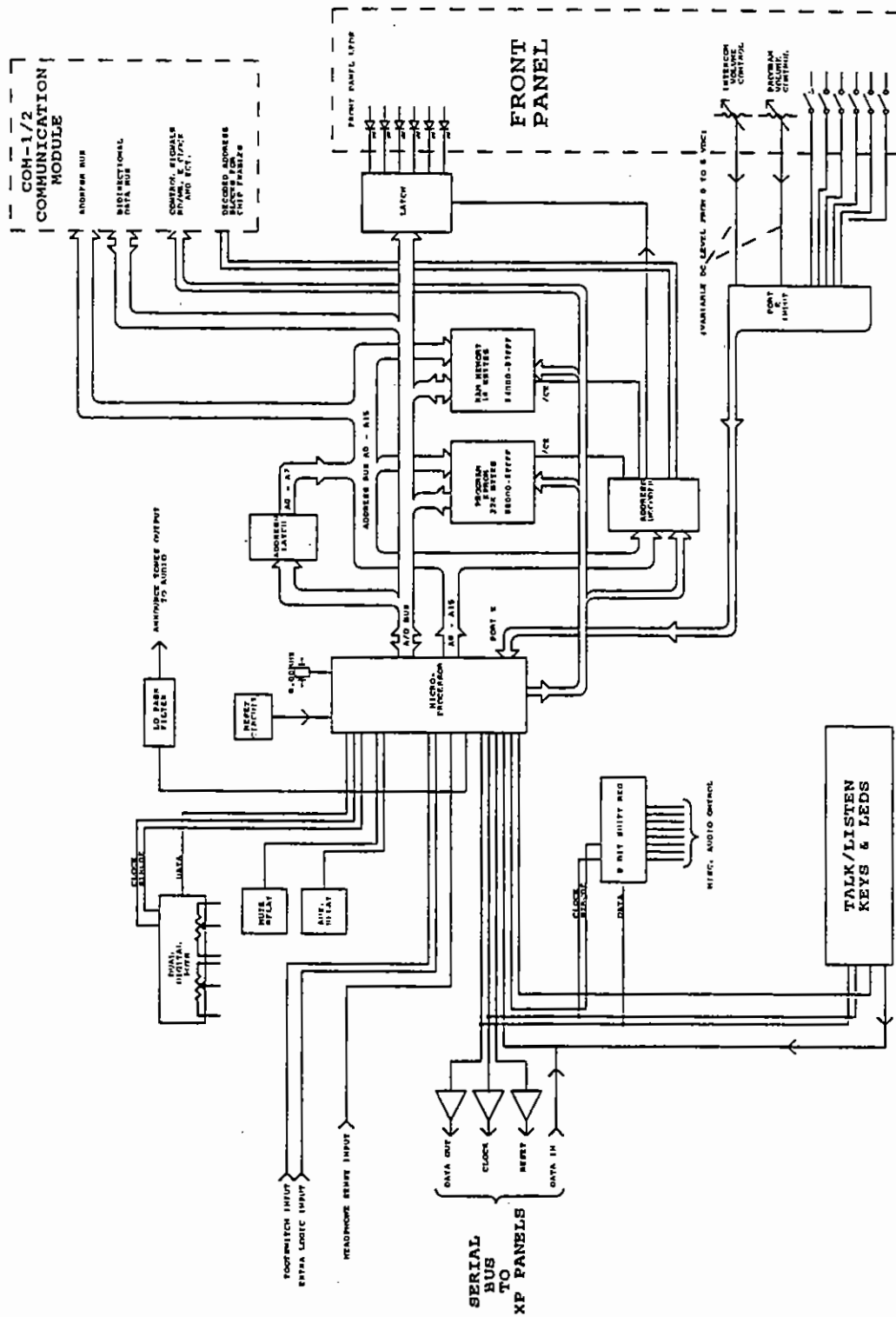
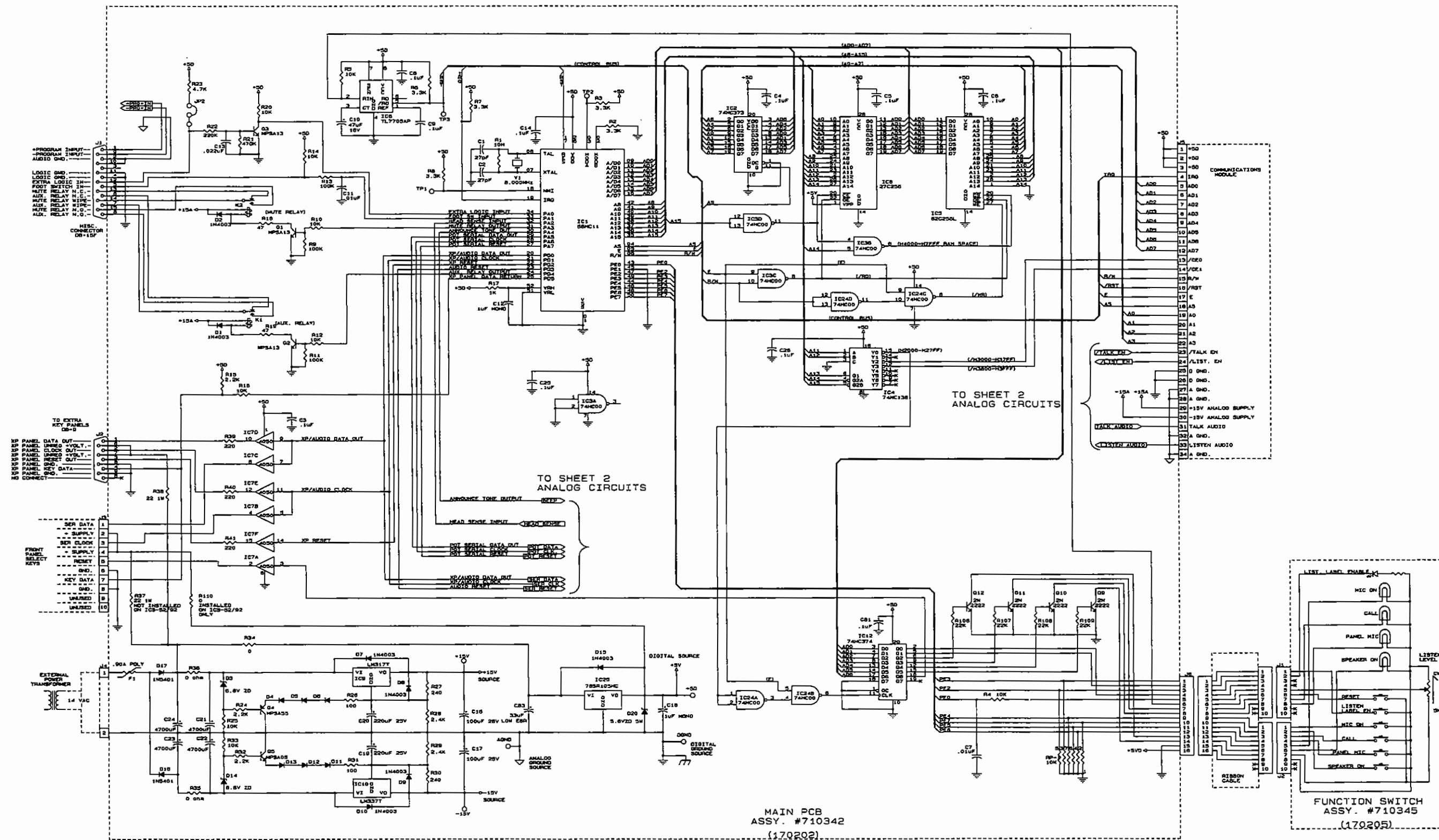


FIGURE S3-1 Digital Block Diagram - ICS-52/ICS-92 Main PCB



MAIN PCB
ASSY. #710342
(170202)

FUNCTION SWITCH
ASSY. #710345
(170205)

FIGURE S3-2 Schematic - ICS-52/ICS-92 Main PCB Sheet 1 Rev. A

ICS-52/ICS-92

ICS-52/ICS-92

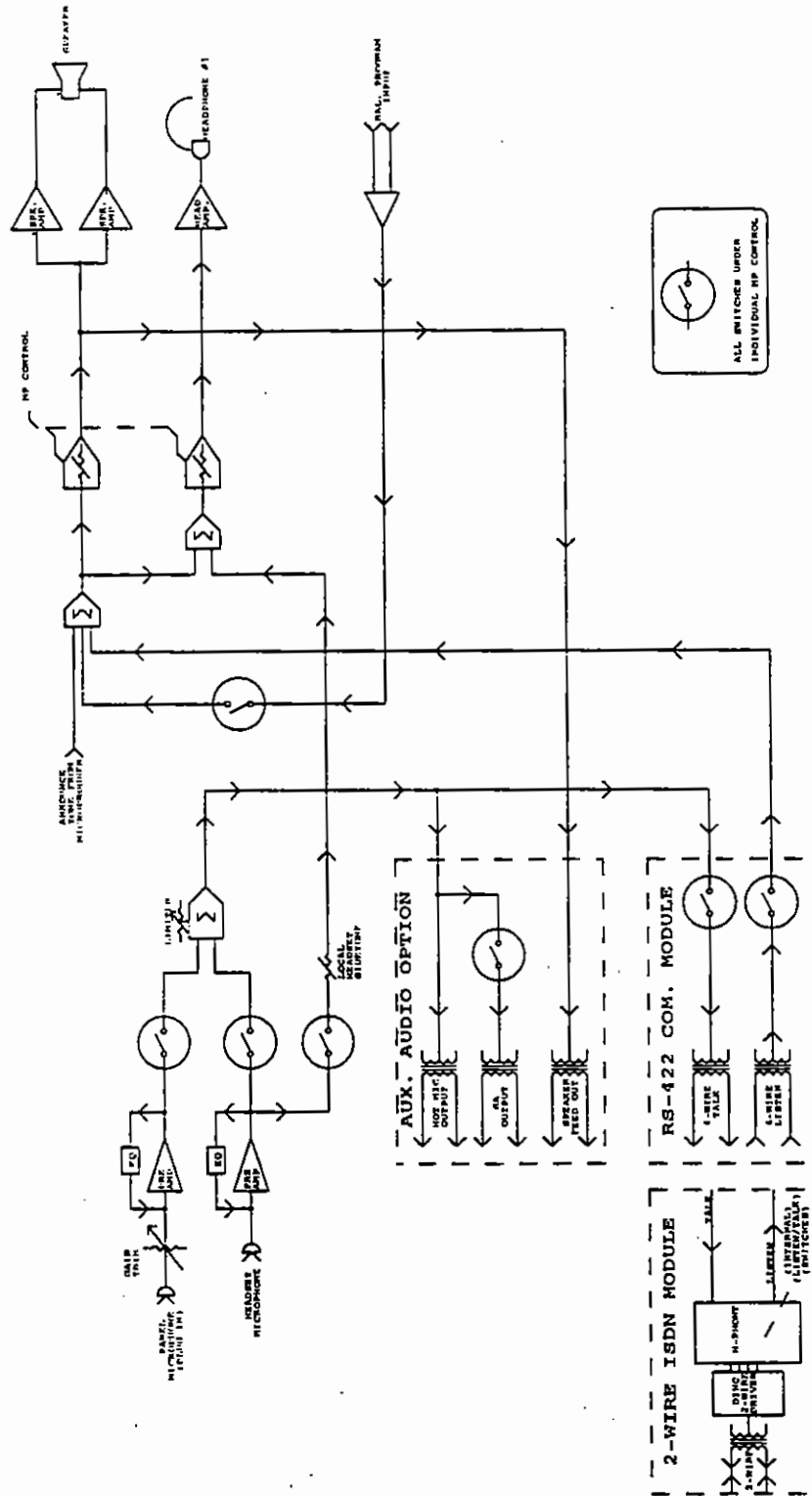


FIGURE S3-3 Analog Block Diagram - ICS-52/ICS-92 Main PCB

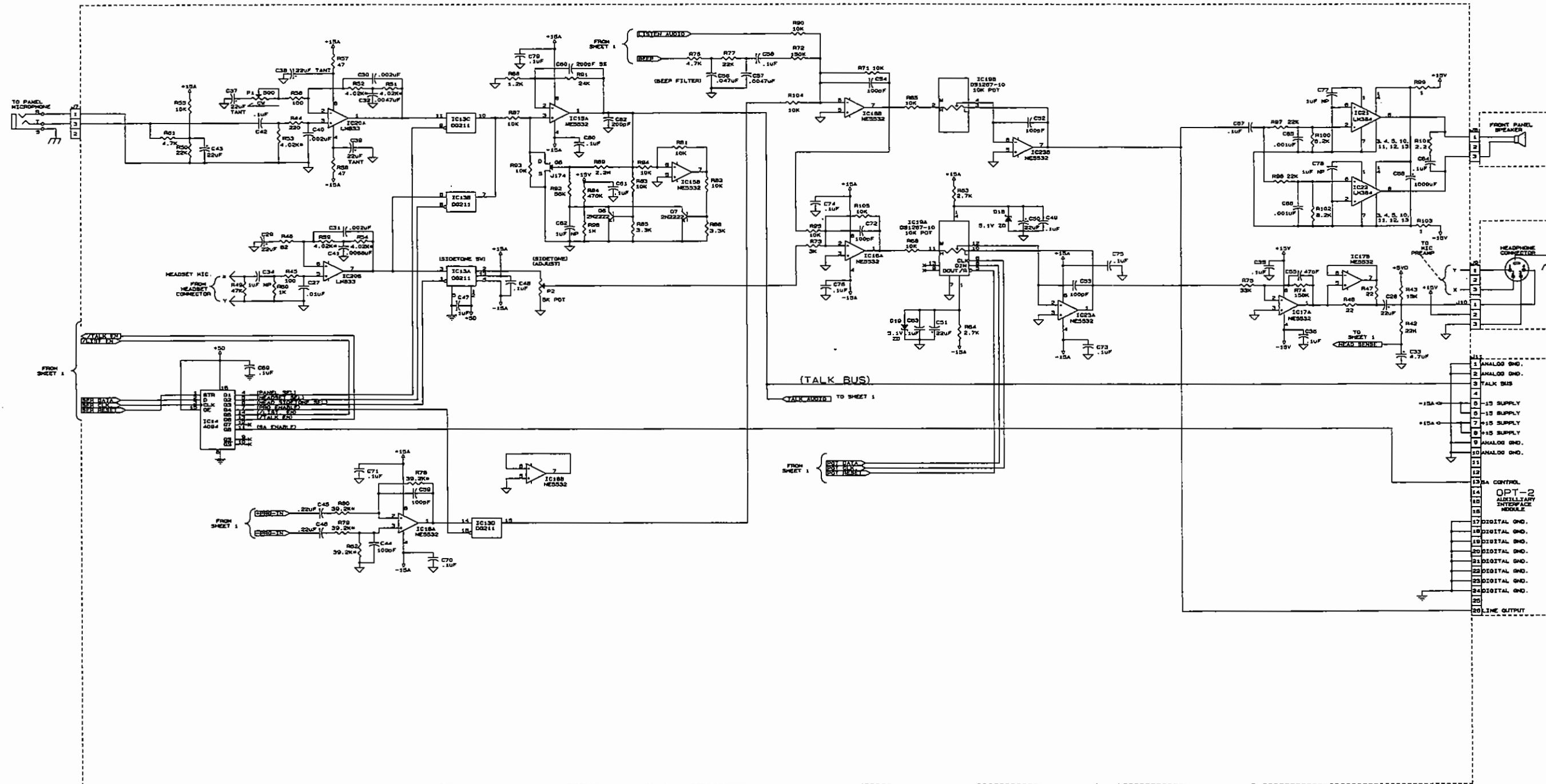


FIGURE S3-4 Schematic - ICS-52/ICS-92 Main PCB Sheet 2 Rev. A

ICS-52/ICS-92

ICS-52/ICS-92

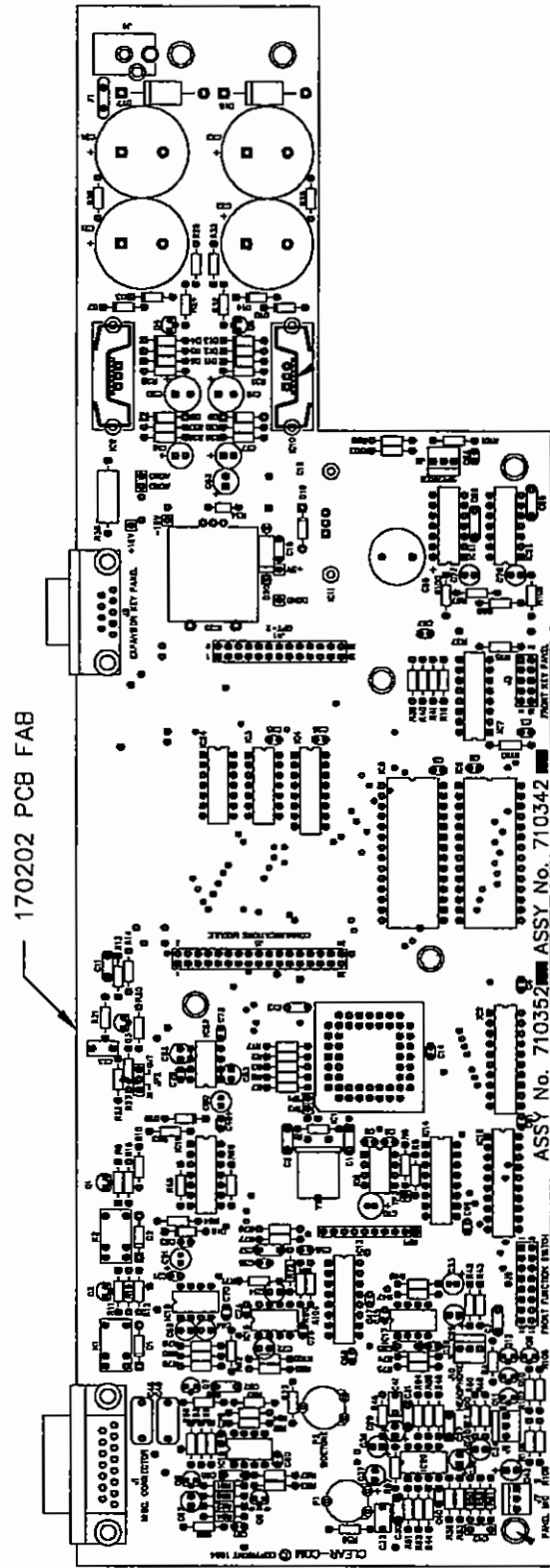


FIGURE S3-5 Assembly Drawing - ICS-52/ICS-92 Main PCB Rev.A

Bill of Materials for ICS-92 Main PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
27PF	CERAMIC	50V	5%	150071	C1,C2
47PF	CERAMIC	50V	10%	150041	C55
100PF	CERAMIC	50V	10%	150006	C44,C52,C53,C54,C59,C72
200PF	CERAMIC	100V	5%	150063	C60,C82
6800PF	CERAMIC	50V	5%	150057	C41
.001UF	CERAMIC	30V	20%	150052	C65,C66
.0022UF	MYLAR	100V	5%	150045	C30,C31,C40
.0047UF	MYLAR	5%	50V	150114	C32
.0047UF	CERAMIC	50V	10%	150016	C57
.01UF	CERAMIC	30V	20%	150012	C7,C11,C27
.022UF	MYLAR	100V	10%	150008	C13
.047UF	MONO	10%	50V	150111	C56
.1UF	MONO	50V	10%	150035	C9,C14,C25,C26, C35,C36,C47,C48,C49,C58, C61,C63, C3,C4,C5,C6,C8, C76,C79,C80,C81,C64,C67, C69,C70,C71,C73,C74,C75
.1UF	MONO	100V	10%	150085	C42
.22UF	MYLAR	100V	20%	150003	C45,C46
1UF	CERAMIC	50V	10%	150073	C12,C18
1UF	ALUMINUM NP	50V	10%	150002	C34,C62,C77,C78
2.2UF	ALUMINUM NP	50V		150065	C33
22UF	TANT.	16V		150032	C38,C39
22UF	ALUMINUM	16V	20%	150142	C28,C29,C37,C43,C50,C51
33UF	ALU LOW ESR	35V	20%	150130	C84, C83
47UF	ALUMINUM	16V	20%	150143	C10
100UF	ALUMINUM	25V	20%	150099	C16,C17
220UF	ALUMINUM	25V		150137	C19,C20
1000UF	ALUMINUM	35V		150092	C68
4700UF	ALUMINUM	25V		150139	C21,C22,C23,C24

Bill of Materials for ICS-92 Main PCB ---- continued**Resistors & Resistor Packs**

Value	Power	Type	Tol.	Part #	Designator
1 OHM	1/4W	CARBON FILM	5%	410139	R99,R103
2.2 OHMS	1/4W	CARBON FILM	5%	410113	R101
22 OHMS	1/4W	CARBON FILM	5%	410004	R47,R48
22 OHMS	1W	CARBON FILM	5%	410174	R38
47 OHMS	1/4W	CARBON FILM	5%	410039	R18,R19,R57,R58
82 OHMS	1/4W	CARBON FILM	5%	410038	R46
100 OHMS	1/4W	CARBON FILM	5%	410071	R26,R31,R45,R56
220 OHMS	1/4W	CARBON FILM	5%	410007	R39,R40,R41,R44
240 OHMS	1/4W	CARBON FILM	5%	410060	R27,R30
500 OHMS		TRIM POT		470060	P1
1K OHMS	1/4W	CARBON FILM	5%	410010	R17,R60
1.2K OHMS	1/4W	CARBON FILM	5%	410041	R88
2.2K OHMS	1/4W	CARBON FILM	5%	410011	R15,R24,R32
2.4K OHMS	1/4W	CARBON FILM	5%	410103	R28,R29
2.7K OHMS	1/4W	CARBON FILM	5%	410040	R63,R64
3.0K OHMS	1/4W	CARBON FILM	5%	410104	R73
3.3K OHMS	1/4W	CARBON FILM	5%	410015	R2,R3,R6,R7,R8,R85,R86
4.02K OHMS	1/8W	METAL FILM	1%	410155	R51,R52,R53,R54,R59
4.7K OHMS	1/4W	CARBON FILM	5%	410013	R23,R61,R76
5K OHMS		TRIM POT		470022	P2
8.2K OHMS	1/4W	CARBON FILM	5%	410037	R100,R102
10K OHMS	1/4W	CARBON FILM	5%	410016	R4,R5,R10,R12,R14,R16, R20,R25,R33,R55,R65,R68, R71,R81, R82,R83,R87,R90, R93,R94, R95,R104,R105
10K OHM X 9		R-PACK		415001	RP1
15K OHMS	1/4W	CARBON FILM	5%	410017	R43
22K OHMS	1/4W	CARBON FILM	5%	410018	R42,R50,R77,R97,R98 R106,R107,R108,R109
24K OHMS	1/4W	CARBON FILM	5%	410083	R91
33K OHMS	1/4W	CARBON FILM	5%	410020	R75
39.2K OHMS	1/8W	METAL FILM	1%	410111	R62,R78,R79,R80
47K OHMS	1/4W	CARBON FILM	5%	410021	R49
56K OHMS	1/4W	CARBON FILM	5%	410023	R92
100K OHMS	1/4W	CARBON FILM	5%	410024	R9,R11,R13
150K OHMS	1/4W	CARBON FILM	5%	410026	R72,R74
220K OHMS	1/4W	CARBON FILM	5%	410028	R22
470K OHMS	1/4W	CARBON FILM	5%	410030	R21,R84
1M OHM	1/4W	CARBON FILM	5%	410058	R96
2.2M OHM	1/4W	CARBON FILM	5%	410153	R89
10M OHM	1/4W	CARBON FILM	5%	410059	R1

Bill of Materials for ICS-92 Main PCB ---- continued**Diodes and Transistors**

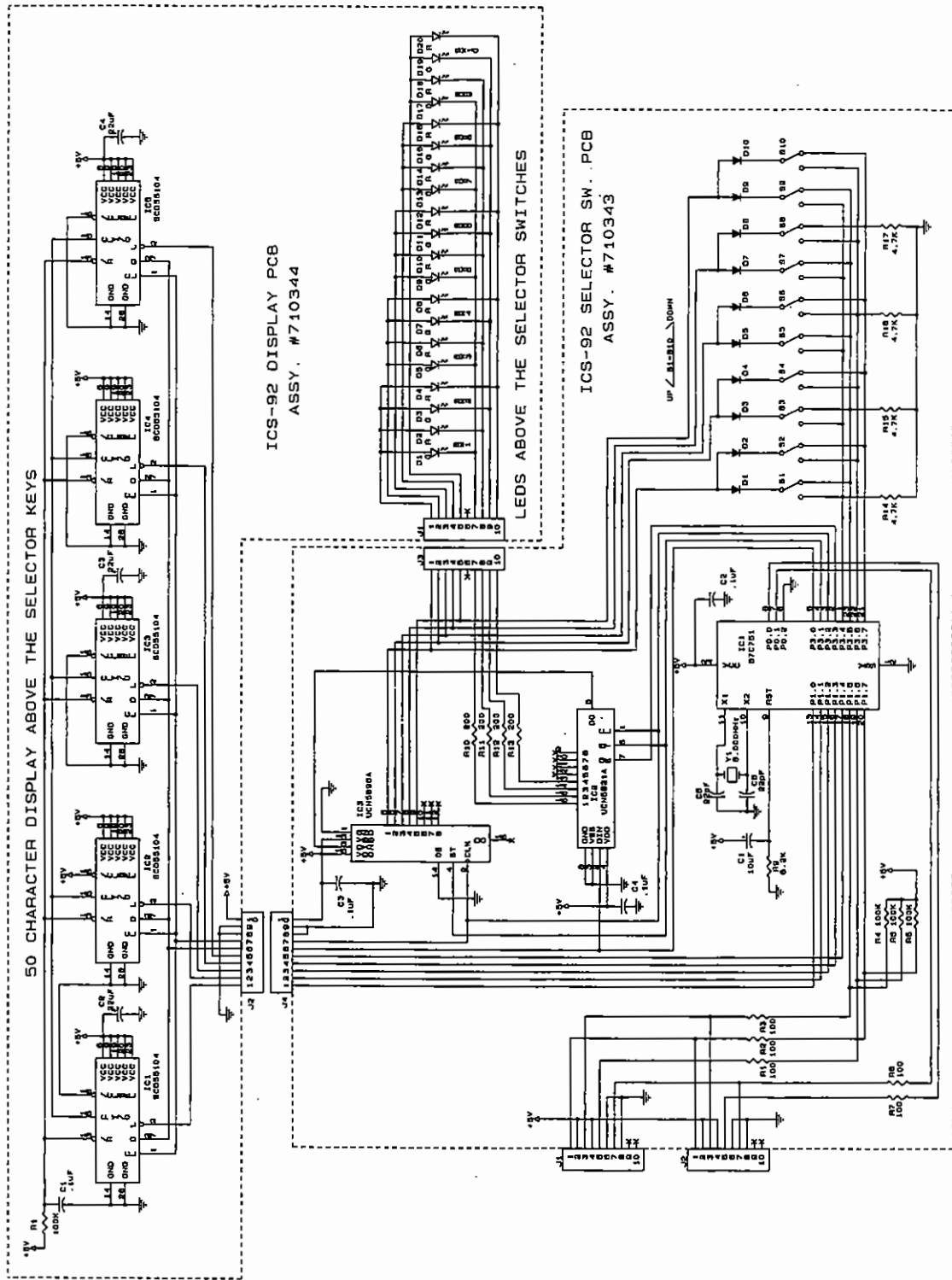
Device	Description	Part #	Designator
DIODE	1N957B ZENER 6.8V .4W 5%	480026	D3,D14
DIODE	1N4003 RECT 1A 200PIV	480058	D1,D2,D7,D8,D9,D10,D15
DIODE	1N4148 SIGNAL 10MA 75PIV	480000	D4,D5,D6,D11,D12,D13
DIODE	1N5231B ZENER 5.1V .5W 5%	480038	D18,D19
DIODE	1N5339 ZENER 5.6V 5W	480182	D20
DIODE	1N5401 RECT 3A 100PIV	480005	D16,D17
TRASISTOR	2N2222 NPN 30V	480006	Q7,Q8,Q9,Q10,Q11,Q12
TRASISTOR	J174 JFET PCHAN 8V VGS	480079	Q6
TRASISTOR	MPS-A05 NPN 60V	480052	Q5
TRASISTOR	MPS-A13 NPN 30V DARL	480004	Q1,Q2,Q3
TRASISTOR	MPS-A55 PNP 60V	480050	Q4

Integrated Circuits

Device	Description	Part #	Designator
4050B	CMOS HEX BUFFER	480077	IC7
4094B	CMOS 8 BIT SHIFT REGISTER	480107	IC14
68HC11A	CMOS MCU 52 PIN PLCC FP	480132	IC1
4HC00	CMOS QUAD NAND	480157	IC3,IC24
74HC138	CMOS 3 TO 8 LINE DECODER	480120	IC4
74HC373	CMOS OCTAL D LATCH	480142	IC2
74HC374	CMOS OCTAL D FL/FLOP	480143	IC12
DG211CJ	CMOS QUAD ANALOG SWITCH	480092	IC13
GM76C256L	CMOS SRAM 32K X 8 100NS	480183	IC5
DS1267-10	DIGITAL POT, DUAL 10K	480195	IC19
LM384	OPAMP, POWER 4W	480012	IC21,IC22
LM833N	OPAMP, DUAL LO NOISE	480175	IC20
NE5532	OPAMP, DUAL LO NOISE	480070	IC15,IC16,IC17,IC18,IC23
78SR105HC	REGULATOR, 5V SWITCHER 1A	480206	IC25
LM317T	REGULATOR, POS ADJ 1.5A	480167	IC9
LM337T	REGULATOR, NEG ADJ 1.5A	480177	IC10
TL7705AP	RESET SUPERVISOR IC	480134	IC6

Bill of Materials for ICS-92 Main PCB ---- continued**Miscellaneous**

Device	Description	Part #	Designator
CONNECTOR	2.1MM CO-AX PC MTG POWER	210213	J4
CONNECTOR	DB-9F RT ANG PC MTG	210186	J2
CONNECTOR	DB-15F RT ANG PC MTG	210187	J1
CRYSTAL	8.000MHZ PARALLEL CRYSTAL	230003	Y1
FUSE	0.90A POLY SWITCH	520036	F1
JUMP JACK	JUMP JAX	210103	JP2
RELAY	SPDT 12V PC RELAY ITT#SZ12	450006	K1,K2



S1 = ANSWERBACK KEY
S2 - S10 = TALK/LISTEN 1-9

ICS-52/ICS-92

FIGURE S3-6 Schematic - ICS-92 Selector Switch Assembly Rev. A

ICS-52/ICS-92

170203 PC FAB.

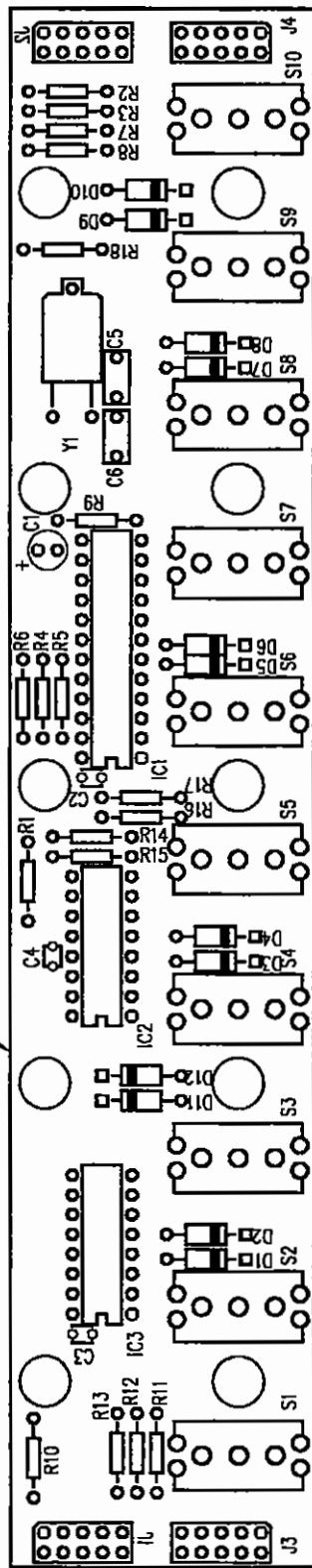


FIGURE S3-7 Assembly Drawing - ICS-92 Selector Switch PCB Rev. A

Bill of Materials for ICS-92 Selector Switch PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
22PF	CERAMIC	50V	10%	150098	C5,C6
.1UF	MONO	50V	10%	150035	C2,C3,C4
10UF	ALUMINUM	50V		150064	C1

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
0 OHM		JUMPER		600000	R18
100 OHMS	1/4W	CARBON FILM	5%	410071	R1,R2,R3,R7,R8
200 OHMS	1/4W	CARBON FILM	5%	410072	R10,R11,R12,R13
4.7K OHMS	1/4W	CARBON FILM	5%	410013	R14,R15,R16,R17
8.2K OHMS	1/4W	CARBON FILM	5%	410037	R9
100K OHMS	1/4W	CARBON FILM	5%	410024	R4,R5,R6

Diodes and Transistors

Device	Description	Part #	Designator
DIODE	1N4148 SIGNAL 10MA 75PIV	480000	D1,D2,D3,D4,D5,D6, D7,D8,D9,D10

Integrated Circuits

Device	Description	Part #	Designator
710353	PROGRAMED MICRO P,87C751	710353	IC1
UCN5821A	CMOS 8 BIT SHFT REG I SINK	480164	IC2
UCN5895	CMOS 8 BIT SHFT REG I SOURCE	480210	IC3

Miscellaneous

Device	Description	Part #	Designator
CRYSTAL	8.000MHZ PARALLEL HC-49U	230003	Y1
SWITCH	SP3T MOM-OFF-MOM PC MTG	510080	S1-S10

ICS-52/ICS-92

170204 PC FAB.

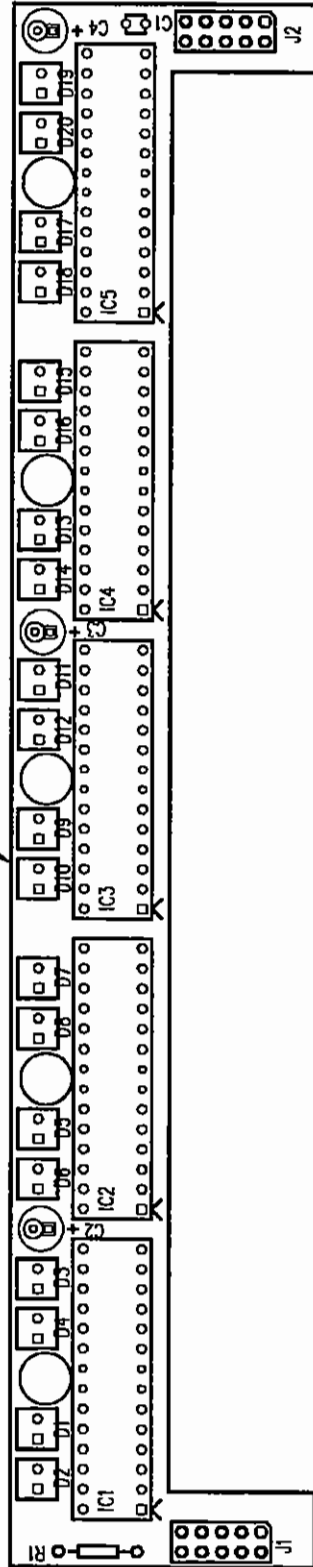


FIGURE S3-8 Assembly Drawing - ICS-92 Display PCB Rev. A

Bill of Materials for ICS-92 Display PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
.1UF	MON	50V	10%	150035	C1
22UF	TAN	16V		150032	C2,C3,C4

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100K OHMS	1/4W	CARBON FILM	5%	410024	R1

Diodes and Transistors

Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP LED	390045	D1,D3,D5,D7,D9,D11, D13,D15,D17,D19
LED	RED, ROUND, FLAT TOP LED	390044	D2,D4,D6,D8,D10,D12, D14,D16,D18,D20

Integrated Circuits

Device	Description	Part #	Designator
DISPLAY	10 CHARACTER LED DISPLAY	390050	IC1,IC2,IC3,IC4,IC5

Miscellaneous

Device	Description	Part #	Designator
LENS	TWO COLOR DISPLAY LENS	250694	

ICS-52/ICS-92

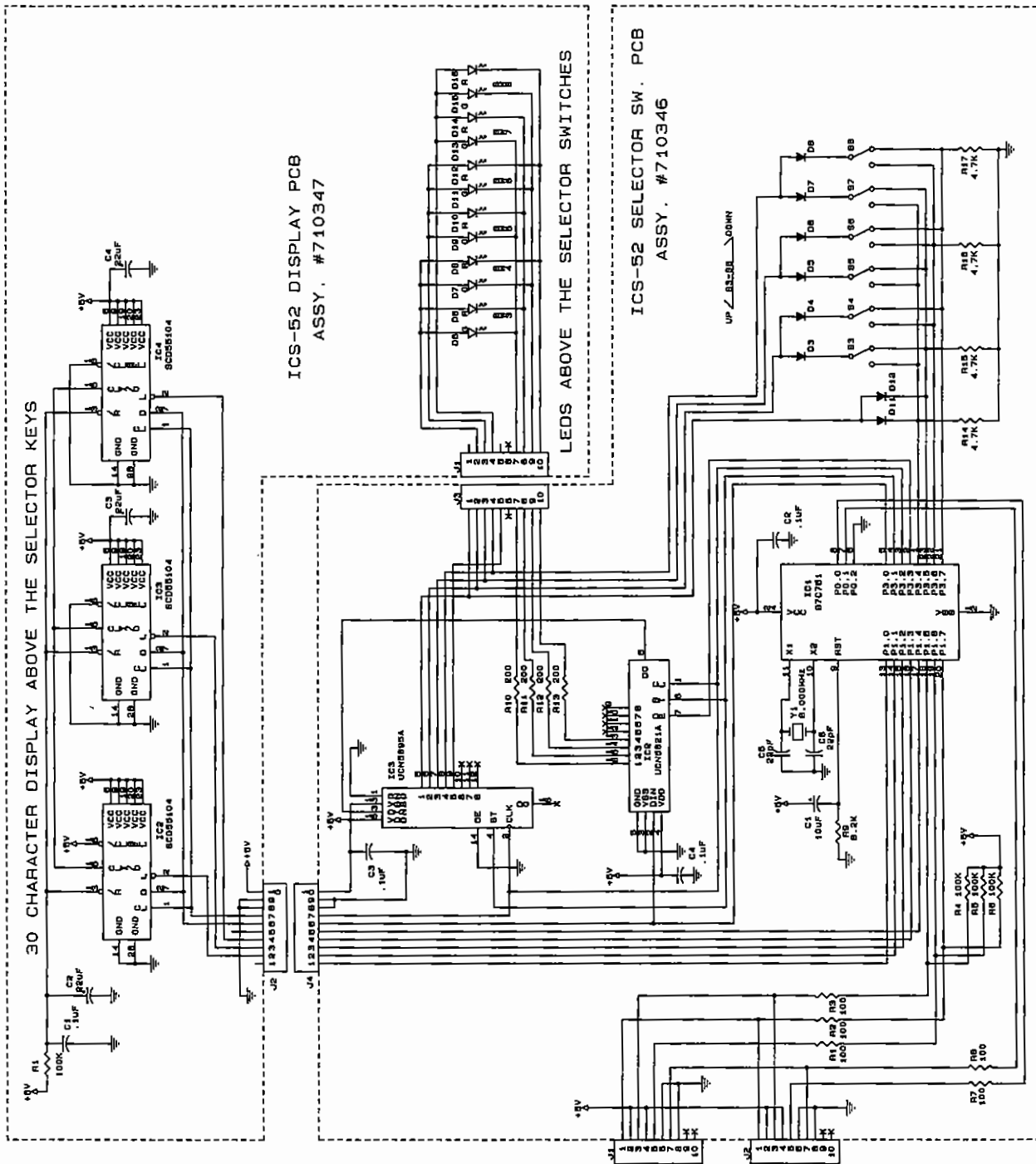


FIGURE S3-9 Schematic - ICS-52 Selector Switch Assembly Rev. A

26-50185-501

170203 PC FAB.

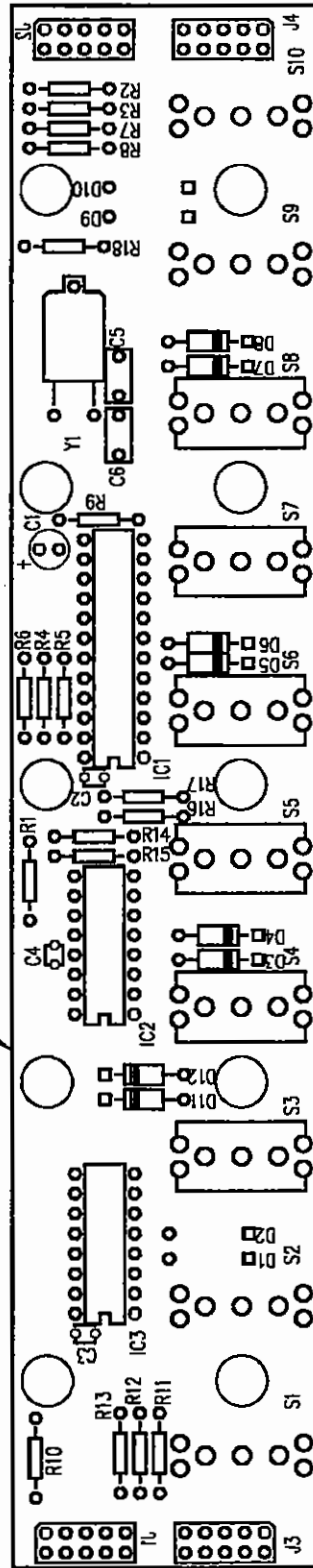


FIGURE S3-10 Assembly drawing - ICS-52 Selector Switch PCB Rev. A

Bill of Materials for ICS-52 Selector Switch PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
22PF	CERAMIC	50V	10%	150098	C5,C6
.1UF	MONO	50V	10%	150035	C2,C3,C4
10UF	ALUMINUM	50V		150064	C1

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
0 OHM		JUMPER		600000	R18
100 OHMS	1/4W	CARBON FILM	5%	410071	R1,R2,R3,R7,R8
200 OHMS	1/4W	CARBON FILM	5%	410072	R10,R11,R12,R13
4.7K OHMS	1/4W	CARBON FILM	5%	410013	R14,R15,R16,R17
8.2K OHMS	1/4W	CARBON FILM	5%	410037	R9
100K OHMS	1/4W	CARBON FILM	5%	410024	R4,R5,R6

Diodes and Transistors

Device	Description	Part #	Designator
DIODE	1N4148 SIGNAL 10MA 75PIV	480000	D3,D4,D5,D6,D7,D8

Integrated Circuits

Device	Description	Part #	Designator
710353	PROGRAMED MICRO P,87C751	710353	IC1
UCN5821A	CMOS 8 BIT SHFT REG I SINK	480164	IC2
UCN5895	CMOS 8 BIT SHFT REG I SOURCE	480210	IC3

Miscellaneous

Device	Description	Part #	Designator
CRYSTAL	8.000MHZ PARALLEL HC-49U	230003	Y1
SWITCH	SP3T MOM-OFF-MOM PC MTG	510080	S3-S8

ICS-52/ICS-92

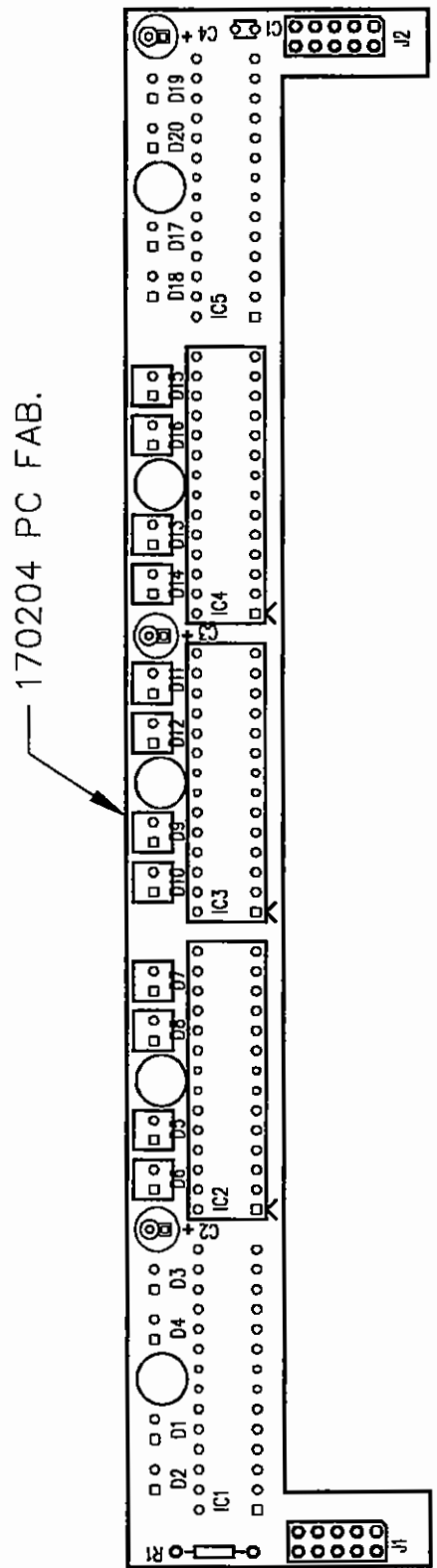


FIGURE S3-11 Assembly Drawing - ICS-52 Selector Switch LED PCB Rev. A

Bill of Materials for ICS-52 Display PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
.1UF	MON	50V	10%	150035	C1
22UF	TAN	16V		150032	C2,C3,C4

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
100K OHMS	1/4W	CARBON FILM	5%	410024	R1

Diodes and Transistors

Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP LED	390045	D5,D7,D9,D11,D13,D15,
LED	RED, ROUND, FLAT TOP LED	390044	D6,D8,D10,D12,D14,D16

Integrated Circuits

Device	Description	Part #	Designator
DISPLAY	10 CHARACTER LED DISPLAY	390050	IC2,IC3,IC4

Miscellaneous

Device	Description	Part #	Designator
LENS	TWO COLOR DISPLAY LENS	250694	

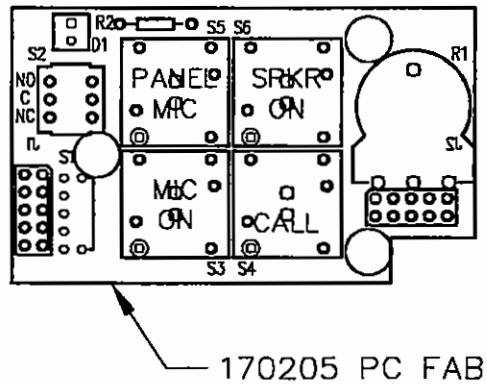


FIGURE S3-12 Assembly Drawing - ICS-52 Function Switch PCB Rev. A

Bill of Materials for ICS-92 Function Switch PCB

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
1K OHMS	1/4W	CARBON FILM	5%	410010	R2
5K OHMS		POT PC MOUNT		470072	R1

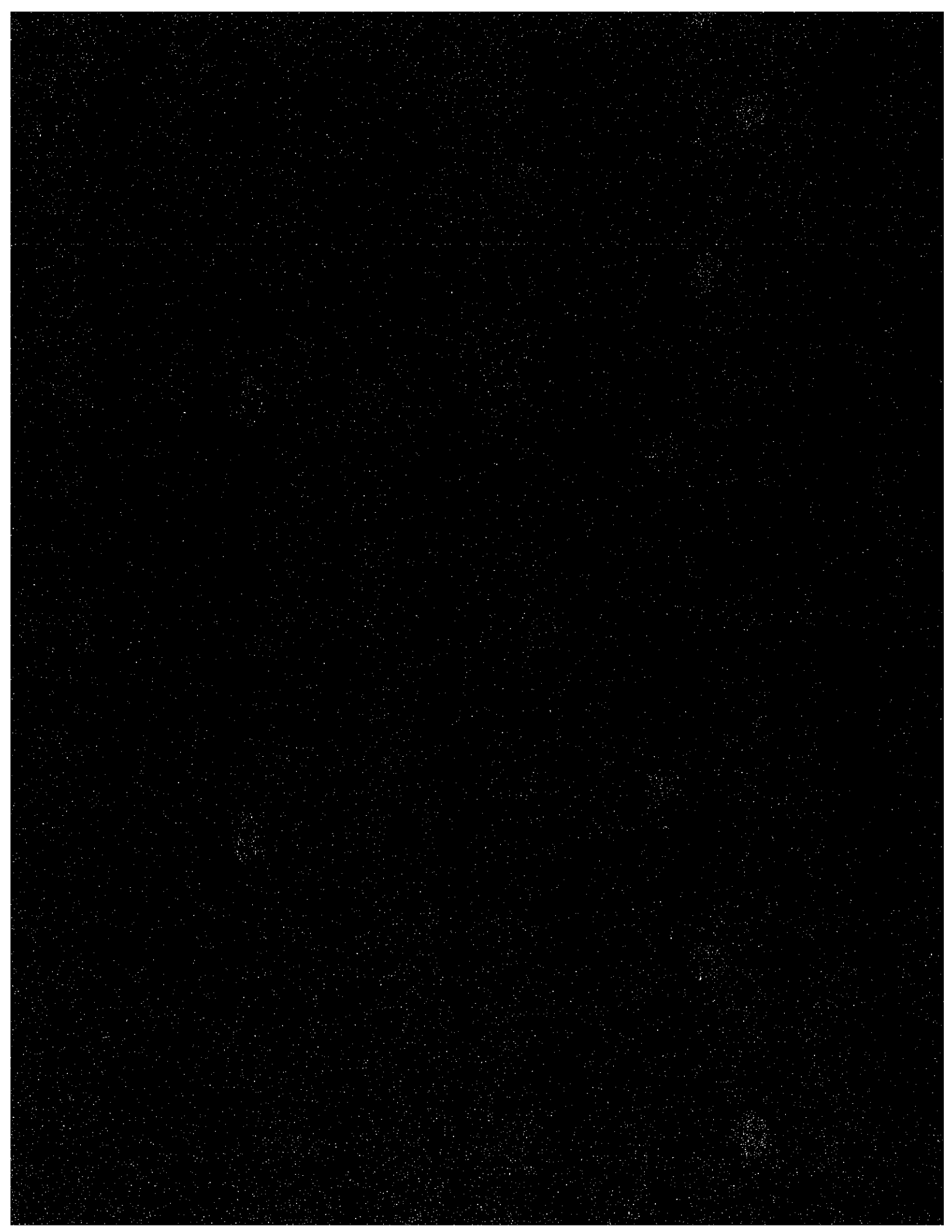
Diodes and Transistors

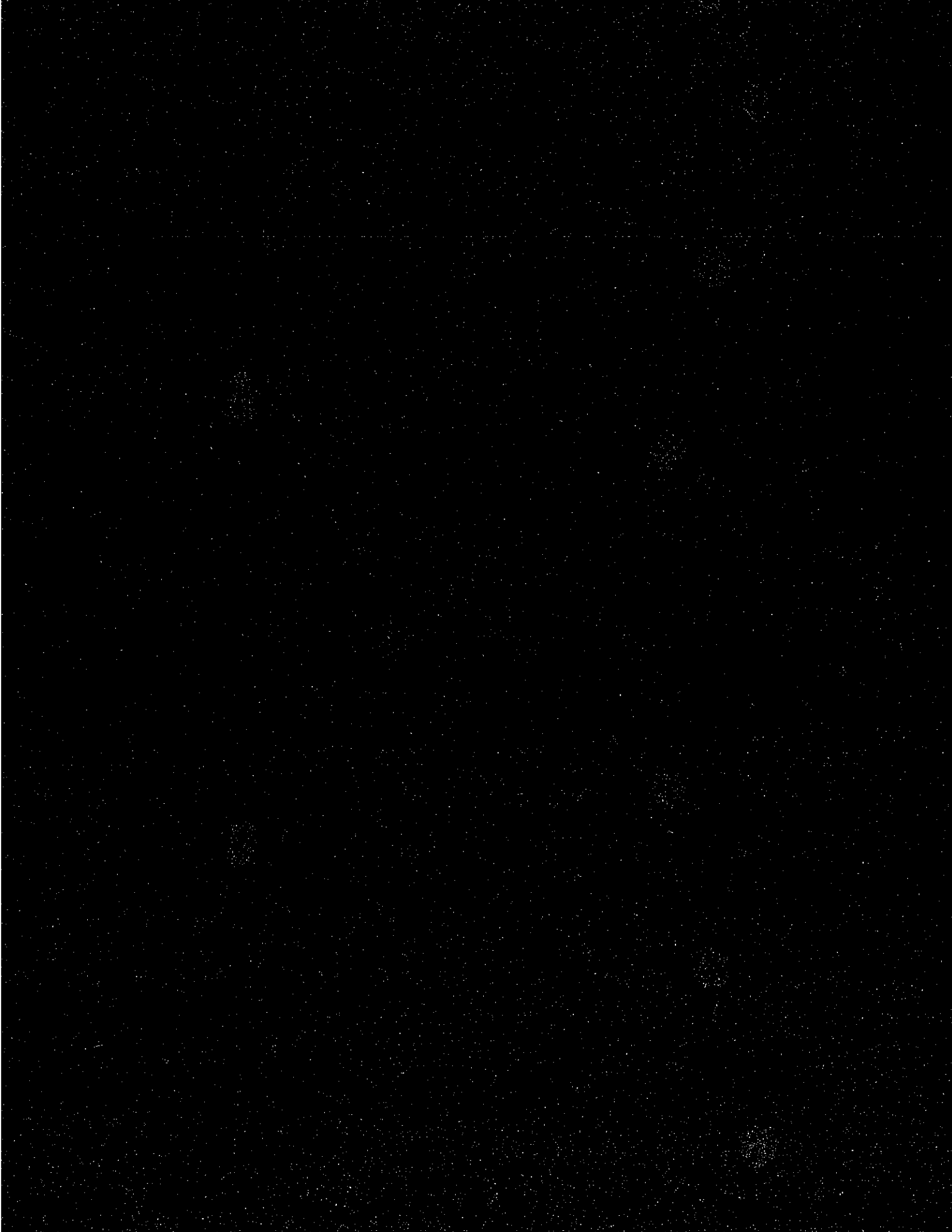
Device	Description	Part #	Designator
LED	GREEN, ROUND, FLAT TOP	390045	D1

Miscellaneous

Device	Description	Part #	Designator
SWITCH	PUSHBUTTON SWITCH	510089	S1
SWITCH	PUSHBUTTON, DPDT	510107	S2
SWITCH	PUSHBUTTON SWITCH W LAMP	510108	S3,S4,S5,S6

20





Introduction

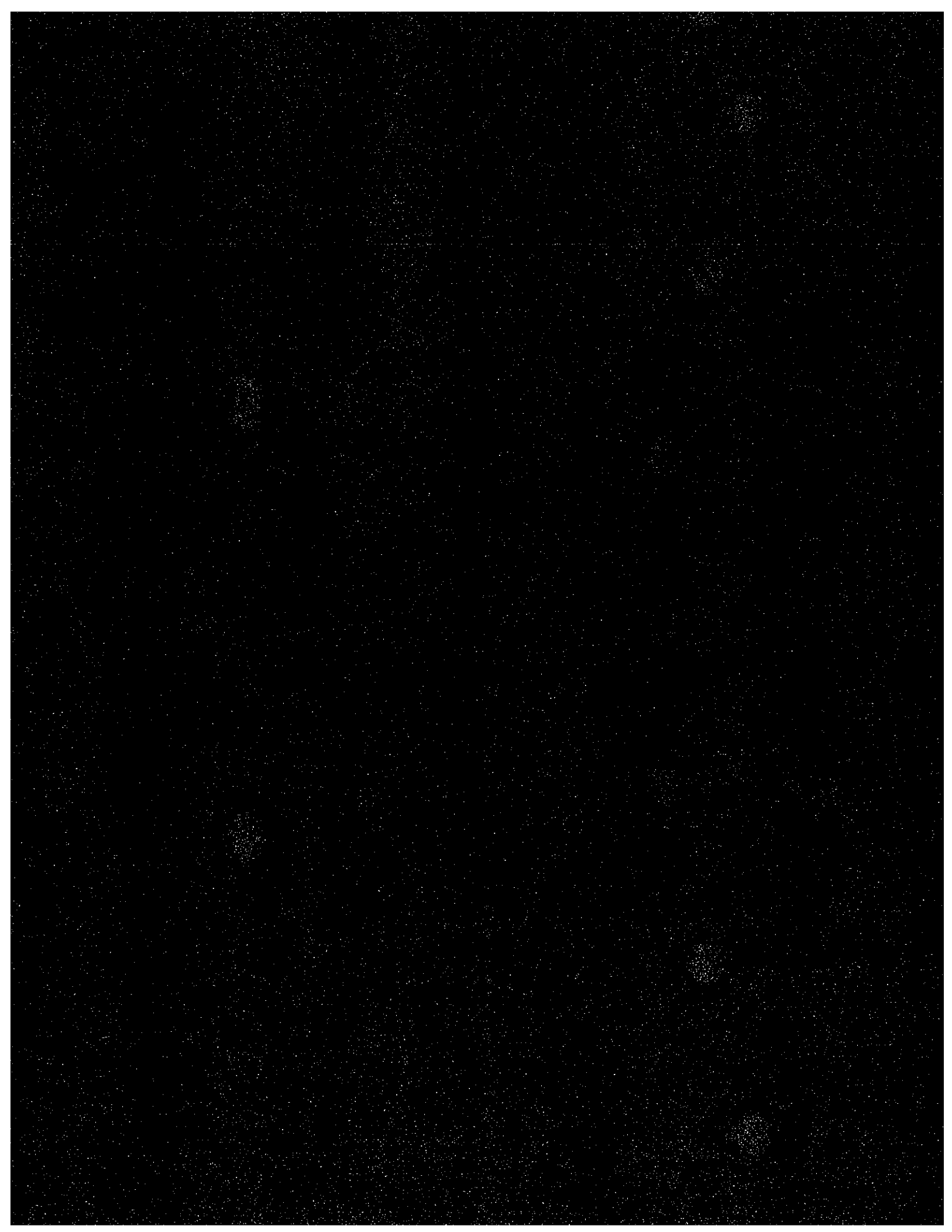
This Chapter contains only the troubleshooting symptom and solutions for the Matrix Plus II Configuration Program. Refer to the Overview Chapter for a list of system-wide symptoms and solutions.

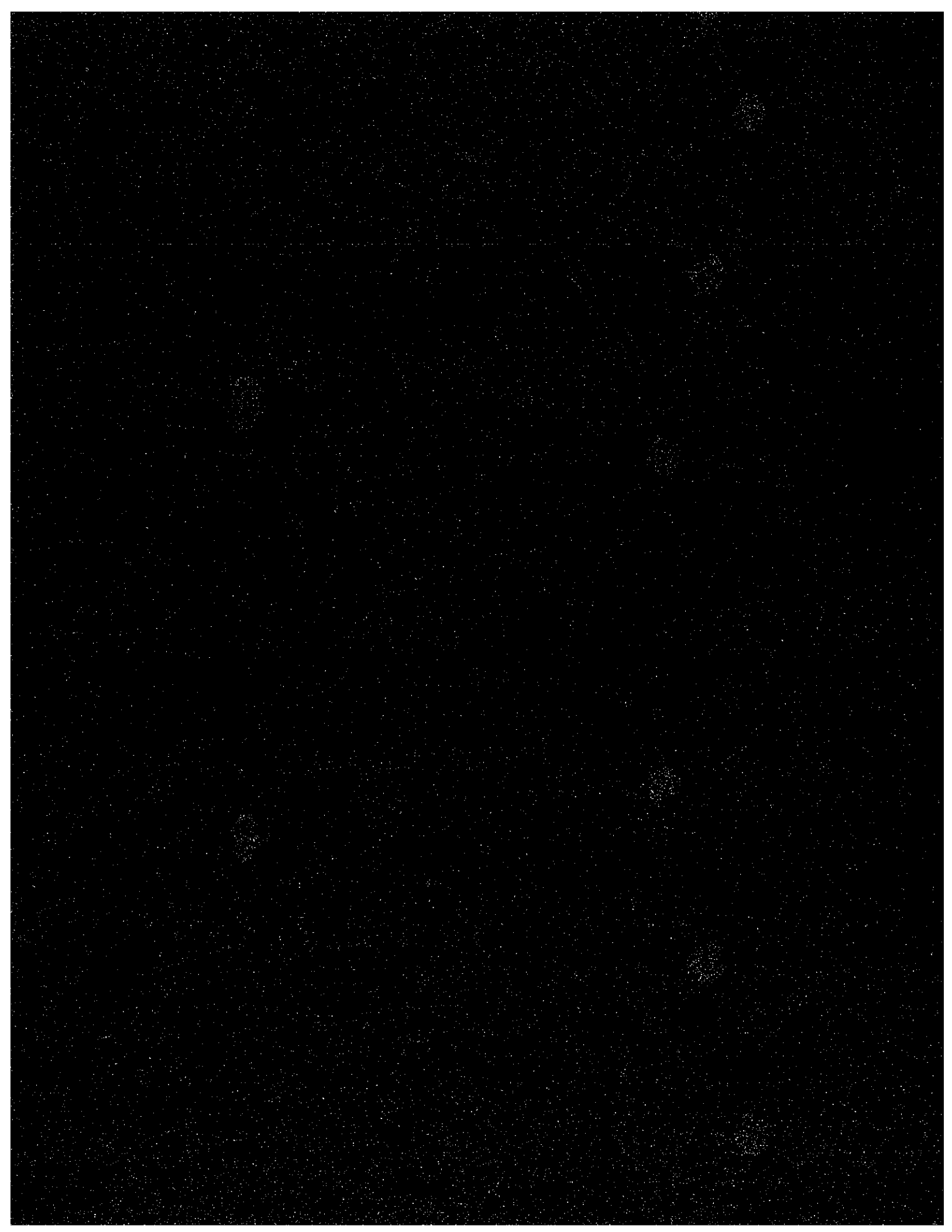
Troubleshooting

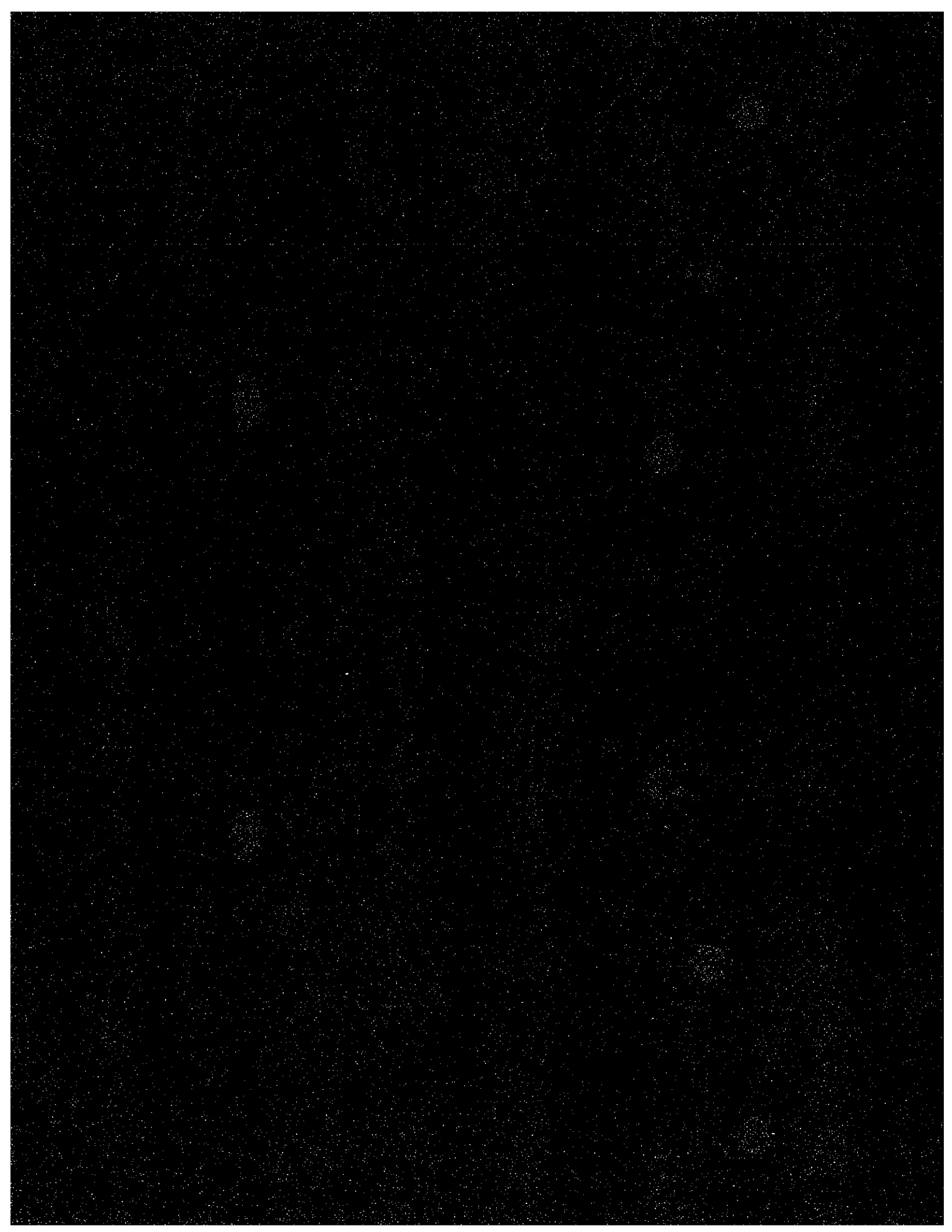
The following discussion addresses the most common problems that may occur with the computer that is attached to the matrix frame and provides several solutions for resolving the problem.

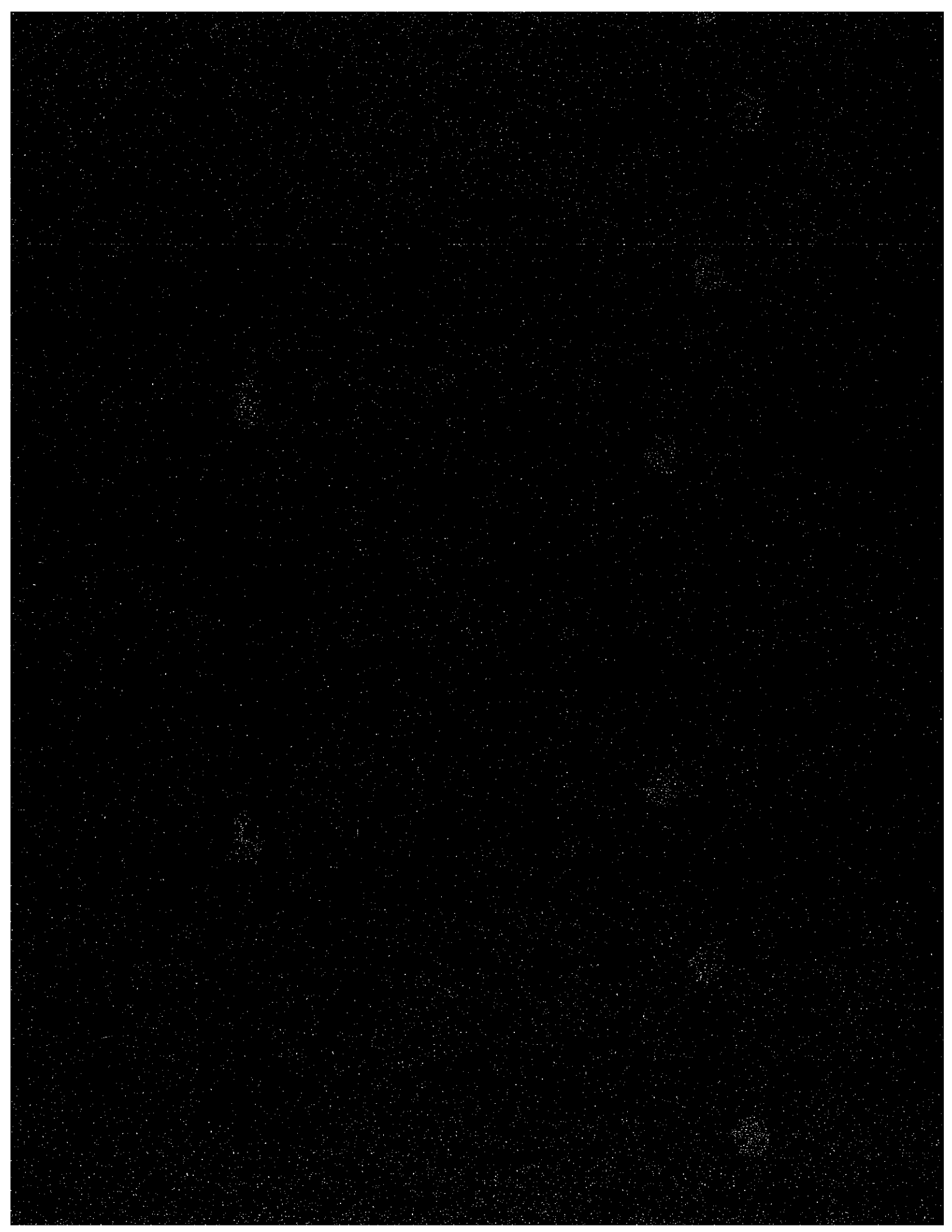
1. The computer used to run the configuration program is not able to receive configuration information from the CPU-100 Master CPU Controller Card in the matrix frame, or to send a configuration to the matrix.
 - Check that the serial port specified in the Computer Setup menu of the Configuration Program matches the port that the cable to the matrix frame is physically connected to. (COM1, COM2, etc.). Be sure that there is not a mouse attached to the port selected as this will confuse MXPLUS2. If this happens, reboot the computer and let the mouse driver reinstall itself.
 - Check the RS-232 cable that connects the computer to the matrix frame. Be sure that it is plugged in at both sides, and that its pinout corresponds to the diagrams shown in the Configuration Chapter in Volume II, Matrix Plus II Installation Manual.
 - Make sure that the PC is fast enough to support the baud rate selected?
 - Make sure that the RS-232 cable is not too long for the baud rate selected. 19.2 KBaud should not be sent more than 50 feet.
 - If interrupt mode has been selected in the Configuration Program, does the com port selected support interrupts? Try Polling Mode.
 - If interrupt mode has been selected, does the interrupts conflict with another DOS application? Try Polling Mode.
 - If the PC is not responding at all, try pressing ESC a few times and waiting a minute or so. If this does not help, you will have to reboot the computer by pressing the <Alt><Ctrl><Delete> keys simultaneously. Then restart the Configuration Program as described in the Configuration Chapter in Volume I, Matrix Plus II Operation Manual.
 - Try pressing the RESET button on the CPU-100 Master CPU Controller Card in the matrix frame.

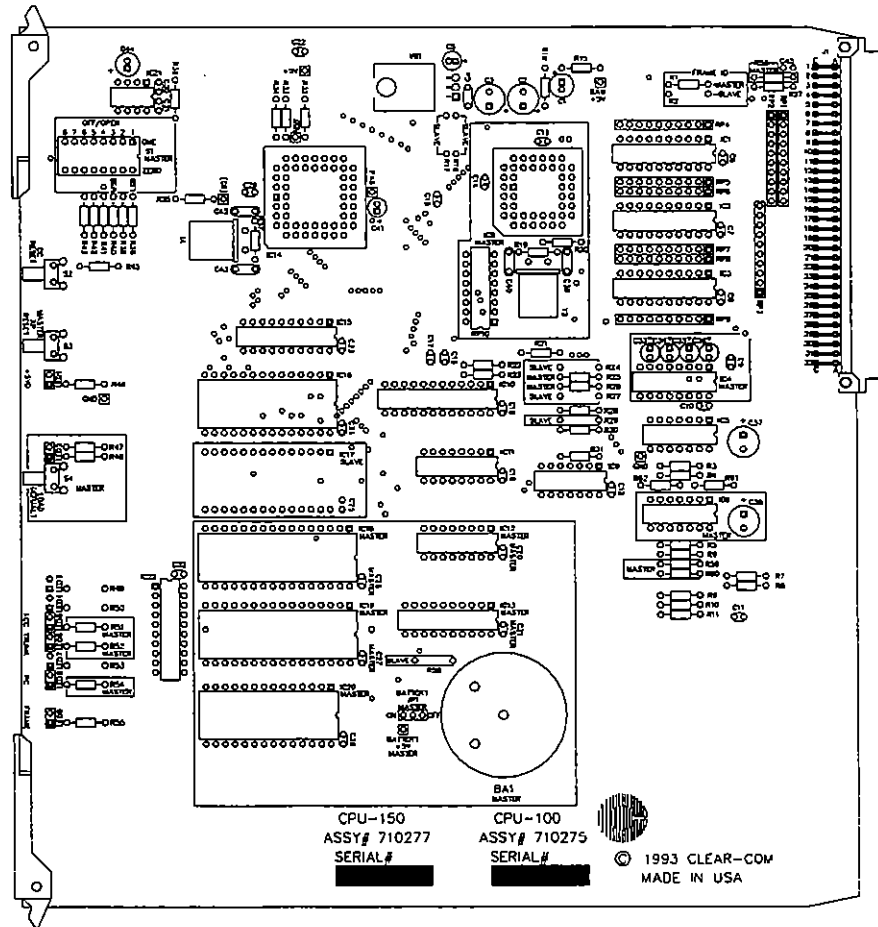
- Check that the computer and its serial port card are working correctly by exercising the port with some other device such as a printer.
2. MXPLUS2 acts erratically, popup menus fail to appear, or mxplus2 displays a message such as: "DOS was unable to provide enough memory to ..."
- This means that MXPLUS2 has run out of available DOS (640K) memory. MXPLUS2 requires at least 512K of free DOS memory. To determine the amount of free DOS memory on your PC, run the MEM command (DOS 5 and 6) or run CHKDSK (earlier DOS versions). (For detailed instructions see your DOS manual). If your system has a large number of ports and/or your PC is low on memory, you can avoid running out of memory by noting the following: MXPLUS2 uses a certain amount of memory for each field on the screen. Thus a screen that contains too many of fields can cause MXPLUS2 to run out of memory. Fields that are "out of sight" (but can be scrolled down to) are included in the field count. For example, checking all of the label check fields in the GLOBAL - ADVANCED screen creates hundreds of fields in even a moderately sized system.
3. MXPLUS2 runs very slowly.
- MXPLUS2 uses a dynamic overlay system which means that it must go out to the hard drive whenever it needs a piece of information that has not been recently accessed. However, MXPLUS2 will automatically detect and use "extended" or "expanded" memory if it is available on your PC. If operation from your hard drive is too slow, consider adding more memory. Alternatively, using a disk cache utility such as Microsoft Smartdrive helps also.
4. Colors are not correct or monochrome screen attributes are not correct.
- MXPLUS2 attempts to correctly determine the type of display your PC has. Sometimes it cannot. In these cases, you can override the setting by using the Display Type option in the MXPLUS2 - PC Setup screen











Matrix Plus II System **CPU-100**
MASTER FRAME CONTROLLER CARD

Introduction

This Section provides maintenance information, schematics, assembly drawings and component lists for the CPU-100 Master CPU Controller Card.

Maintenance information includes discussions about the card's battery backed memory, reset pushbuttons, the LOAD DEFAULT pushbutton, and LED indicators. This Section also describes the sequence that the CPU-100's microprocessor performs when sending configuration information to the crosspoint cards in the matrix frame after a reset.

The CPU-100 is the master controller card in the Matrix Plus II system. The CPU-100 manages the communication between matrix cards, stores system configurations, communicates with an external PC Computer to receive configurations from the Configuration Program, manages the LINK function between multiple matrixes, and controls certain interfaces directly.

Spare CPU-100 boards should be stored in electrically insulating packaging, for example heavy duty plastic bags or in an empty slot in the matrix frame.

Battery Backed Memory

The CPU-100 Master CPU Controller Card contains one lithium battery to provide back-up power for its processor's internal RAM memory. This RAM memory contains the complete operating configuration of the system and the Default configuration.

The lithium battery should be replaced every 5 years as a preventive maintenance measure. Disconnecting the battery causes the battery-backed RAM memory to lose any configuration information stored in it.

The battery should be disconnected for any service on the board including replacement of the battery. A pair of jumper pins located on the board, allow you to disconnect the battery. To disconnect the battery, remove the battery disconnect jumper and replace it on the other pair of pins on the header. The board will operate without the battery connected but all parameters of the operation will be lost on power down..

Caution

Lithium batteries may overheat and possibly explode if they are shorted. When you handle the loose battery or entire CPU-100 circuit board, never let the battery (or the circuits that it is connected to) touch external electrically conducting materials!

Reset Pushbuttons

The following paragraphs briefly describe the action of each of the two reset buttons. Pressing both reset buttons at once is equivalent to cycling the mains AC power to the matrix frame OFF and then ON.

For further information on when to use these reset controls, see the Overall Chapter of this Maintenance Manual.

Frame Controller Reset

The upper reset pushbutton (labeled "CC Reset Switch" on the CPU-100 card) resets only the CPU-100 Master CPU Controller card. Resetting the CPU controller causes it to discontinue its current activity and restart its internal program as if power were first applied to it. The Matrix Plus II System will then require about half a minute before operation is fully restored. During this time (or any other time that the CPU-100 card is unplugged or inoperative), all existing talk and listen paths will continue to function, and new talk paths can be activated. However, listen paths cannot be activated.

After the CPU-100 card is reset, it must restart its internal program and then send configuration information to all of the crosspoint cards in the system. If a Matrix Card has a legitimate configuration, the CPU-100 will load that configuration back and use it. If the Matrix Card does not have a legitimate configuration the CPU-100 will initialize that Matrix card from the battery backed configuration on the Controller Card. This design allows the CPU-100 Master CPU Controller Card to be "hot patched", which means plugged in and out of the matrix frame while the system is running without disturbing talk or listen paths in the system.

Crosspoint Card Master Reset

The lower pushbutton (labeled "Master XP Reset" on the CPU-100 card) sends a "reset" command to all of the crosspoint cards in the frame (both frames in a two frame system). This has the effect of pressing each crosspoint card's reset pushbutton. Resetting a crosspoint card also sends a new configuration to any stations connected to it.

This process takes several seconds per crosspoint card, and disconnects all existing talk paths from both of the ports on each crosspoint card. These talk paths are not reestablished once the crosspoint cards are reinitialized.

CPU-100

Load Default Pushbutton

The LOAD DEFAULT pushbutton is used to move the Default configuration stored in memory to the Current operating configuration. The following discussion is a description of Default Configuration and how to use the LOAD DEFAULT Pushbutton.

The Default configuration is a second operating configuration saved in memory. The Default configuration portion of memory can only be written to by commands from the Configuration Computer. The Configuration computer can perform the following functions on the Default configuration memory:

- Download from the Configuration Computer to the Default configuration.
- Upload from the Default configuration to the Configuration Computer.
- Load the Default into the Current configuration.
- Load the Current into the Default configuration.

To load the Default into the Current, at the CPU-100 board, press and hold the LOAD DEFAULT pushbutton for more than 5 seconds. The red LED above the pushbutton will flash for about 5 seconds then it will turn on solid indicating that the load default command has been accepted and the process has started. The LOAD DEFAULT LED will remain on as long as the Current and Default memory sections are identical. Any change to the Current configuration will cause the led to go off.

If the LOAD DEFAULT Pushbutton is held while the CPU RESET is pressed, the Default configuration will be loaded immediately into the Current configuration. In this case, the LOAD DEFAULT pushbutton is not read until after the RAM test is conducted on the CPU board. The RAM test is indicated by all of the led coming on for a short period. The LOAD DEFAULT pushbutton must be held until the RAM memory test is over.

CPU-100

LED Indicators

A series of nine LED indicators on the edge of the CPU-100 Master CPU Controller Card indicate system status as shown in Figure M1-1. The paragraphs following Figure M1-1 describe the function of each LED indicator.

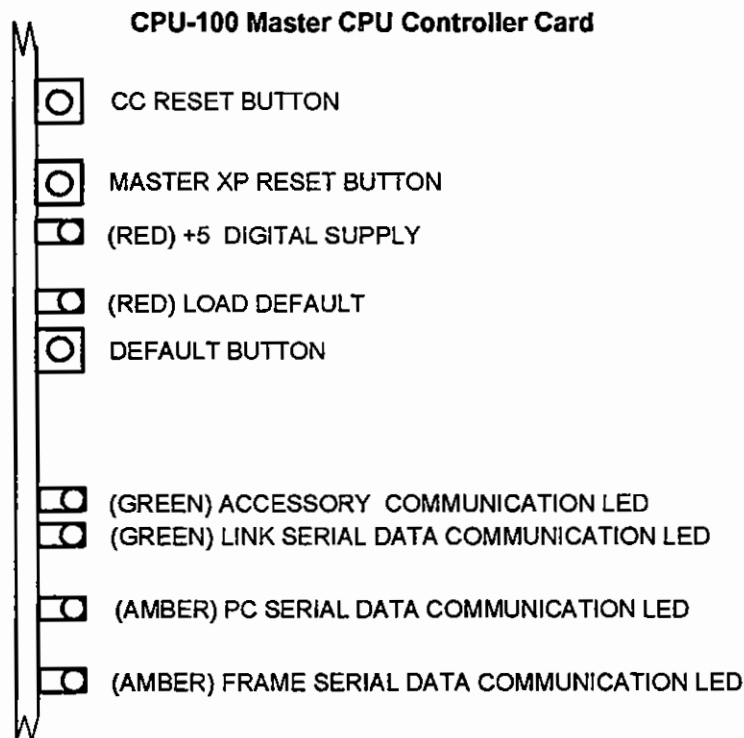


FIGURE M1-1. CPU-100 Master CPU Controller Card LED Indicators

- **+5 VDC (red)**. When lit indicates that +5 Volt DC power is supplied to the CPU-100 Card.
- **LOAD DEFAULT (red)**. Refer to the section in this chapter on the LOAD DEFAULT Pushbutton.
- **ACC SERIAL DATA COMMUNICATION (green)**. When lit indicates that the CPU-100 is in progress of an actual data transmission to the Accessory Port (RLY-8).
- **TRUNK SERIAL DATA COMMUNICATION (green)**. When lit indicates that the CPU-100 is in progress of actual communication to another Matrix frame for LINKING purposes. In actual use this led will flicker occasionally.
- **PC SERIAL DATA COMMUNICATION (amber)**. When lit indicates the Configuration Program is actively sending/receiving configuration information to/from the matrix frame.
- **FRAME SERIAL DATA COMMUNICATION (amber)**. When lit indicates that communication between the CPU-100 Card and one of the crosspoint Cards is actively in progress. In normal use this LED Indicator flickers at least once every three seconds.

CPU-100

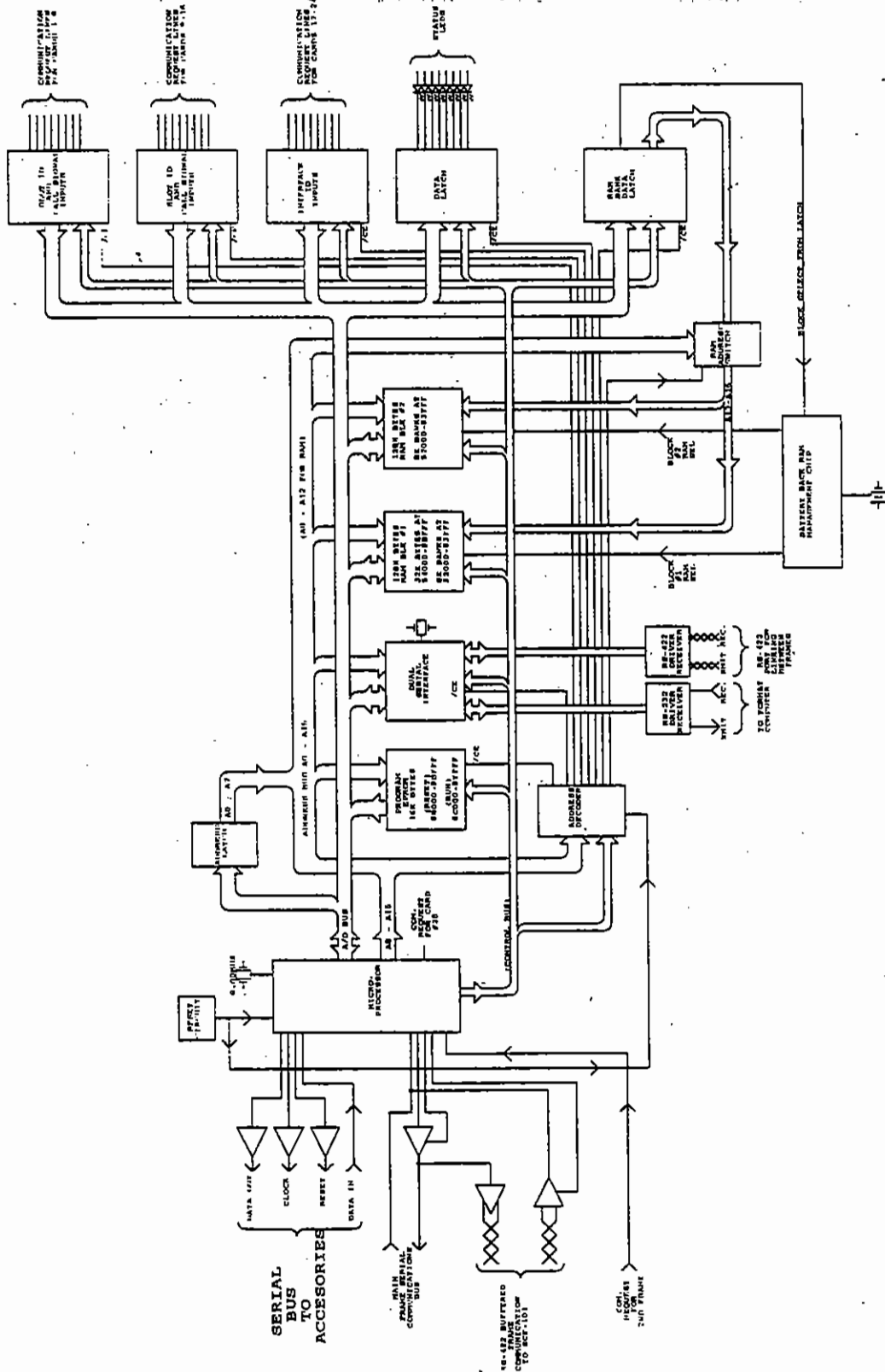
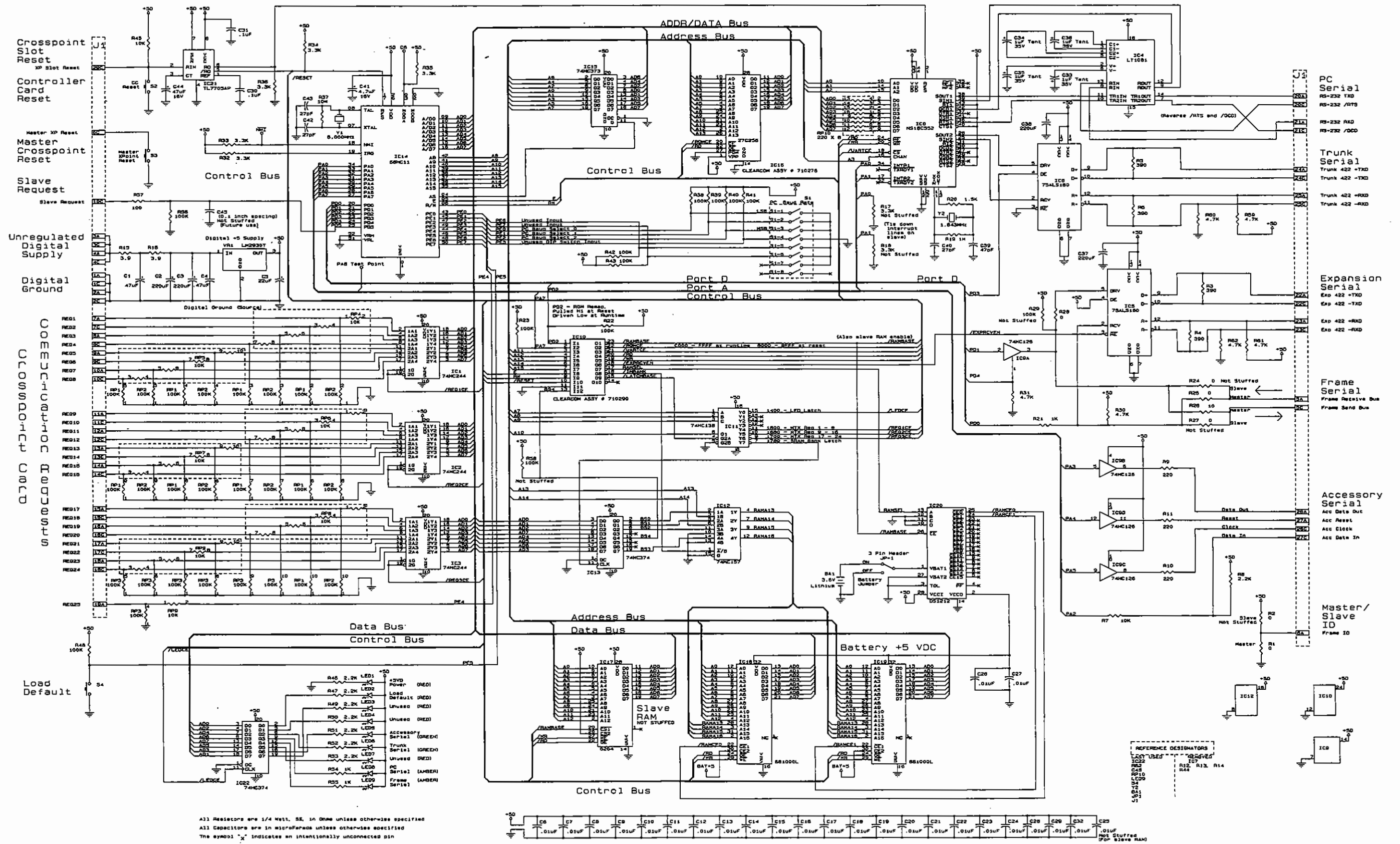


FIGURE M1-2 Digital Block Diagram - CPU-100



All Resistors are 1/4 Watt, 5%, in Ohms unless otherwise specified
 All Capacitors are in microFarads unless otherwise specified
 The symbol "x" indicates an intentionally unconnected pin

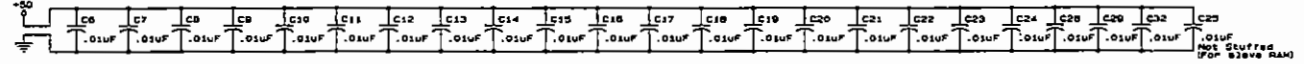


FIGURE M1-3 Schematic - CPU-100 PCB Rev. A

CPU-100

CPU-100

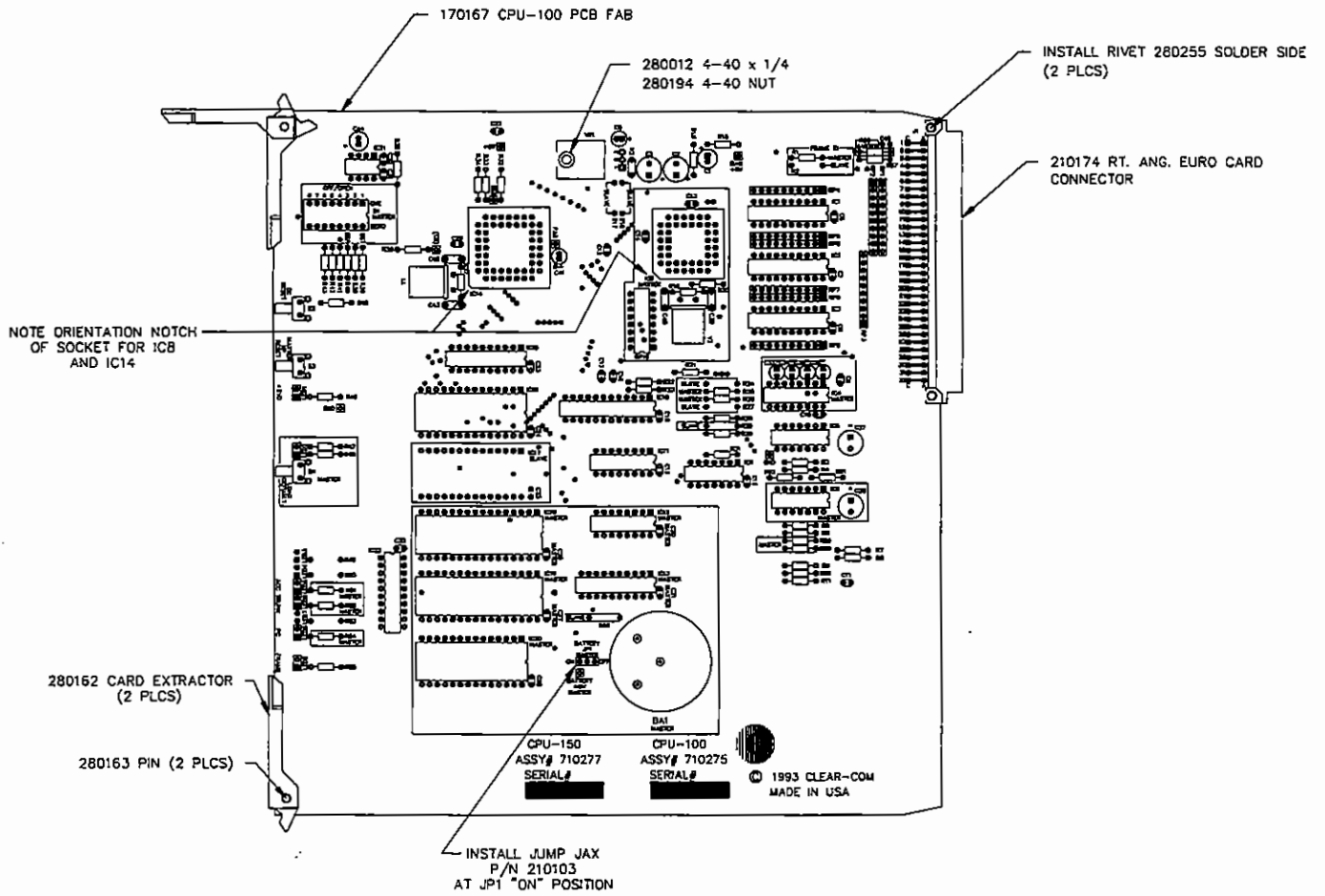


FIGURE M1-4 Assembly Drawing - CPU-100 PCB Rev. C

Bill of Materials for the CPU-100 PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
27 pF	Ceramic Disc	50V	5%	150071	C40 C42 C43
47 pF	Ceramic Disc	50V	10%	150041	C39
0.01 uF	Monolithic	50V	20%	150109	C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C26 C27 C28 C29 C32
0.1 uF	Monolithic	50V	10%	150035	C30 C31
0.47 uF	Monolithic	50V		150043	C4
1 uF	Tantalum	35V	20%	150116	C33 C34 C35 C36
4.7 uF	Aluminum	16V	10%	150141	C41
22 uF	Aluminum	16V	20%	150142	C5
47 uF	Aluminum	16V	20%	150143	C1 C44
220 uF	Aluminum	16V	20%	150146	C2 C3 C37 C38

CPU-100

Resistors & Resistor Packs

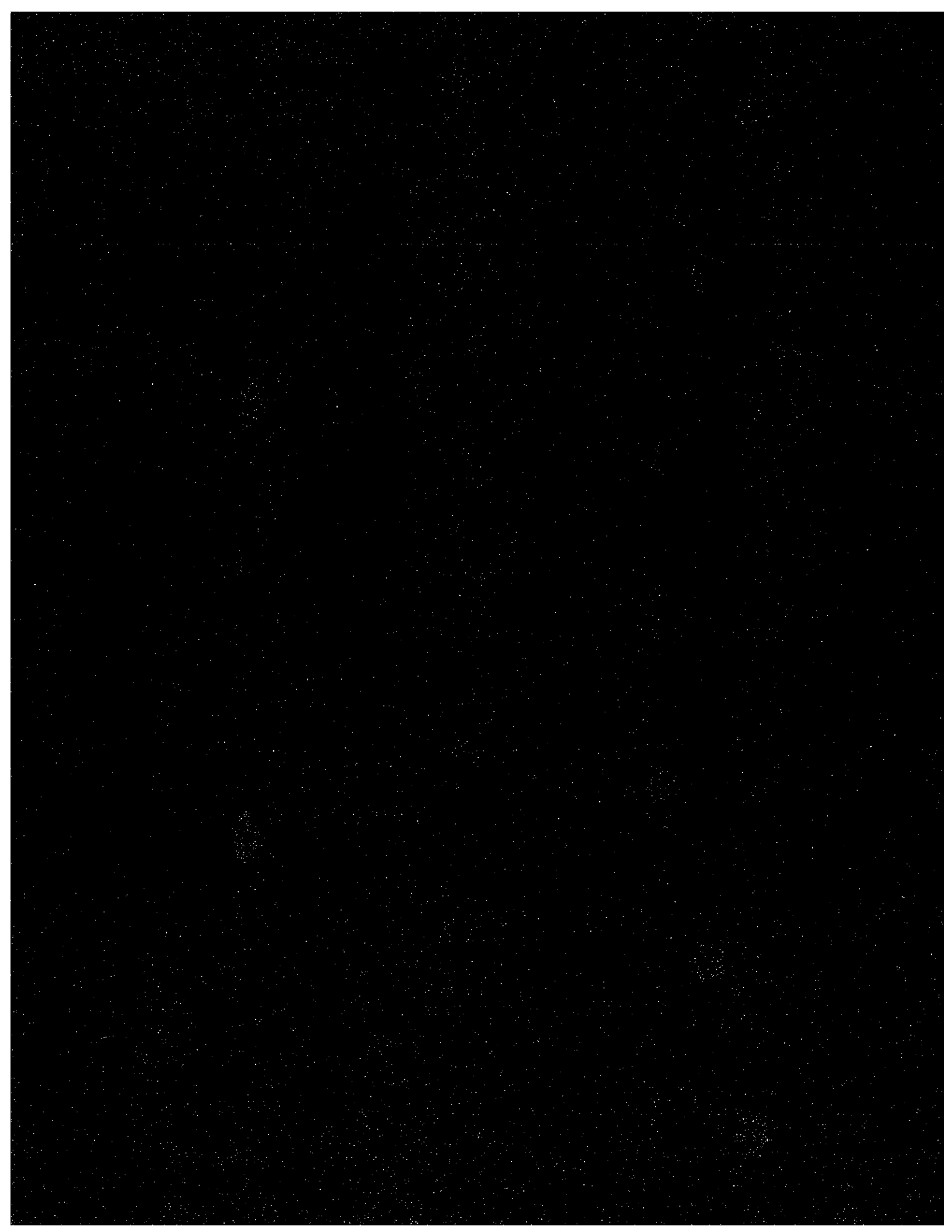
Value	Power	Type	Tol.	Part #	Designator
3.9 OHM	1/4	Carbon Film	5%	410001	R15 R16
10 OHM	1/4	Carbon Film	5%	410002	R26
100 OHM	1/4	Carbon Film	5%	410071	R57
220 OHM		R-Pack		415004	RP10
220 OHM	1/4	Carbon Film	5%	410007	R9 R10 R11
390 OHM	1/4	Carbon Film	5%	410005	R3 R4 R5 R6
1K OHM	1/4	Carbon Film	5%	410010	R21 R54 R55
1.5K OHM	1/4	Carbon Film	5%	410055	R20
2.2K OHM	1/4	Carbon Film	5%	410011	R8 R46 R47 R51 R52
3.3K OHM	1/4	Carbon Film	5%	410015	R32 R33 R34 R35 R36
4.7K OHM	1/4	Carbon Film	5%	410013	R30 R31 R59 R60 R61 R62
10K OHM		R-Pack		415003	RP4 RP5 RP6 RP7 RP8 RP9
10K OHM	1/4	Carbon Film	5%	410016	R7 R45
100K OHM		R-Pack		415002	RP1 RP2 RP3
100K OHM	1/4	Carbon Film	5%	410024	R22 R23 R29 R38 R39 R40 R41 R42 R43 R48 R56
1M OHM	1/4	Carbon Film	5%	410058	R19
10M OHM	1/4	Carbon Film	5%	410059	R37

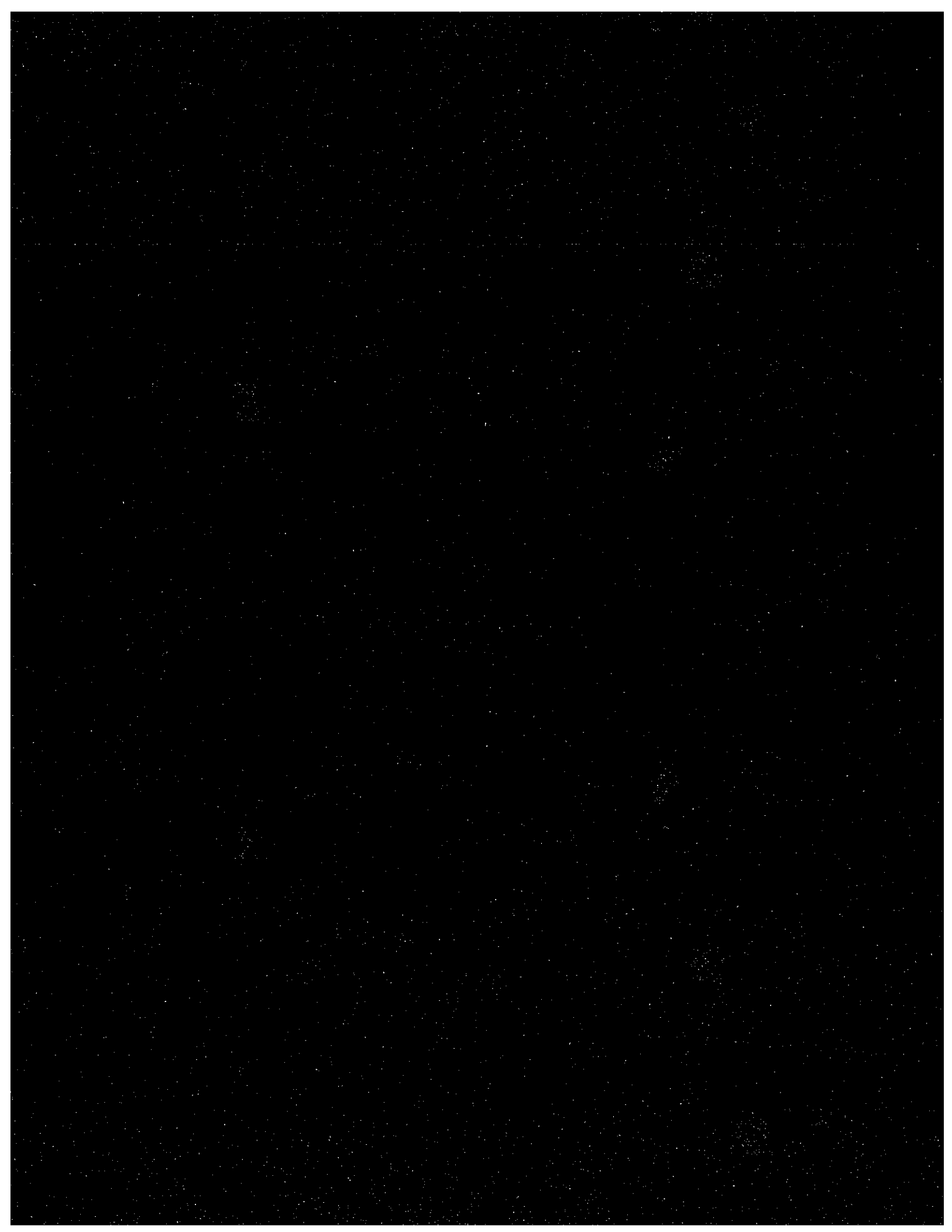
Bill of Materials for the CPU-100 PCB ----- cont.**Integrated Circuits**

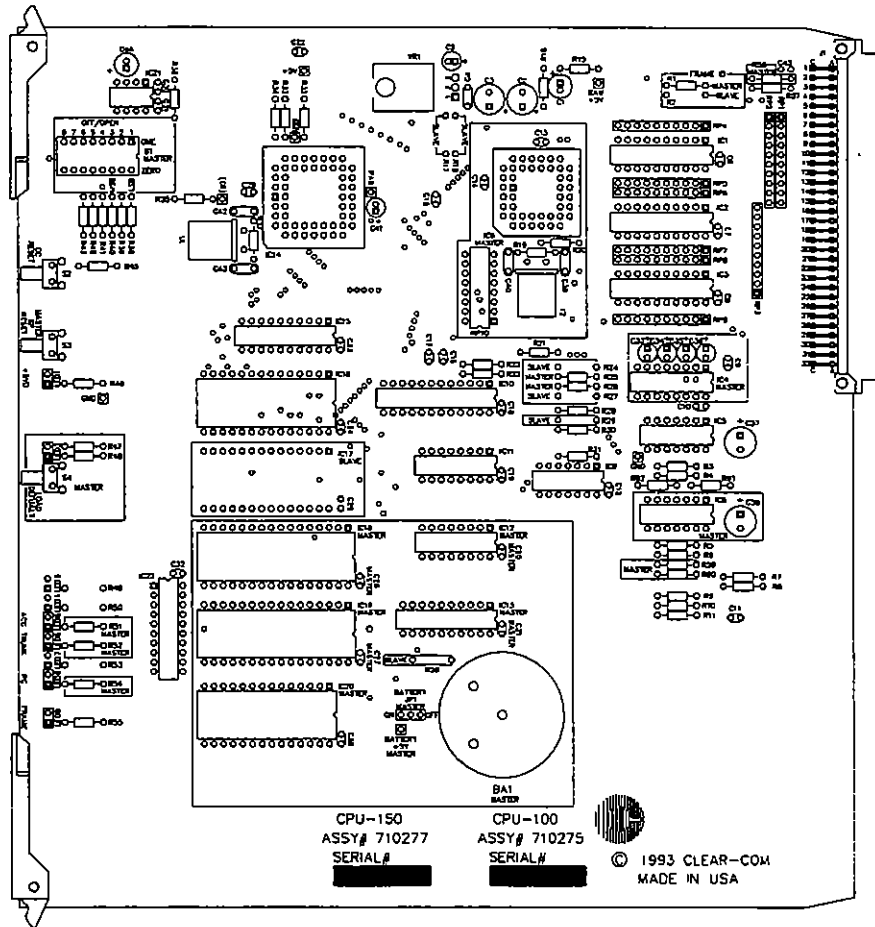
Device	Description	Part #	Designator
Digital IC	TL7705AP RESET CCT	480134	IC21
Interface Chip	1081 RS232 DRIVER	480126	IC4
Interface Chip	75ALS180 RS-422 DRIVER	480187	IC5 IC6
Interface Chip	NS16C552 CMOS DUAL UART	480188	IC8
Logic Chip	74HC126 QUAD BUFFER	480180	IC9
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC11
Logic Chip	74HC157 QUAD 2-INPUT MUX	480192	IC12
Logic Chip	74HC244 CMOS OCTAL BUFFER	480141	IC1 IC2 IC3
Logic Chip	74HC373 CMOS OCTAL D LATCH	480142	IC15
Logic Chip	74HC374 CMOS OCTAL D FF	480143	IC13 IC22
Microprocessor	68HC11AOFN CMOS MCU	480132	IC14
RAM Memory	681000-L10 CMOS SRAM 128K X8	480193	IC18 IC19
Digital IC	DS1212 CMOS NVRAM CONT.	480124	IC20
Regulator	LM2930T POS 5V REG TO220	480153	VR1

Miscellaneous

Device	Description	Part #	Designator
Battery	LITHIUM WAFER CELL #TL-5134	400006	BA1
Connector	EURO CARD RT ANG CONN	210174	J1
Crystal	1.843MHZ PARALLEL	230002	Y2
Crystal	8.000MHz PARALLEL	230003	Y1
EPROM	CPU-100 MASTER CARD PROG	710276	IC16
LED	T1 RT ANG 5mA AMBER LED	390029	LED8 LED9
LED	T1 RT ANG 5mA GREEN LED	390028	LED5 LED6
LED	T1 RT ANG 5mA RED LED	390027	LED1 LED2
Logic IC	CPU-100 PROGRAMMED GAL	710290	IC10
Switch	8 POS DIP SWITCH #76SB08	510078	S1
Switch	PUSHBUTTON SPST PC MOUNT	510099	S2 S3 S4







Matrix Plus II System **CPU-150**
SLAVE FRAME CONTROLLER CARD

Introduction

This Section provides troubleshooting information, schematics, assembly drawings and component lists for the CPU-150 Slave CPU Controller Card.

The CPU-150 Slave CPU Controller Card is only used in applications that have 51 or more audio ports (up to the maximum of 100 audio ports) installed in the system.

The CPU-150 is the controller card for the second frame in a two frame Matrix Plus II system. The CPU-150 only gathers communication requests from matrix cards in the second frame and passes those request on to the CPU-100 in the first frame. The CPU-150 is constructed from the same raw PCB as the CPU-100 except that many parts are left off and a different program is used.

Spare CPU-150 boards should be stored in electrically insulating packaging, for example heavy duty plastic bags or in an empty slot in a frame.

CPU-150

Troubleshooting

Troubleshooting information includes descriptions of the card's reset pushbuttons and LED indicators.

Reset Pushbuttons

The following paragraphs briefly describe the action of each of the two reset buttons. For further information on when to use these reset controls, see the Overall Chapter of this Maintenance Manual.

Frame Controller Reset

The upper reset pushbutton (labeled "CC Reset Switch" on the CPU-150 card) resets only the CPU-150 Slave CPU Controller card. Resetting the Slave CPU controller has very little effect on system operation. Being that the CPU-150 is only gathering communication requests from matrix cards in the second frame, restarting that microprocessor is very short and does not affect the system. Resetting of the CPU-150 will only be needed on rare occasions. Reset the CPU-150 only if communication in the second frame is in suspect.

Crosspoint Card Master Reset

The lower pushbutton (labeled "Master XP Reset" on the CPU-150 card) sends a "reset" command to all of the crosspoint cards in the frame. This has the effect of pressing each crosspoint card's reset pushbutton in both frames. Resetting a crosspoint card also sends a new configuration to any stations connected to it.

LED Indicators

The LED indicators on the edge of the CPU-150 Slave CPU Controller Card indicate system status as shown in Figure M2-1. The paragraphs following Figure M2-1 describe the function of each LED indicator.

CPU-150

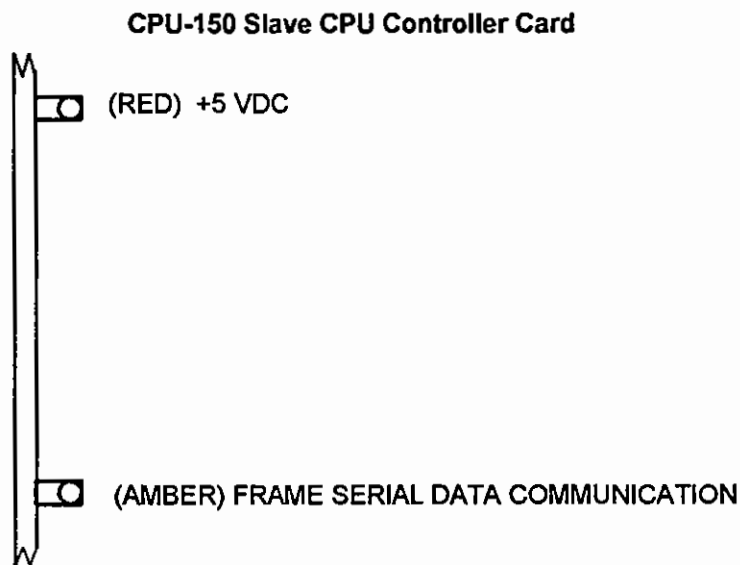


FIGURE M2-1. CPU-150 Slave CPU Controller Card LED Indicators

- **+5 VDC (red).** When lit indicates that +5 Volt DC power is supplied to the CPU-150 Card.
- **FRAME SERIAL DATA COMMUNICATION (amber).** When lit indicates that communication between the CPU-150 Card and the CPU-100 Master CPU Controller Card is actively in progress. In normal use this LED Indicator flickers at least once every three seconds.

CPU-150

CPU-150

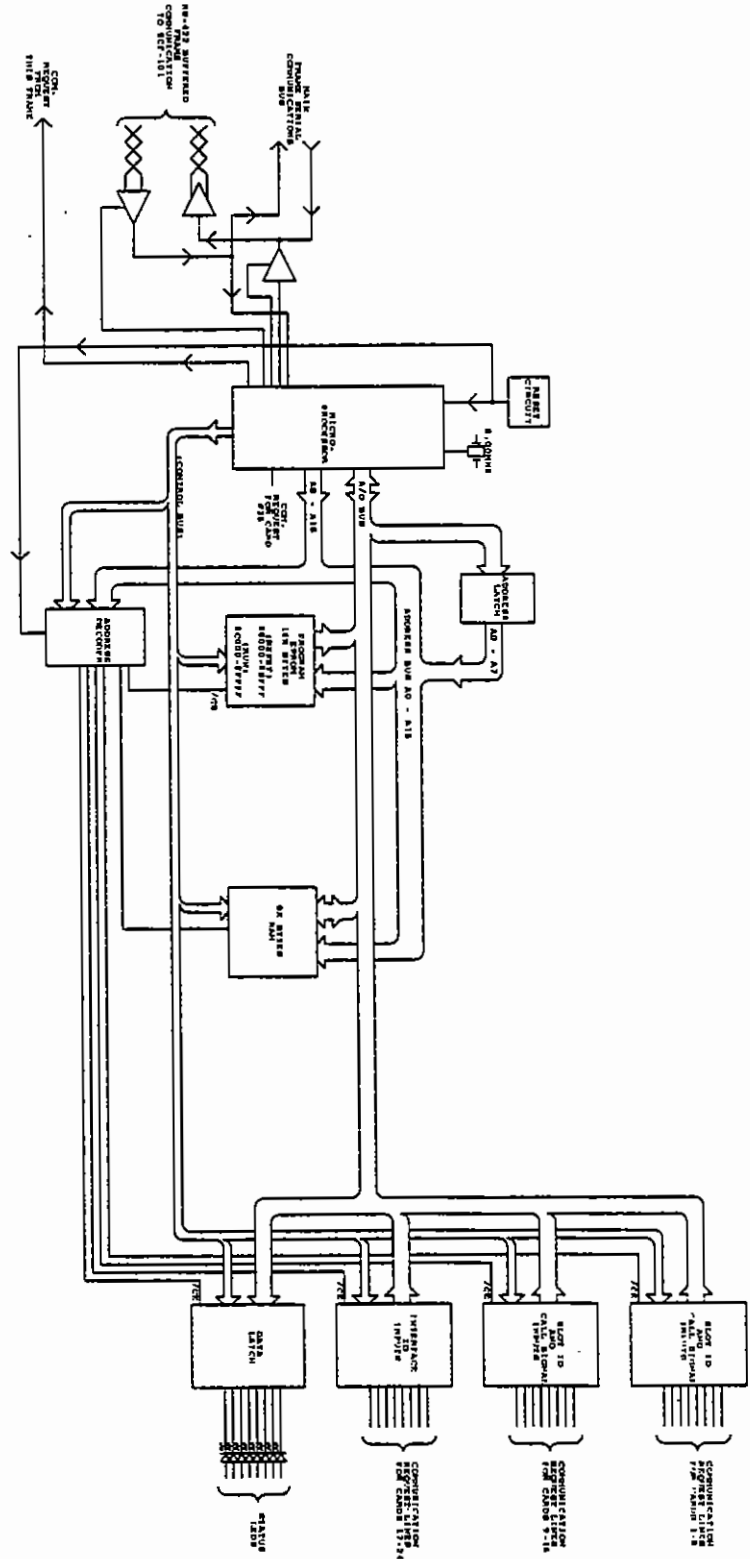


FIGURE M2-2 Block Diagram - CPU-150

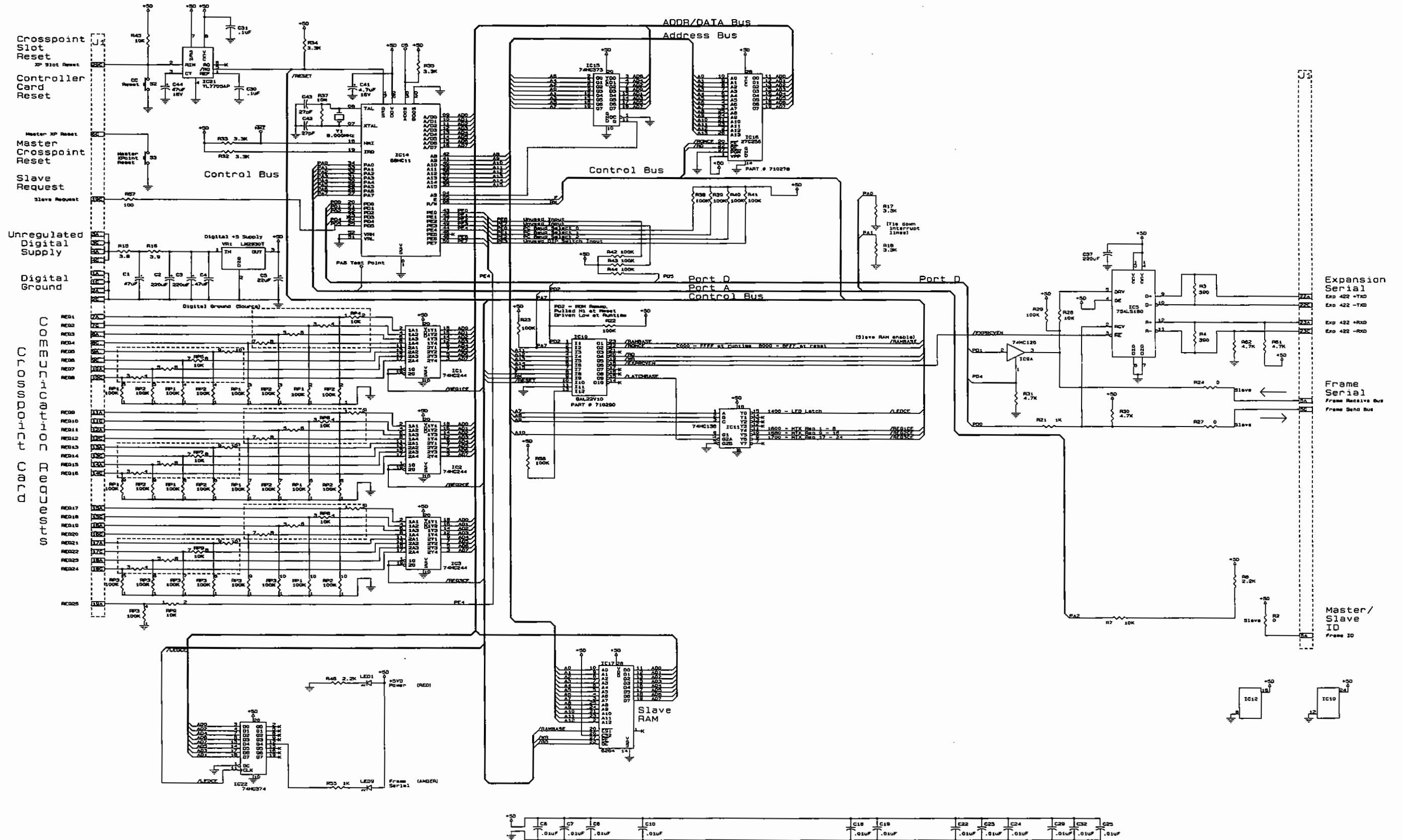


FIGURE M2-3 Schematic - CPU-150 PCB Rev. A

CPU-150

CPU-150

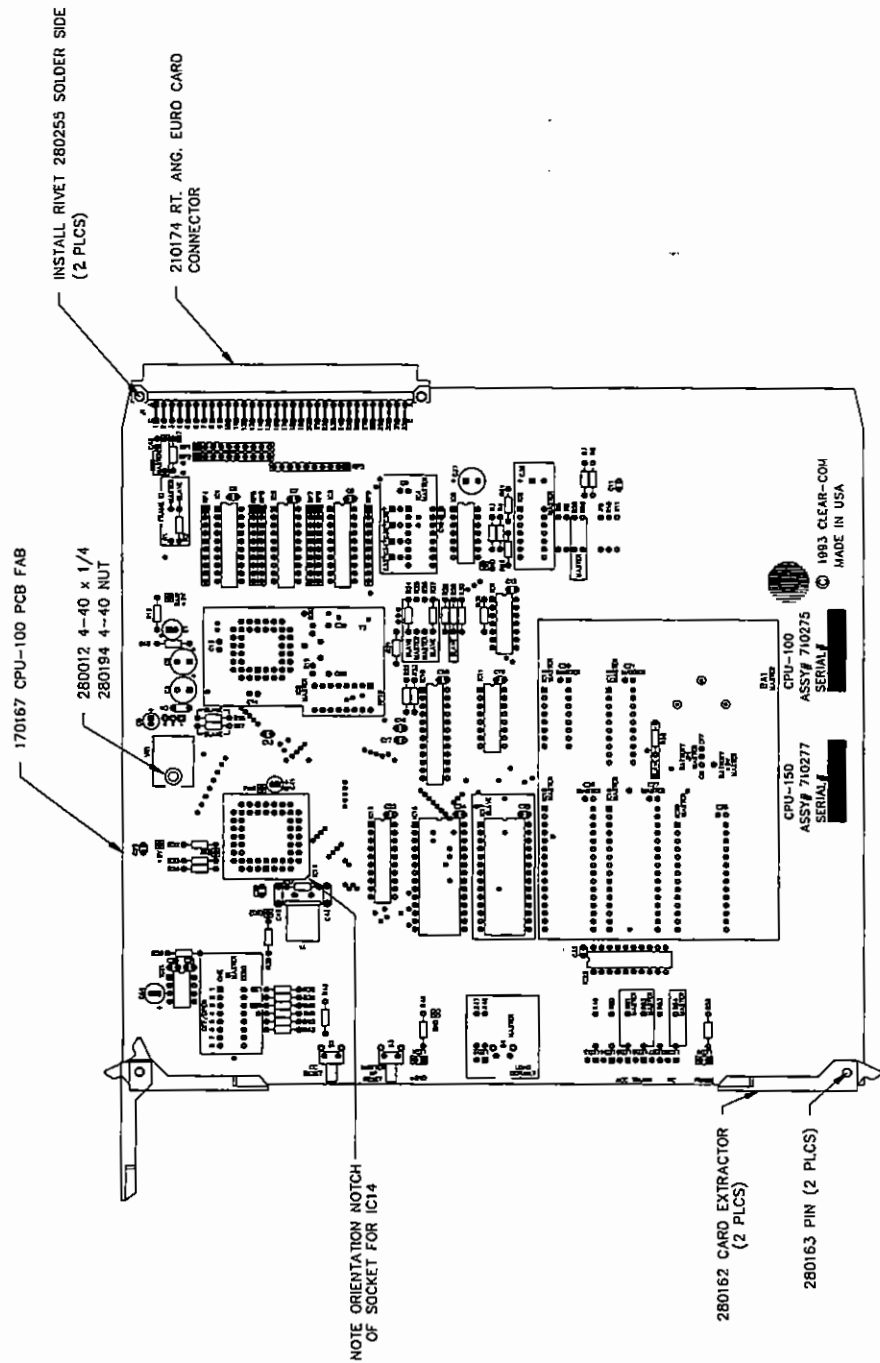


FIGURE M2-4 Assembly Drawing - CPU-150 PCB Rev. C

Bill of Materials for the CPU-150 PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
27 pF	Ceramic Disc	50V	5%	150071	C42 C43
0.01 uF	Monolithic	50V	20%	150109	C6 C7 C8 C10 C12 C18 C19 C22 C23 C24 C25 C29 C32
0.1 uF	Monolithic	50V	10%	150035	C30 C31
0.47 uF	Monolithic	50V		150043	C4
4.7 uF	Aluminum	16V	10%	150141	C41
22 uF	Aluminum	16V	20%	150142	C5
47 uF	Aluminum	16V	20%	150143	C1 C44
220 uF	Aluminum	16V	20%	150146	C2 C3 C37

Resistors & Resistor Packs

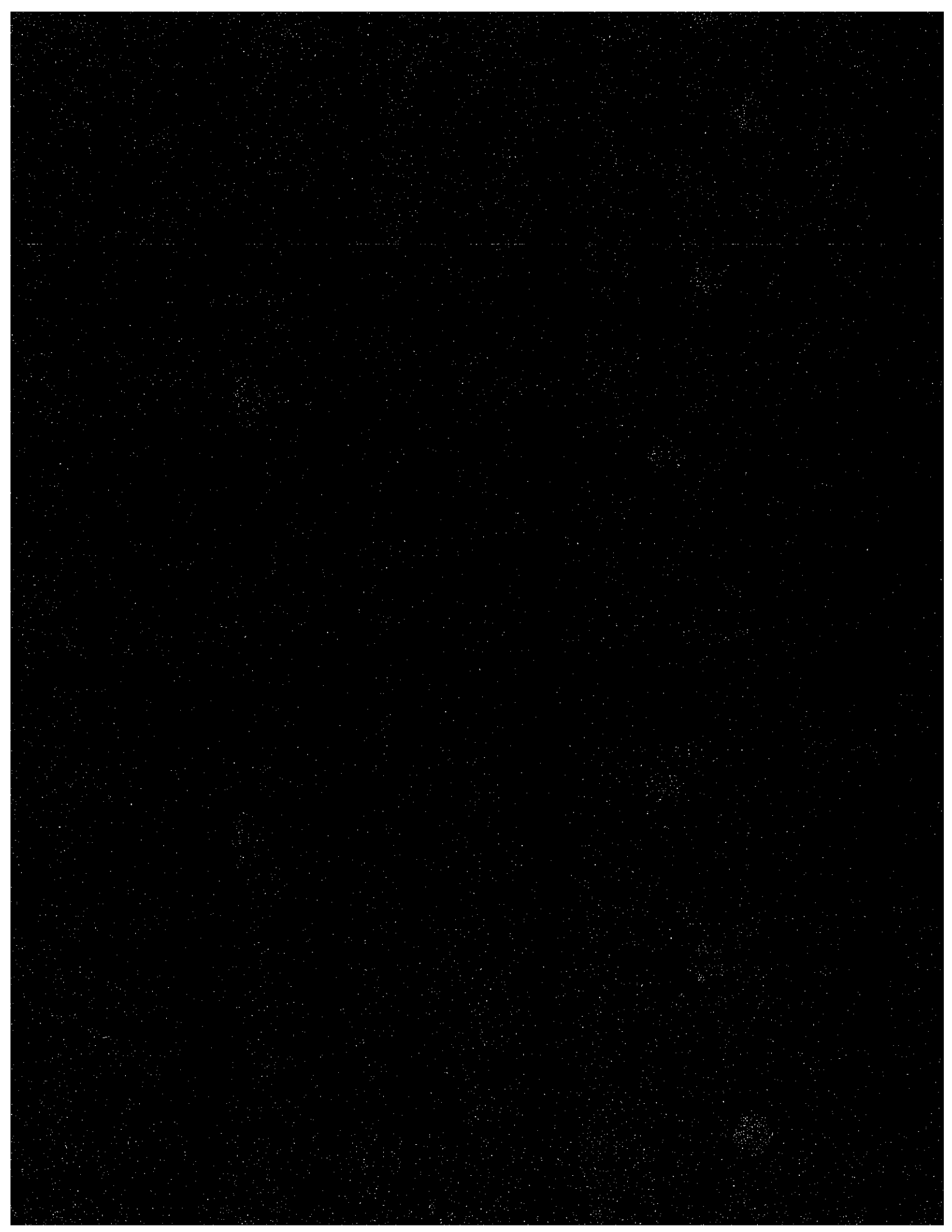
Value	Power	Type	Tol.	Part #	Designator
3.9 OHM	1/4	Carbon Film	5%	410001	R15 R16
100 OHM	1/4	Carbon Film	5%	410071	R57
390 OHM	1/4	Carbon Film	5%	410005	R3 R4
1K OHM	1/4	Carbon Film	5%	410010	R21 R55
2.2K OHM	1/4	Carbon Film	5%	410011	R8 R46
3.3K OHM	1/4	Carbon Film	5%	410015	R17 R18 R32 R33 R34 R35
4.7K OHM	1/4	Carbon Film	5%	410013	R30 R31
10K OHM		R-PACK		415003	RP4 RP5 RP6 RP7 RP8 RP9
10K OHM	1/4	Carbon Film	5%	410016	R7 R28 R45
100K OHM		R-PACK		415002	RP1 RP2 RP3
100K OHM	1/4	Carbon Film	5%	410024	R22 R23 R29 R38 R39 R40 R41 R42 R43 R58
10M OHM	1/4	Carbon Film	5%	410059	R37

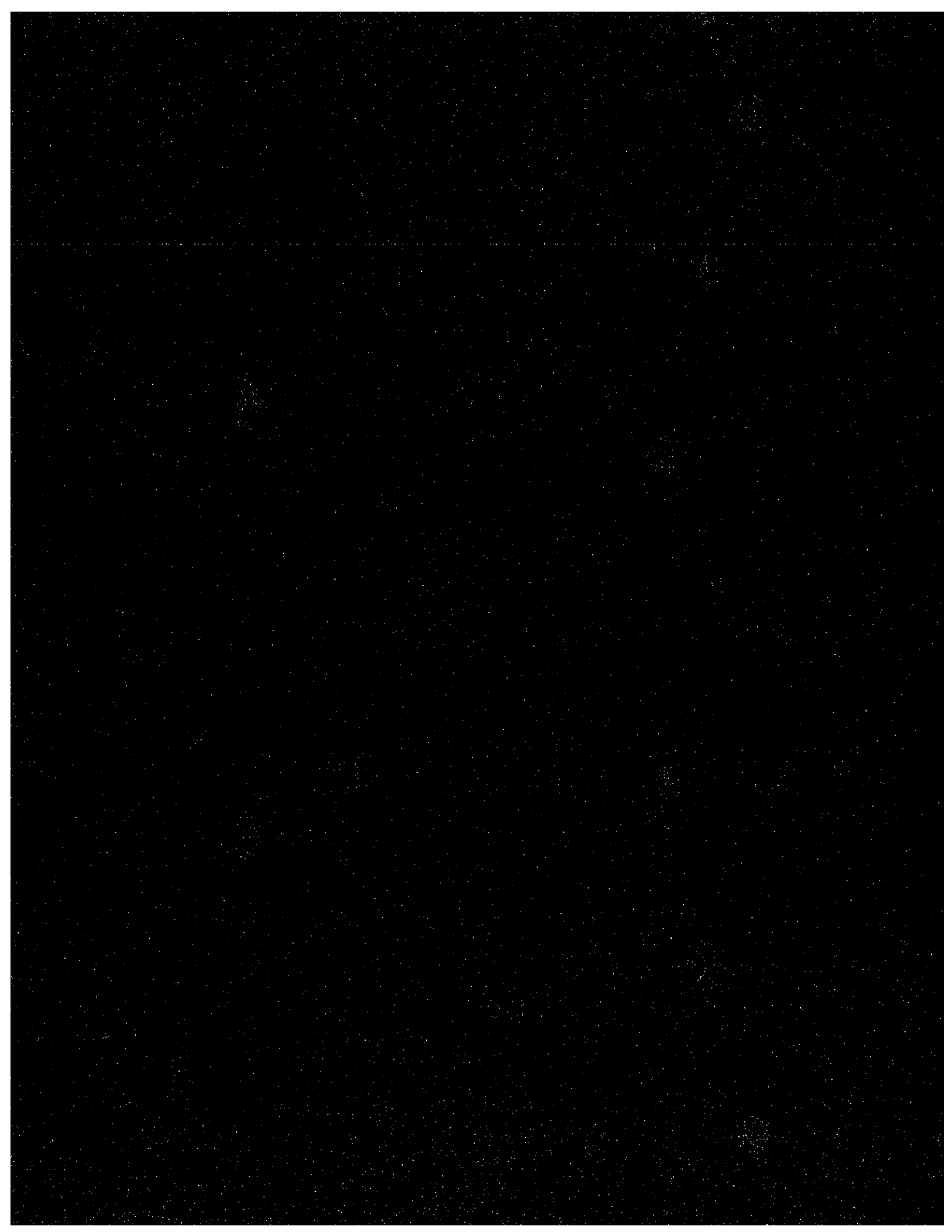
Bill of Materials for the CPU-150 PCB ----- cont.**Integrated Circuits**

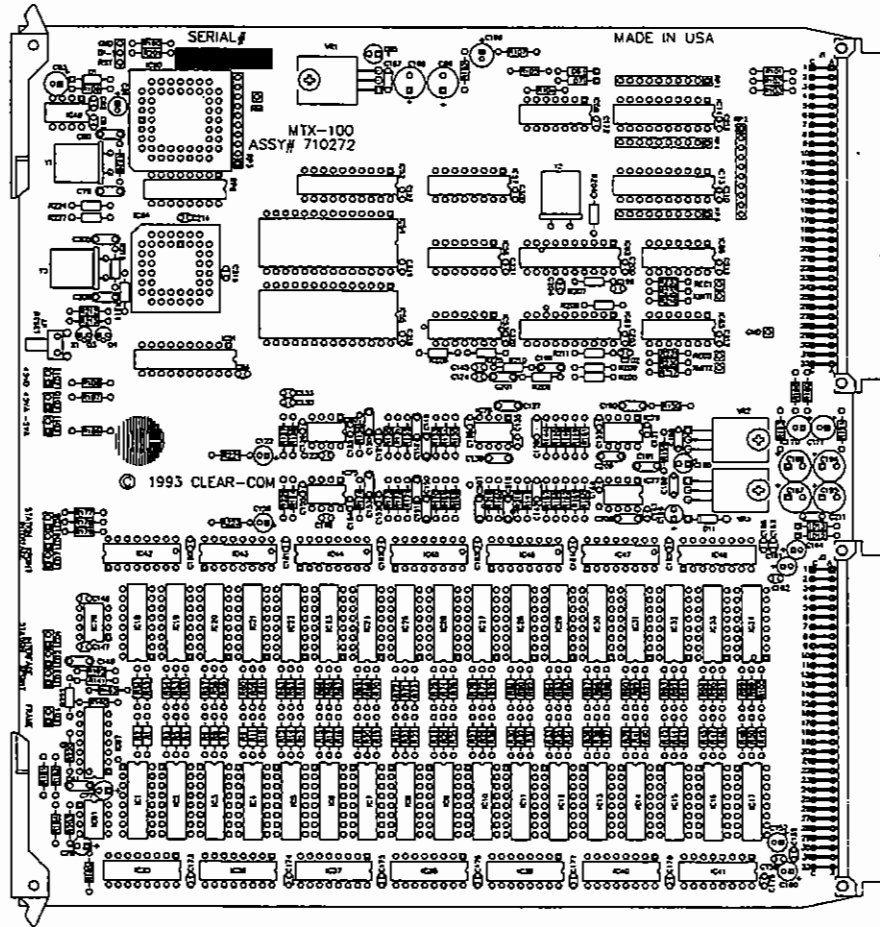
Device	Description	Part #	Designator
Digital IC	TL7705AP RESET CCT	480134	IC21
Interface Chip	75ALS180 RS-422 DRIVER	480187	IC5
Logic Chip	74HC126 QUAD BUFFER	480180	IC9
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC11
Logic Chip	74HC244 CMOS OCTAL BUFFER	480141	IC1 IC2 IC3
Logic Chip	74HC373 CMOS OCTAL D LATCH	480142	IC15
Logic Chip	74HC374 CMOS OCTAL D FF	480143	IC22
Microprocessor	68HC11AOFN CMOS MCU	480132	IC14
RAM Memory	6264 CMOS 8K X 8 STATIC	480117	IC17
Regulator	LM2930T POS 5V REG TO220	480153	VR1

Miscellaneous

Device	Description	Part #	Designator
Logic IC	CPU-100 PROGRAMMED GAL	710290	IC10 IC10
EPROM	CPU-150 SLAVE CARD PROG	710278	IC16
Connector	EURO CARD RT ANG	210174	J1
Switch	PUSHBUTTON SWITCH SPST	510099	S2 S3
Crystal	8.000MHz PARALLEL	230003	Y1
LED	T1 RT ANG 5mA AMBER LED	390029	LED9
LED	T1 RT ANG 5mA RED LED	390027	LED1







Matrix Plus II System MTX-100
STATION CROSSPOINT CARD

Introduction

This Section provides troubleshooting information, schematics, assembly drawings and component lists for the MTX-100 Station Crosspoint Card and the DTMF Option for the MTX-100 (if configured).

The MTX-100 is a 2 X 50 Matrix Switching Card for use in Matrix Plus II systems. The card contains a microprocessor to manage the communication to intercom stations and control the on board matrix switches. The MTX-100 supports all Matrix Plus II intercom stations with 3 or 4 pair wiring to the stations. The MTX-100 communicates to the station via 1 or 2 pair RS-422 data and 2 pairs of audio lines. The MTX-100 can also be used to connect to Matrix Plus II interfaces or directly connect to outside applications. An option (DTMF-1) allows the MTX-100 to send and decode standard DTMF tones on the 4-audio lines.

Spare MTX-100 cards should be stored in electrically insulating packaging, for example heavy duty plastic bags or in an empty slot in a matrix frame.

Troubleshooting

Troubleshooting information includes descriptions of the MTX-100 card's reset pushbutton, LED indicators, and a list of possible symptoms and solutions to problems.

Reset Pushbutton

The Reset pushbutton on the front edge of the MTX-100 card causes the microprocessor on the MTX-100 card to stop whatever it is doing and restart from the beginning of its internal program.

Under normal operating conditions, it is never necessary to press the Reset button. Technical personnel might push the Reset button if they believe that the MTX-100 card is behaving incorrectly as a result of corruption of the internal data or instruction sequence of the MTX-100's microprocessor.

Resetting the MTX-100 disconnects all communication paths on both ports of the MTX-100 card and causes any stations connected to be re-initialized. When communication with the CPU-100 Master CPU Controller card is reestablished (which can take several seconds), new talk paths can be activated, but the previously existing paths are lost.

LED Indicators

The MTX-100 Station Crosspoint Card has 10 LED indicators on its front edge as shown in Figure M3-1. These LED indicators provide status information about the MTX-100 card's operation. The paragraphs following Figure M3-1 briefly describe the function of each LED indicator.

MTX-100 Station/Interface Crosspoint Card

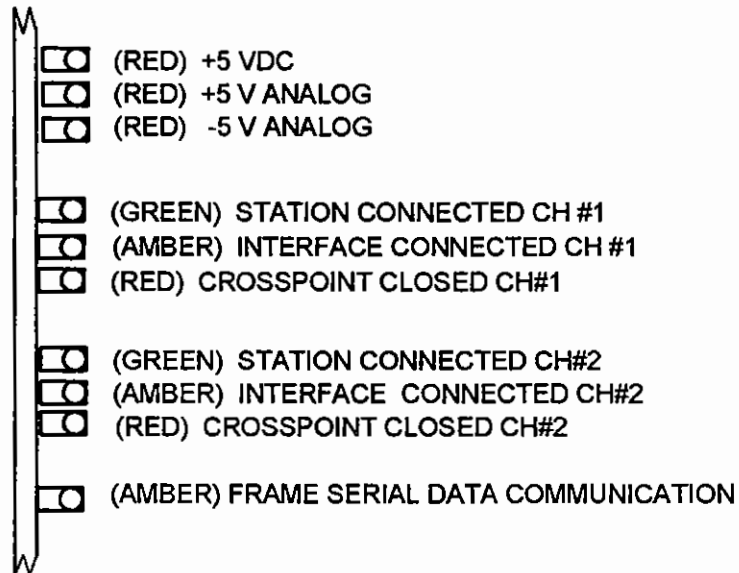


FIGURE M3-1. MTX-100 LED Indicators

MTX-100

- **+5 VDC (RED)** Indicates the presence of 5 volt digital power supply.
- **+5V ANALOG (RED)** Indicated the presence of the +5 volt analog power supply.
- **-5V ANALOG (RED)** Indicates the presence of the -5 volt analog power supply.
- **STATION CONNECTED CH#1 (GREEN)** When lit, indicates that the first port of this card is connected to a Matrix Plus II intercom station and that data communications to and from the station are established. This LED indicator should always be lit when the port is connected to an intercom station.
- **INTERFACE CONNECTED CH#1 (AMBER)** When lit, indicates that the first port of this is connected to a Matrix Plus II interface.
- **CROSSPOINT CLOSED CH#1 (RED)** When lit, indicates that at least one crosspoint switch is closed on the first port of this card.
- **STATION CONNECTED CH#2 (GREEN)** When lit, indicates that the second port of this card is connected to a Matrix Plus II intercom station and that data communications to and from the station are established. This LED indicator should always be lit when the port is connected to an intercom station.
- **INTERFACE CONNECTED CH#2 (AMBER)** When lit, indicates that the second port of this is connected to a Matrix Plus II interface.
- **CROSSPOINT CLOSED CH#2 (RED)** When lit, indicates that at least one crosspoint switch is closed on the second port of this card.
- **FRAME SERIAL DATA COMMUNICATION (AMBER)** When lit indicates that the port is currently communicating with the CPU-100 Master CPU Controller Card. The LED is on only during actual communication with the CPU-100 so normally it will only be on briefly. During up-loading and down-loading it will be on longer but only during actual communication to or from the CPU-100.

List of Possible Symptoms and Possible Solutions

1. A station indicates that it is disconnected from frame.
 - Check the Station Connected led on the MTX-100 card. If the led is not lit then check the station and the wiring to the station.
 - Check the Frame Communication Led. If there is no frame communication activity indicated to this card while the other cards in the frame do have such activity, reset the card.
 - If parallel stations are installed on the port in question check that each has a unique ID pin assignment in its matrix connector.
 - Replace card and station separately to isolate.
2. Audio sounds low or distorted.
 - Check the + and - 5 volt analog power leds. Replace card if a power led is off.
3. Card has no controlled activity.
 - Check the Digital 5 volt led. Replace card if out.
 - Reset card. Replace card if it does not respond.

MTX-100

MTX-100

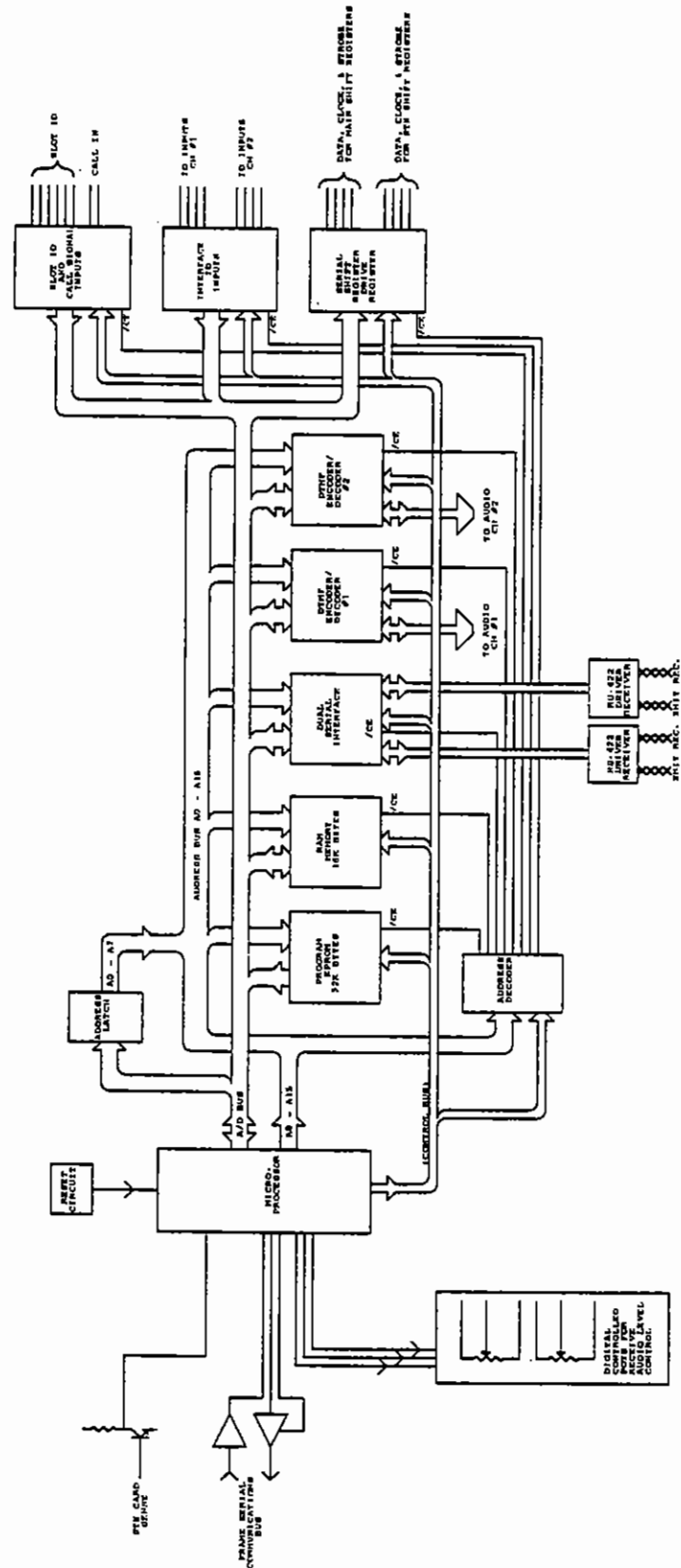
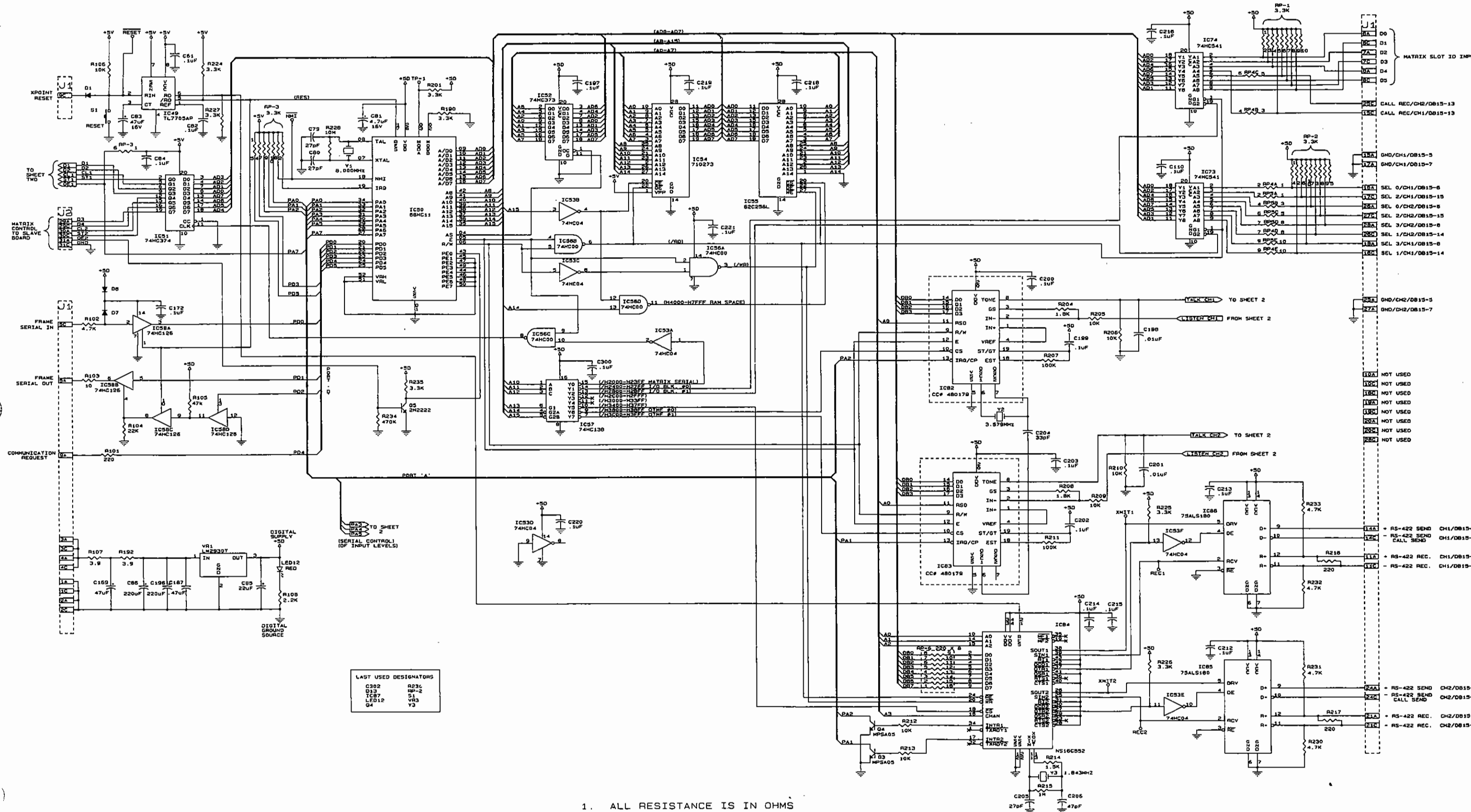


FIGURE M3-2 Digital Block Diagram - MTX-100



1. ALL RESISTANCE IS IN OHMS
2. ALL CAPACITANCE IS IN MICROFARADS

FIGURE M3-3 Schematic - MTX-100 PCB Sheet 1, Rev. C

MTX-100

MTX-100

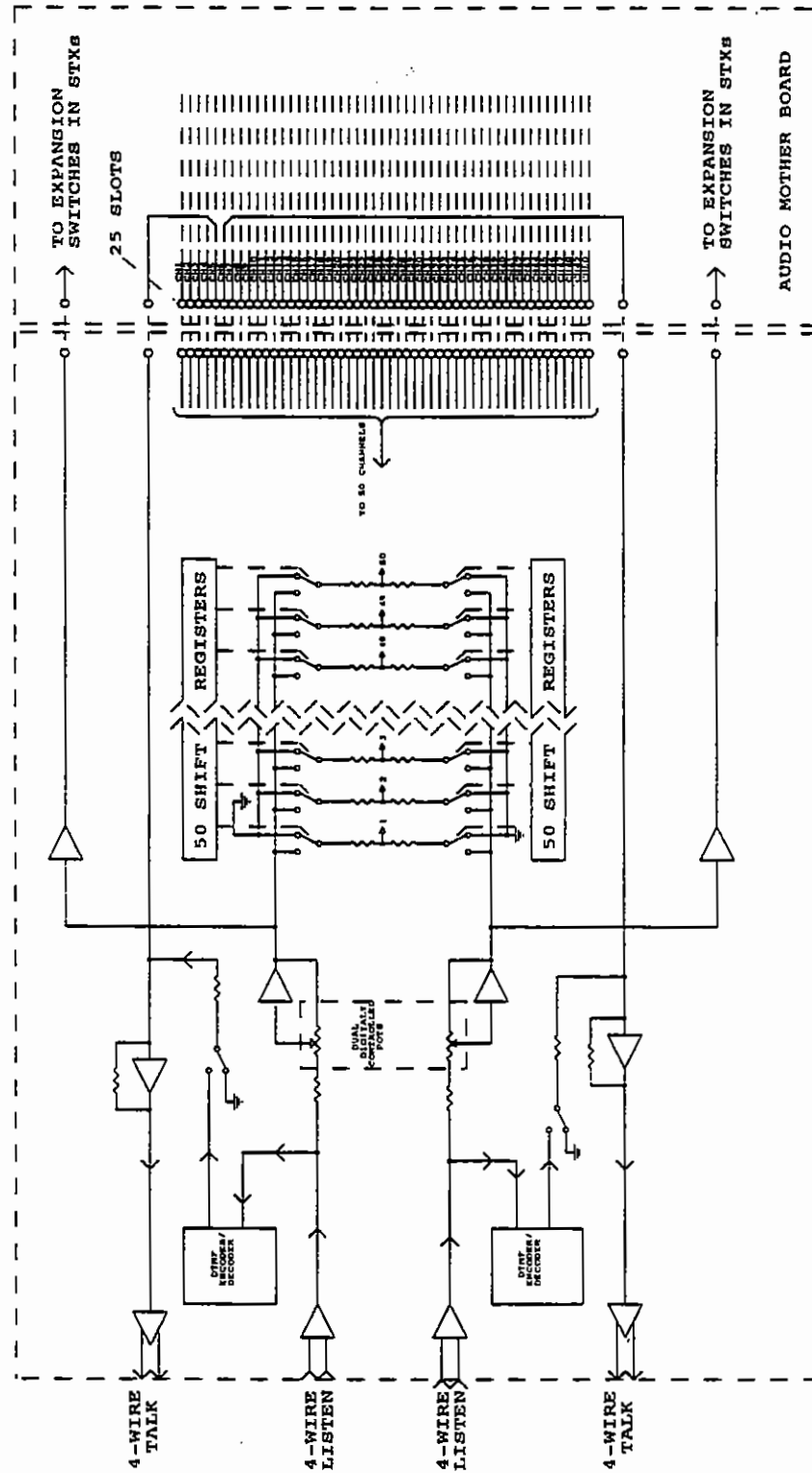


FIGURE M3-4 Analog Block Diagram - MTX-100

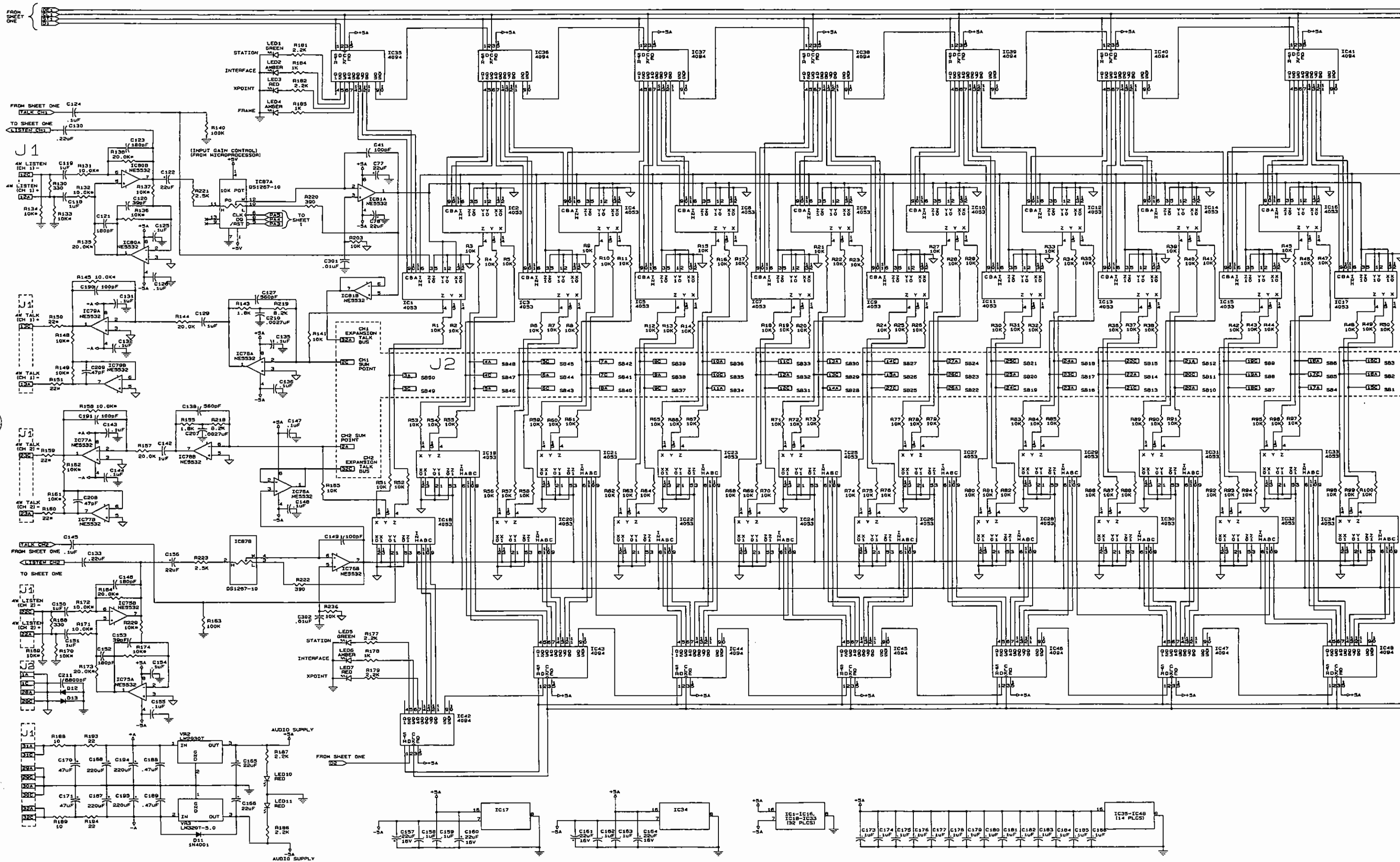


FIGURE M3-5 Schematic - MTX-100 PCB Sheet 2, Rev. C

MTX-100

MTX-100

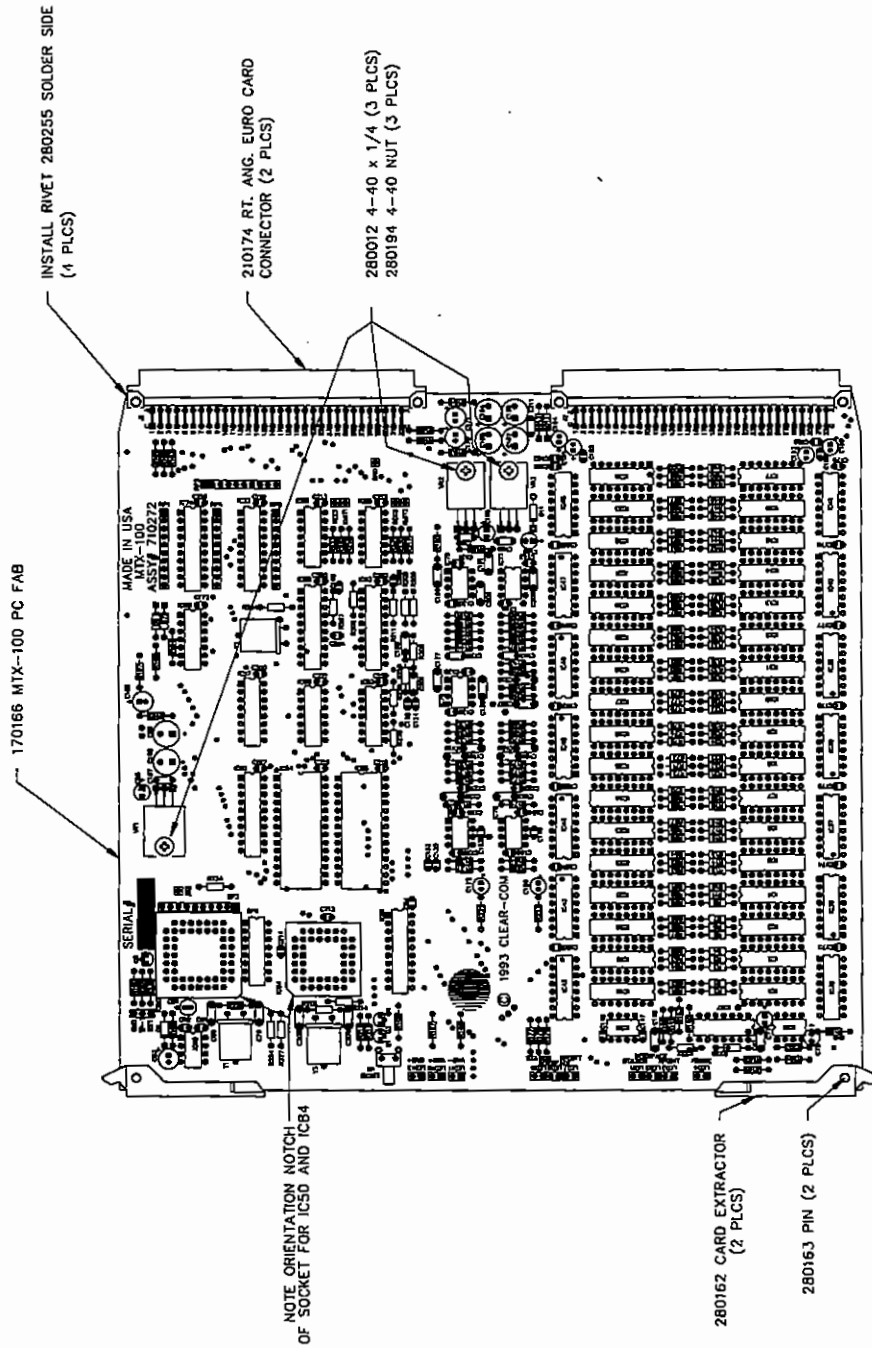


FIGURE M3-6 Assembly Drawing - MTX-100 PCB, Rev. D

Bill of Materials for the MTX-100 PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
27	pF	Ceramic Disc	50V	5%	150071	C79 C80 C205
33	pF	Monolithic	50V	10%	150128	C204
39	pF	Ceramic Disc	50V	5%	150026	C120 C153
47	pF	Ceramic Disc	50V	10%	150041	C206 C208 C209
100	pF	Ceramic Disc	50V	10%	150006	C41 C149 C190 C191
180	pF	Ceramic Disc	50V	5%	150070	C121 C123 C146 C152
560	pF	Ceramic Disc	50V	10%	150149	C127 C138
0.0027	uF	Mylar	50V	5%	150148	C207 C210
6800	pF	Monolithic	50V	5%	150083	C211
0.01	uF	Ceramic Disc	30V	20%	150012	C198 C201
0.1	uF	Monolithic	50V	10%	150035	C61 C82 C84 C110 C124 C125 C126 C131 C132 C135 C136 C143 C144 C145 C147 C148 C154 C155 C158 C159 C162 C163 C172 C173 C174 C175 C176 C177 C178 C179 C180 C181 C182 C183 C184 C185 C186 C197 C199 C200 C202 C203 C212 C213 C214 C215 C216 C218 C219 C220 C221 C300
0.22	uF	Monolithic	50V	20%	150133	C130 C133
0.47	uF	Monolithic	50V		150043	C187 C188 C189
1	uF	Ceramic Disc	50V	10%	150073	C118 C119 C129 C142 C150 C151
4.7	uF	Aluminum	16V	10%	150141	C81
22	uF	Aluminum	16V	20%	150142	C77 C78 C85 C122 C156 C157 C160 C161 C164 C165 C166
47	uF	Aluminum	16V	20%	150143	C83 C169 C170 C171
220	uF	Aluminum	16V	20%	150146	C86 C167 C168 C194 C195 C196

Bill of Materials for the MTX-100 PCB ----- cont.

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
10 OHM	1/4	Carbon Film	5%	410002	R103 R107 R188 R189 R192
22 OHM	1/4	Carbon Film	5%	410004	R193 R194
100 OHM	1/8	Metal Film	1%	410156	R150 R151 R159 R160
220 OHM		X 8 DIP Isolated		415004	RP-6
220 OHM	1/4	Carbon Film	5%	410007	R101 R216 R217
330 OHM	1/4	Carbon Film	5%	410061	R130 R168
390 OHM	1/4	Carbon Film	5%	410005	R220 R222
1K OHM	1/4	Carbon Film	5%	410010	R185
1.5K OHM	1/4	Carbon Film	5%	410055	R214
1.8K OHM	1/4	Carbon Film	5%	410035	R143 R155 R204 R208
2.2K OHM	1/4	Carbon Film	5%	410011	R108 R177 R178 R179 R181 R182 R184 R186 R187
2.4K OHM	1/4	Carbon Film	5%	410103	R221 R223
3.3K OHM				415000	RP-1 RP-2 RP-3
3.3K OHM	1/4	Carbon Film	5%	410015	R190 R201 R224 R225 R226 R227 R235
4.7K OHM	1/4	Carbon Film	5%	410013	R102 R230 R231 R232 R233
8.2K OHM	1/4	Carbon Film	5%	410037	R218 R219
10K OHM	1/4	Metal Film	1%	410089	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R100 R106 R131 R132 R133 R134 R135 R136 R137 R138 R141 R144

MTX-100

10K	OHM		X 5 SIP Isolated		415003	R145 R148 R149 R157 R158 R161 R162 R164 R165 R169 R170 R171 R172 R173 R174 R203 R205 R206 R209 R210 R212 R213 R229 RP-4 RP-5
22K	OHM	1/4	Carbon Film	5%	410018	R104
47K	OHM	1/4	Carbon Film	5%	410021	R105
100K	OHM	1/4	Carbon Film	5%	410024	R140 R163 R207 R211
470K	OHM	1/4	Carbon Film	5%	410030	R234
1M	OHM	1/4	Carbon Film	5%	410058	R215
10M	OHM	1/4	Carbon Film	5%	410059	R228

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D11
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D6 D7 D12 D13
Transistor	2N2222 NPN 30V	480006	Q5
Transistor	MPS-A05 NPN 60V	480052	Q3 Q4

Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	4053 CMOS TRIPLE 2CH SW	480127	IC1 IC2 IC3 IC4 IC5 IC6 IC7 IC8 IC9 IC10 IC11 IC12 IC13 IC14 IC15 IC16 IC17 IC18 IC19 IC20 IC21 IC22 IC23 IC24 IC25 IC26 IC27 IC28 IC29 IC30 IC31 IC32 IC33 IC34
Digital IC	DS1267-10 DUAL 10K POT	480195	IC87
Digital IC	TL7705AP RESET CCT	480134	IC49
Interface Chip	75ALS180 RS-422 DRIVER	480187	IC85 IC86
Interface Chip	NS16C552 DUAL UART	480188	IC84
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC35 IC36 IC37 IC38 IC39 IC40 IC41 IC42 IC43 IC44 IC45 IC46 IC47 IC48
Logic Chip	74HC00 CMOS QUAD NAND	480157	IC56
Logic Chip	74HC04 CMOS HEX INVERTER	480138	IC53
Logic Chip	74HC126 QUAD BUFFER	480180	IC58

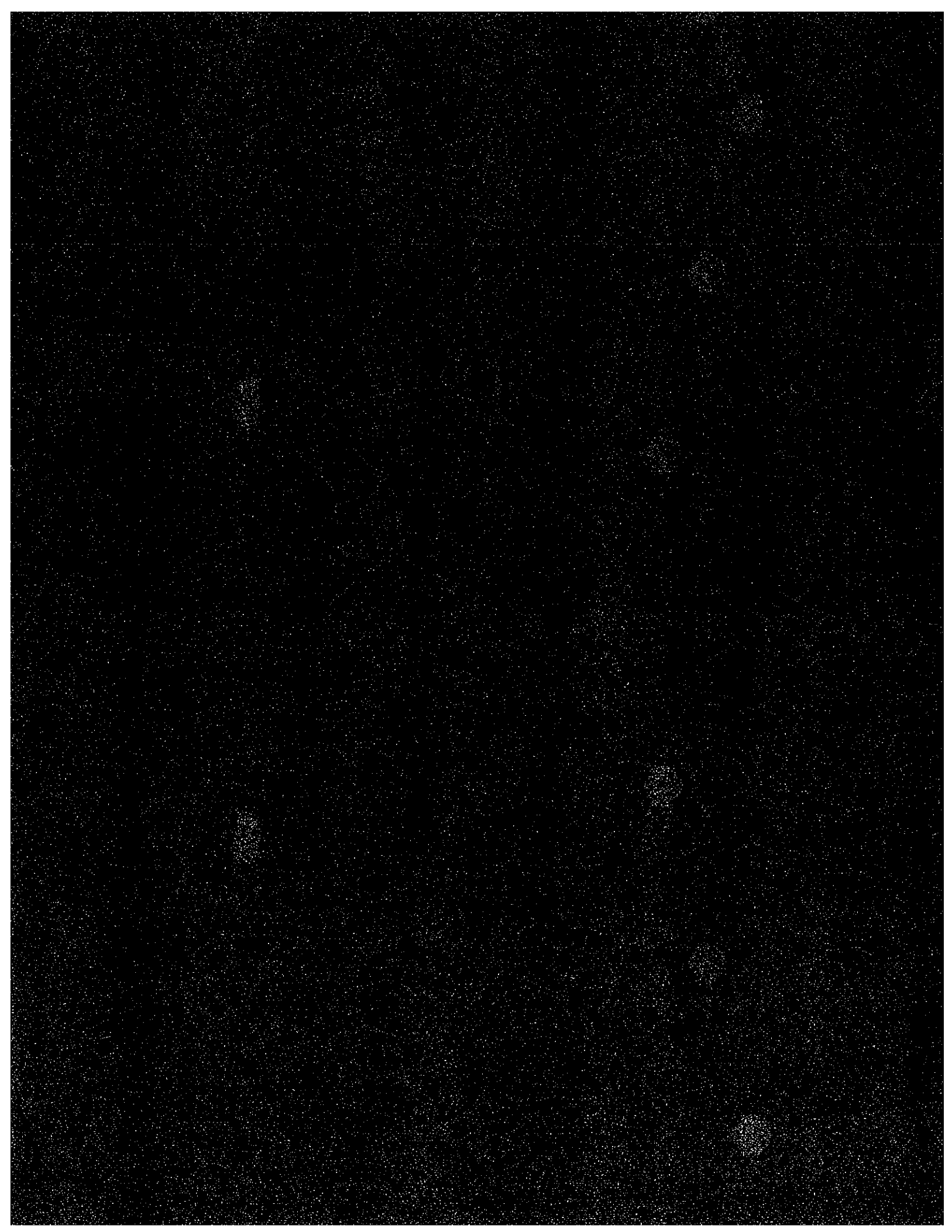
Bill of Materials for the MTX-100 PCB ----- cont.

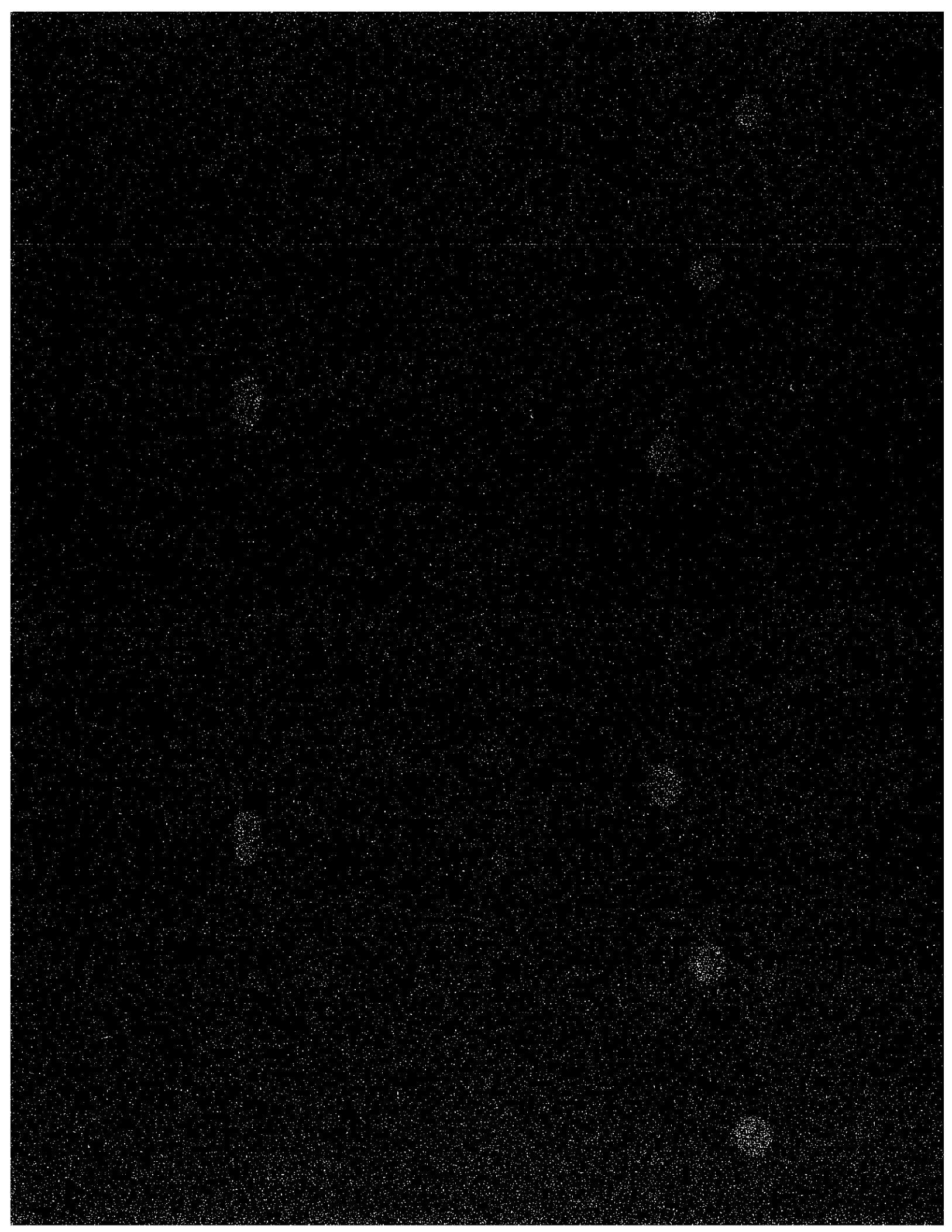
Device	Description	Part #	Designator
Logic Chip	74HC138 CMOS 3 TO 8 DECOD	480120	IC57
Logic Chip	74HC373 CMOS OCTAL D LATCH	480142	IC52
Logic Chip	74HC374 CMOS OCTAL D FF	480143	IC51
Logic Chip	74HC541 CMOS OCT BUFFER	480194	IC73 IC74
Microprocessor	68HC11AOFN CMOS MCU	480132	IC50
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC75 IC76 IC77 IC78 IC79 IC80 IC81
RAM Memory	GM76C256L CMOS 32K X 8	480183	IC55
Regulator	LM2930T POS 5V REG TO220	480153	VR1 VR2
Regulator	LM320T-5.0 NEG 5V REG TO-220	480155	VR3

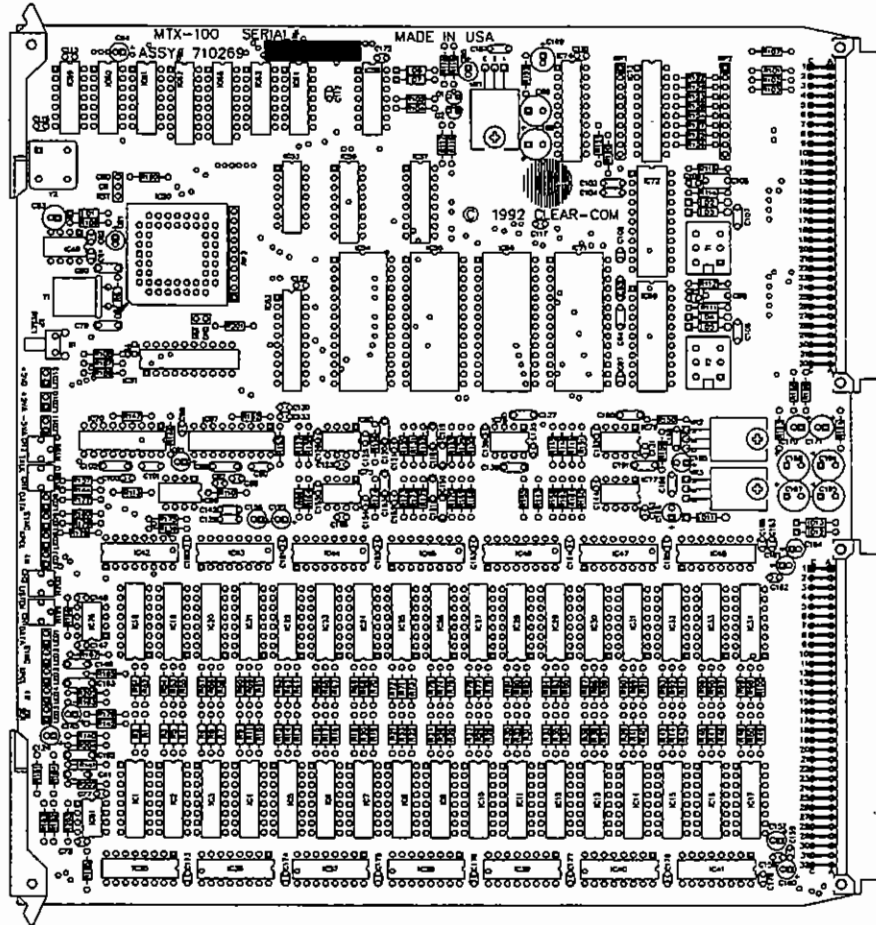
Miscellaneous

Device	Description	Part #	Designator
Connector	EURO CARD RT ANG 64 pin	210174	J1 J2
Crystal	1.843MHZ PARALLEL	230002	Y3
Crystal	3.579545MHZ PARALLEL	230001	Y2
Crystal	8.000MHz PARALLEL	230003	Y1
EPROM	MTX-100 PROGRAM IC	710273	IC54
EPROM	MTX-100M PROGRAM IC	710323	IC54
LED	T1 RT ANG 5mA AMBER LED	390029	LED4
LED	T1 RT ANG 5mA GREEN LED	390028	LED1 LED2 LED5 LED6
LED	T1 RT ANG 5mA RED LED	390027	LED3 LED7 LED10 LED11 LED12
Switch	PUSHBUTTON SPST PC MOUNT	510099	S1 S1

MTX-100







Matrix Plus II System MTX-200
STATION CROSSPOINT CARD

Introduction

This Section provides troubleshooting information, schematics, assembly drawings and component lists for the MTX-200 Digital Station Crosspoint Card.

The MTX-200 is a 2 X 50 Matrix Switching Card for use in Matrix Plus II systems. The card contains a microprocessor to manage the communication to intercom stations and control the on board matrix switches. The MTX-200 supports all Matrix Plus II intercom stations (configured with the digital option) with a single pair of wires that contains both data and audio. The MTX-200 cannot be used to connect to Matrix Plus II interfaces or to directly connect to outside applications.

Spare MTX-200 cards should be stored in electrically insulating packaging, for example heavy duty plastic bags or in an empty slot in a matrix frame.

Troubleshooting

Troubleshooting information includes descriptions of the MTX-200 card's reset pushbutton, LED indicators, and a table of possible symptoms and solutions to problems.

Reset Pushbutton

The Reset pushbutton on the front edge of the MTX-200 card causes the microprocessor on the MTX-200 card to stop whatever it is doing and restart from the beginning of its internal program.

Under normal operating conditions, it is never necessary to press the Reset button. Technical personnel might push the Reset button if they believe that the MTX-200 card is behaving incorrectly as a result of corruption of the internal data or instruction sequence of the MTX-200's microprocessor.

Resetting the MTX-200 disconnects all communication paths on both ports of the MTX-200 card and causes any stations connected to be re-initialized. When communication with the CPU-100 Master CPU Controller card is reestablished (which can take several seconds), new talk paths can be activated, but the previously existing paths are lost.

MTX-200

LED Indicators

The MTX-200 Digital Station Crosspoint Card has 8 LED indicators on its front edge as shown in Figure M4-1. These LED indicators provide status information about the MTX-200 card's operation. The paragraphs following Figure M4-1 briefly describe the function of each LED indicator.

MTX-200 Digital Station Crosspoint Card

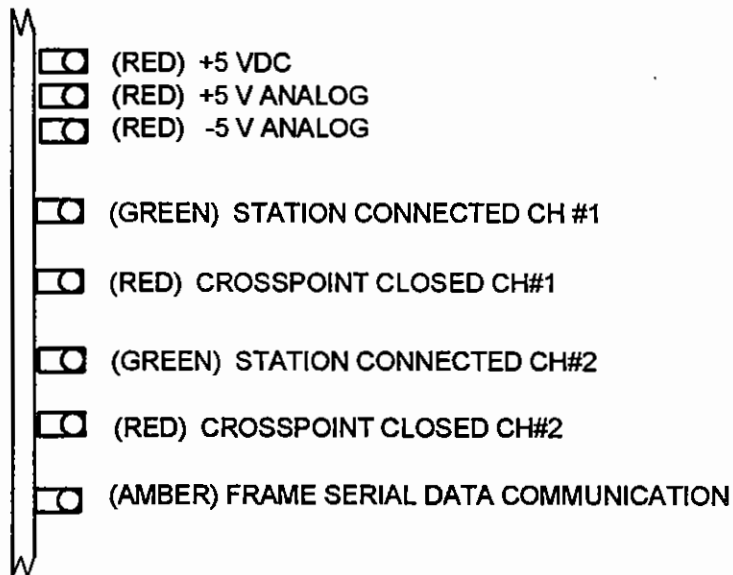


FIGURE M4-1. MTX-200 LED Indicators

MTX-200

- **+5 VDC (RED)** Indicates the presence of 5 volt digital power supply.
- **+5V ANALOG (RED)** Indicated the presence of the +5 volt analog power supply.
- **-5V ANALOG (RED)** Indicates the presence of the -5 volt analog power supply.
- **STATION CONNECTED CH#1 (GREEN)** When lit, indicates that the first port of this card is connected to a Matrix Plus II intercom station and that data communications to and from the station are established. This LED indicator should always be lit when the port is connected to an intercom station.
- **CROSSPOINT CLOSED CH#1 (RED)** When lit, indicates that at least one crosspoint switch is closed on the first port of this card.
- **STATION CONNECTED CH#2 (GREEN)** When lit, indicates that the second port of this card is connected to a Matrix Plus II intercom station and that data communications to and from the station are established. This LED indicator should always be lit when the port is connected to an intercom station.
- **CROSSPOINT CLOSED CH#2 (RED)** When lit, indicates that at least one crosspoint switch is closed on the second port of this card.
- **FRAME SERIAL DATA COMMUNICATION (AMBER)** When lit indicates that the port is currently communicating with the CPU-100 Master CPU Controller Card. The LED is on only during actual communication with the CPU-100 so normally it will only be on briefly. During up-loading and down-loading it will be on longer but only during actual communication to or from the CPU-100.

List of Possible Symptoms and Possible Solutions

1. A station indicates that it is disconnected from frame.
 - Check the Station Connected led on the MTX-200 card. If the led is not lit then check the station and the wiring to the station.
 - Check the Frame Communication Led. If there is no frame communication activity indicated to this card while the other cards in the frame do have such activity, reset the card.
 - Replace card and station separately to isolate.
2. Audio sounds low or distorted.
 - Check the + and - 5 volt analog power leds. Replace card if a power led is off.
3. Card has no controlled activity.
 - Check the Digital 5 volt led. Replace card if out.
 - Reset card. Replace card if it does not respond.

MTX-200

MTX-200

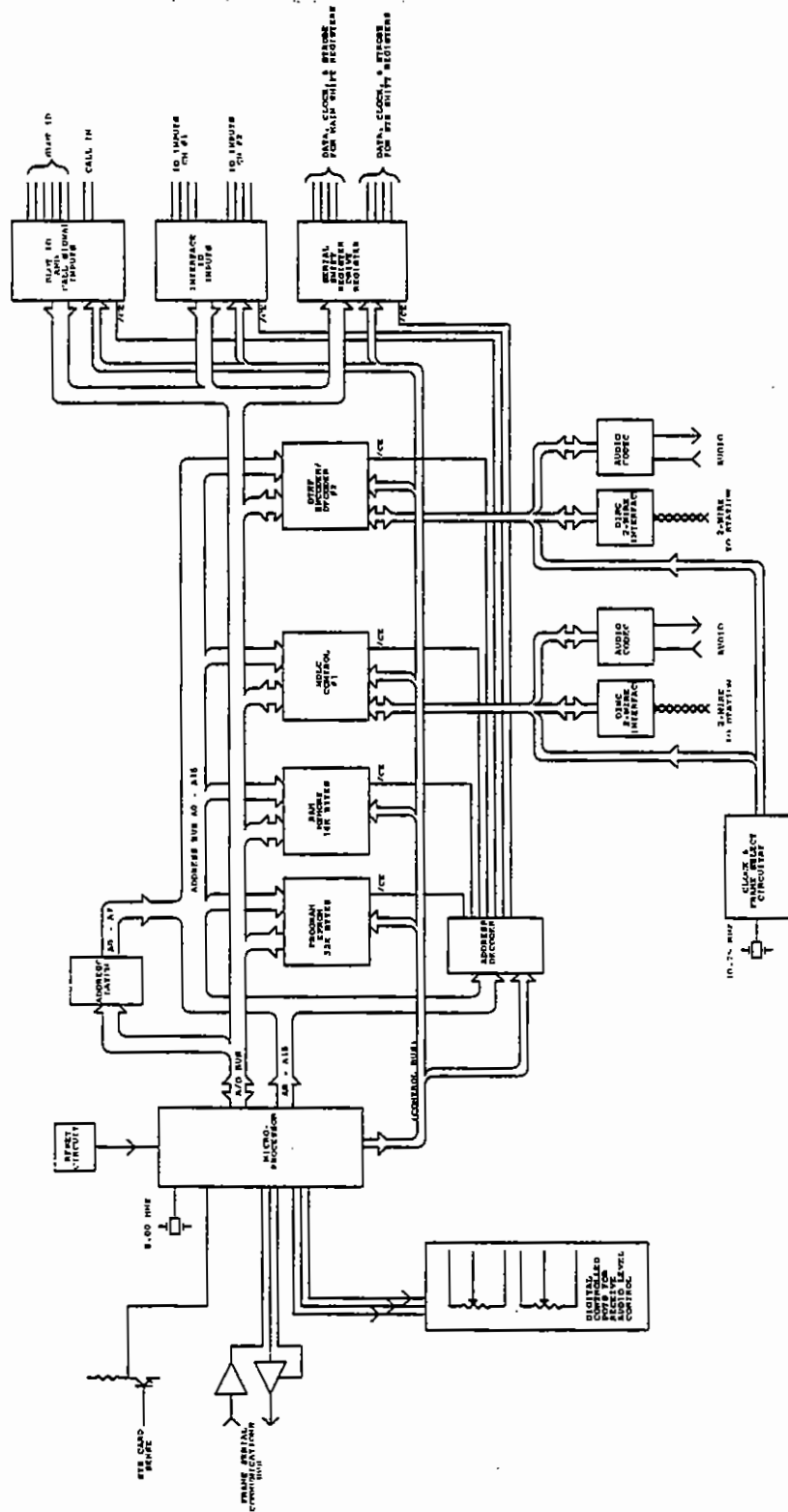
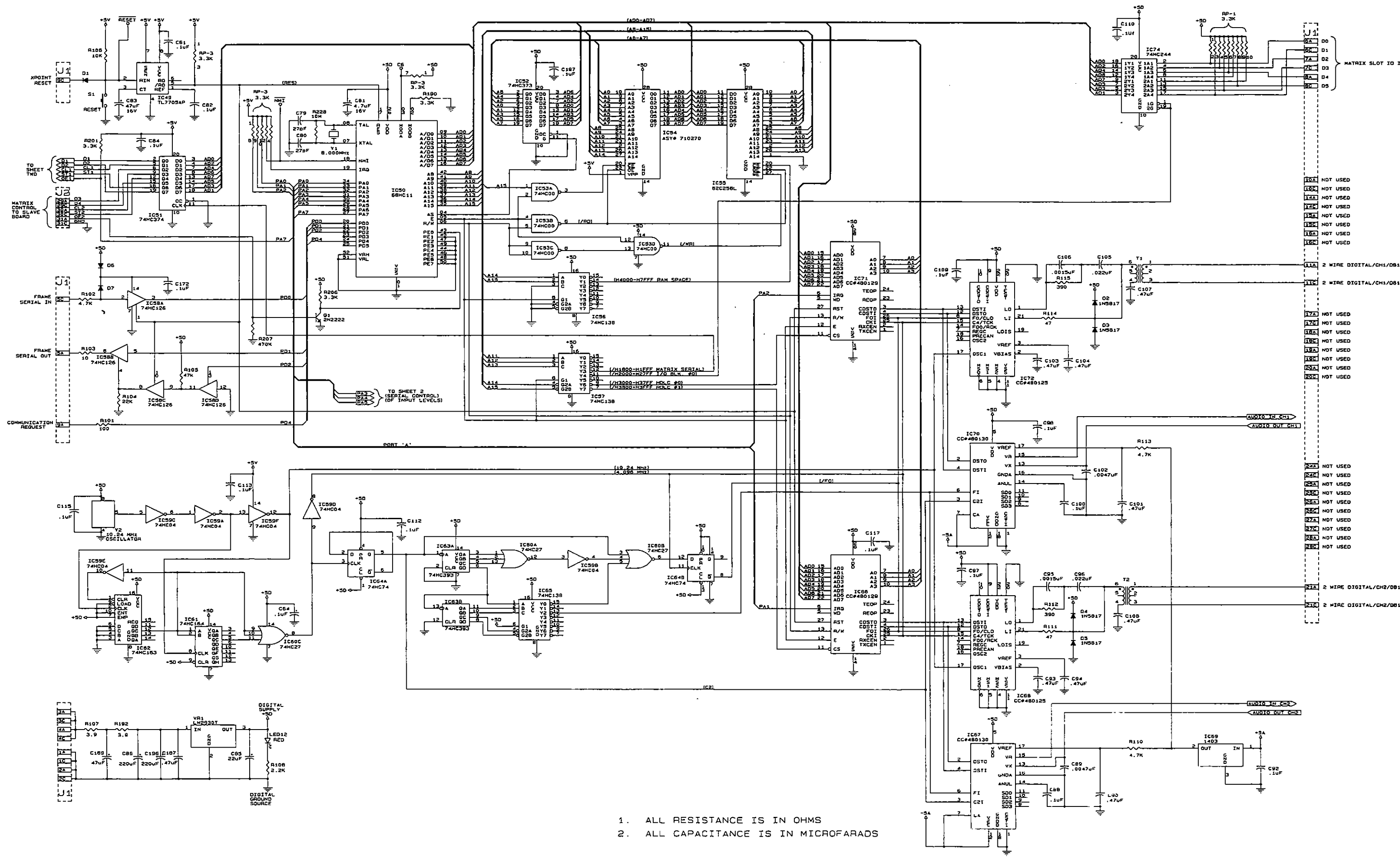


FIGURE M4-2 Digital Block Diagram - MTX-200



1. ALL RESISTANCE IS IN OHMS
2. ALL CAPACITANCE IS IN MICROFARADS

FIGURE M4-3 Schematic - MTX-200 PCB Sheet 1, Rev. B

MTX-200

MTX-200

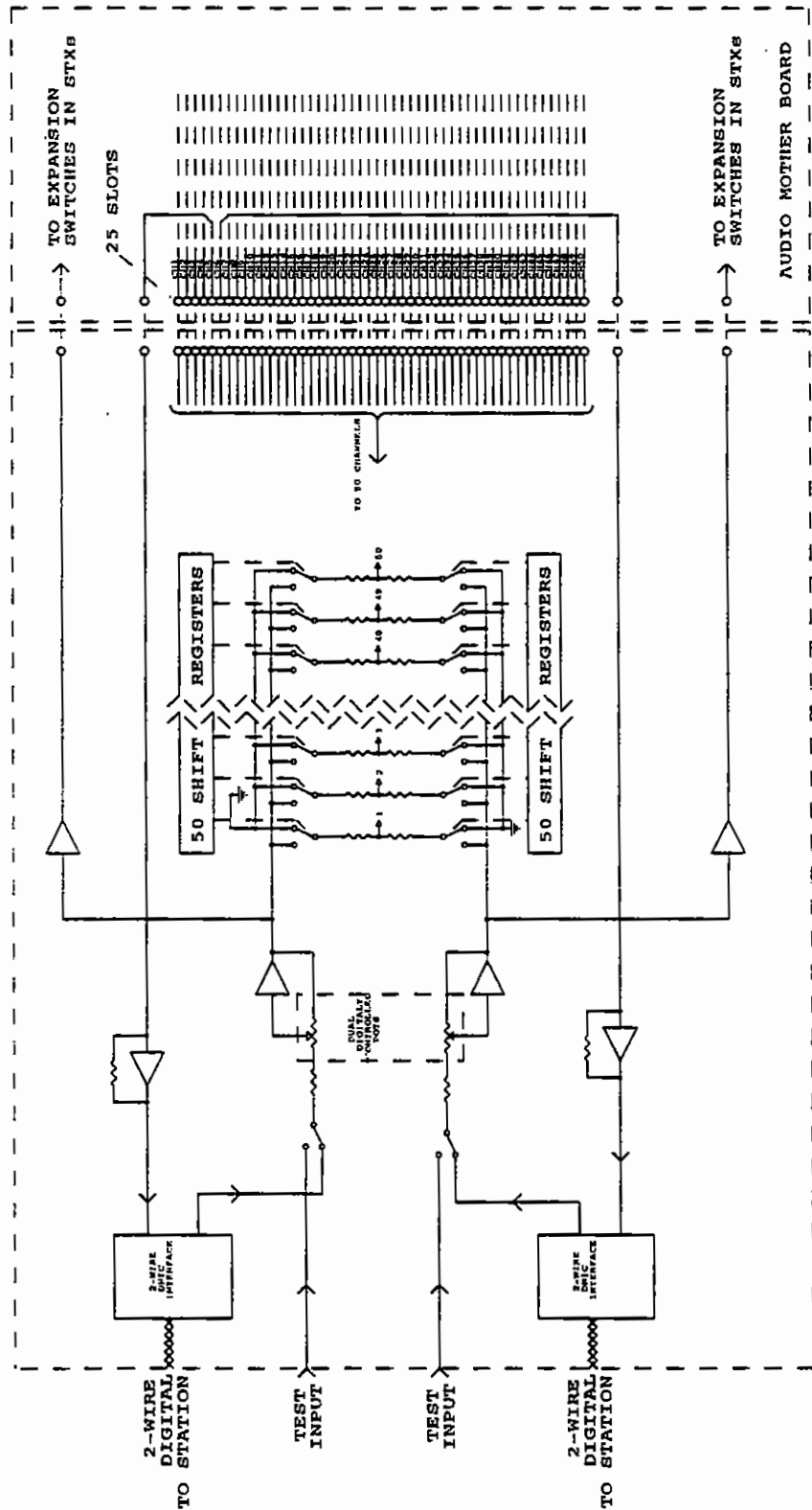


FIGURE M4-4 Analog Block Diagram - MTX-200

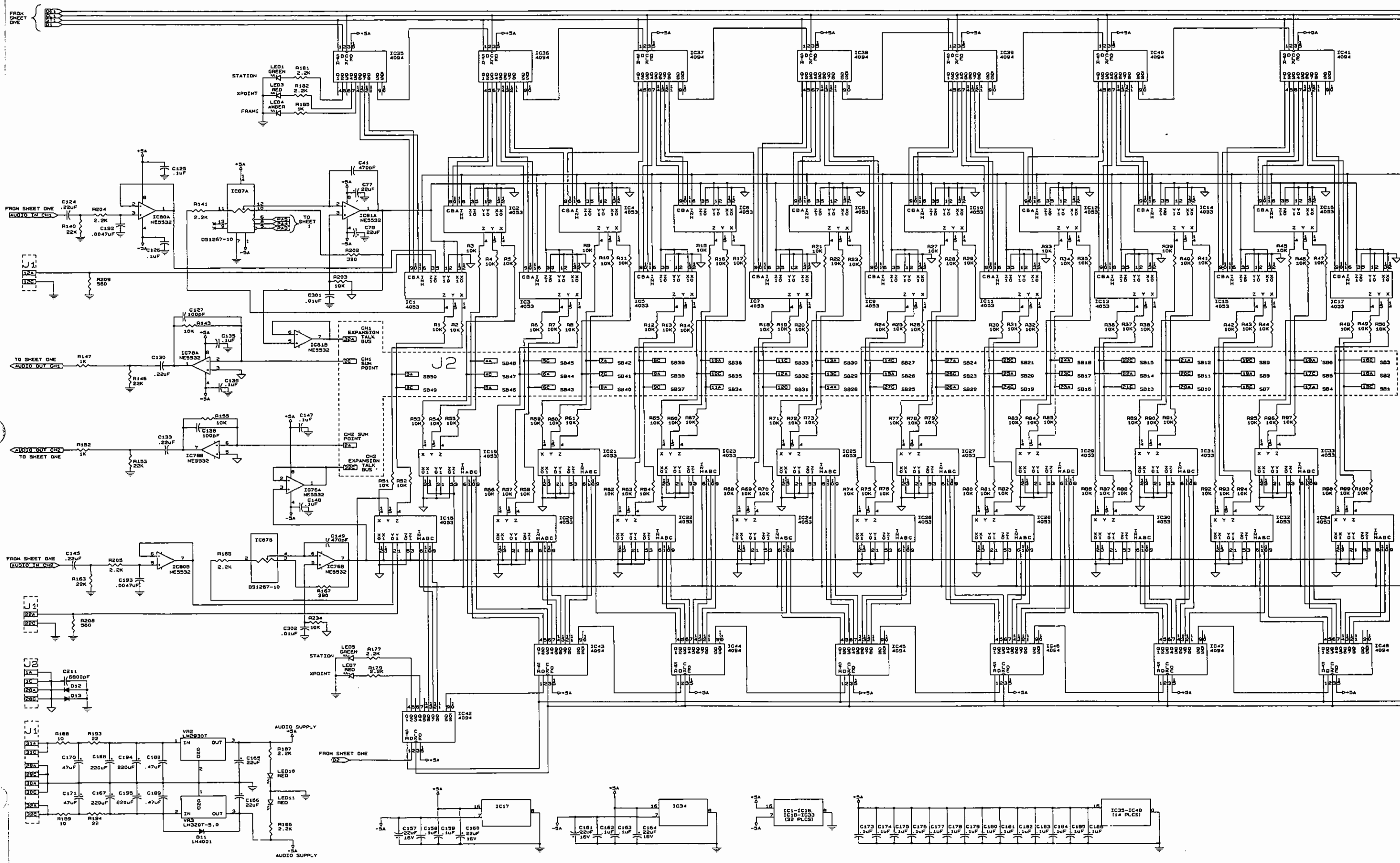


FIGURE M4-5 Schematic - MTX-200 PCB Sheet 2, Rev. B

MTX-200

MTX-200

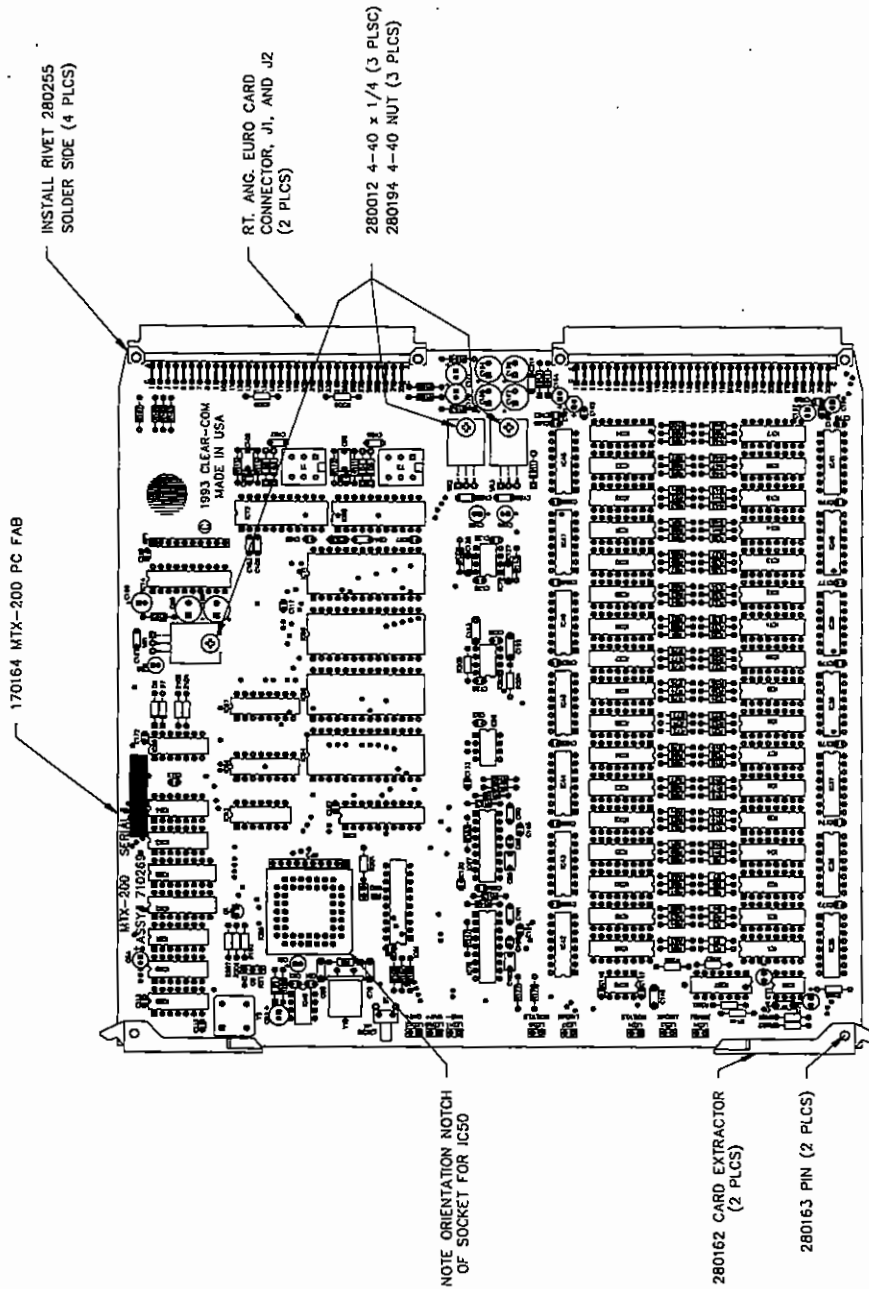


FIGURE M4-6 Assembly Drawing - MTX-200 PCB, Rev. A

Bill of Materials for the MTX-200 PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
27	pF	Ceramic Disc	50V	5%	150071	C79 C80
100	pF	Ceramic Disc	50V	10%	150006	C127 C138
470	pF	Ceramic Disc	50V	10%	150014	C41 C149
0.0015	uF	Monolithic	50V	10%	150125	C95 C106
0.0047	uF	Ceramic Disc	50V	10%	150016	C89 C102 C192 C193
6800	pF	Monolithic	50V	5%	150083	C211
0.022	uF	Monolithic	50V	10%	150082	C96 C105
0.1	uF	Monolithic	50V	10%	150035	C61 C64 C82 C84 C88 C92 C97 C98 C100 C109 C110 C112 C113 C115 C117 C125 C126 C135 C136 C147 C148 C158 C159 C162 C163 C172 C173 C174 C175 C176 C177 C178 C179 C180 C181 C182 C183 C184 C185 C186 C197
0.22	uF	Monolithic	50V	20%	150133	C124 C130 C133 C145
0.47	uF	Monolithic	50V		150043	C90 C93 C94 C101 C103 C104 C107 C108 C187 C188 C189
4.7	uF	Aluminum	16V	10%	150141	C81
22	uF	Aluminum	16V	20%	150142	C77 C78 C85 C157 C160 C161 C164 C165 C166
47	uF	Aluminum	16V	20%	150143	C83 C169 C170 C171
220	uF	Aluminum	16V	20%	150146	C86 C167 C168 C194 C195 C196

Bill of Materials for the MTX-200 PCB ----- cont.

Resistors & Resistor Packs

Value		Power	Type	Tol.	Part #	Designator
10	OHM	1/4	Carbon Film	5%	410002	R103 R107 R188 R189 R192
22	OHM	1/4	Carbon Film	5%	410004	R193 R194
47	OHM	1/4	Carbon Film	5%	410039	R111 R114
100	OHM	1/4	Carbon Film	5%	410071	R101
390	OHM	1/4	Carbon Film	5%	410005	R112 R115 R167 R202
560	OHM	1/4	Carbon Film	5%	410046	R208 R209
1K	OHM	1/4	Carbon Film	5%	410010	R147 R152 R185
2.2K	OHM	1/4	Carbon Film	5%	410011	R108 R141 R165 R177 R179 R181 R184 R186 R187 R204 R205
3.3K	OHM		R-PACK		415000	RP-1 RP-3
3.3K	OHM	1/4	Carbon Film	5%	410015	R190 R201 R206
4.7K	OHM	1/4	Carbon Film	5%	410013	R102 R110 R113
10K	OHM	1/4	Carbon Film	5%	410016	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R100 R106 R143 R155
22K	OHM	1/4	Carbon Film	5%	410018	R104 R140 R146 R153 R163
47K	OHM	1/4	Carbon Film	5%	410021	R105
470K	OHM	1/4	Carbon Film	5%	410030	R207
10M	OHM	1/4	Carbon Film	5%	410059	R8

MTX-200

Bill of Materials for the MTX-200 PCB ----- cont.**Diodes and Transistors**

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D11
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D6 D7 D12 D13
Diode	1N5817 SHTKY 1A 20V	480147	D2 D3 D4 D5
Transistor	2N2222 NPN 30V	480006	Q1

Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	4053 TRIPLE SWITCH	480127	IC1 IC2 IC3 IC4 IC5 IC6 IC7 IC8 IC9 IC10 IC11 IC12 IC13 IC14 IC15 IC16 IC17 IC18 IC19 IC20 IC21 IC22 IC23 IC24 IC25 IC26 IC27 IC28 IC29 IC30 IC31 IC32 IC33 IC34
Digital IC	DS1267-10 DUAL 10K POT	480195	IC87
Digital IC	TL7705AP RESET CCT	480134	IC49
Interface Chip	HDLC PROTOCOL CONT.	480129	IC66 IC71
Interface Chip	PCM FILTER/CODEC	480130	IC67 IC70
Interface Chip	CMOS DIG NTWK INT	480125	IC68 IC72
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC35 IC36 IC37 IC38 IC39 IC40 IC41 IC42 IC43 IC44 IC45 IC46 IC47 IC48
Logic Chip	74HC00 CMOS QUAD NAND	480157	IC53
Logic Chip	74HC04 CMOS INVERTER	480138	IC59
Logic Chip	74HC126 CMOS QUAD BUFFER	480180	IC58
Logic Chip	74HC138 CMOS 3 TO 8 DECODE	480120	IC56 IC57 IC65
Logic Chip	74HC163 CMOS PRESET CNTR	480139	IC62
Logic Chip	74HC164 CMOS 8 BIT SHIFT REG	480140	IC61
Logic Chip	74HC244 CMOS OCTAL BUFFER	480141	IC74
Logic Chip	74HC27 CMOS 3-INPUT NOR	480185	IC60
Logic Chip	74HC373 CMOS OCTAL D LATCH	480142	IC52
Logic Chip	74HC374 CMOS OCTAL D FF	480143	IC51
Logic Chip	74HC393 CMOS DUAL 4 BIT CNT	480145	IC63
Logic Chip	74HC74 CMOS DUAL D FF	480184	IC64
Microprocessor	68HC11AOFN CMOS MCU	480132	IC50
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC76 IC78 IC80 IC81
RAM Memory	GM76C256L CMOS SRAM 32K X 8	480183	IC55

MTX-200

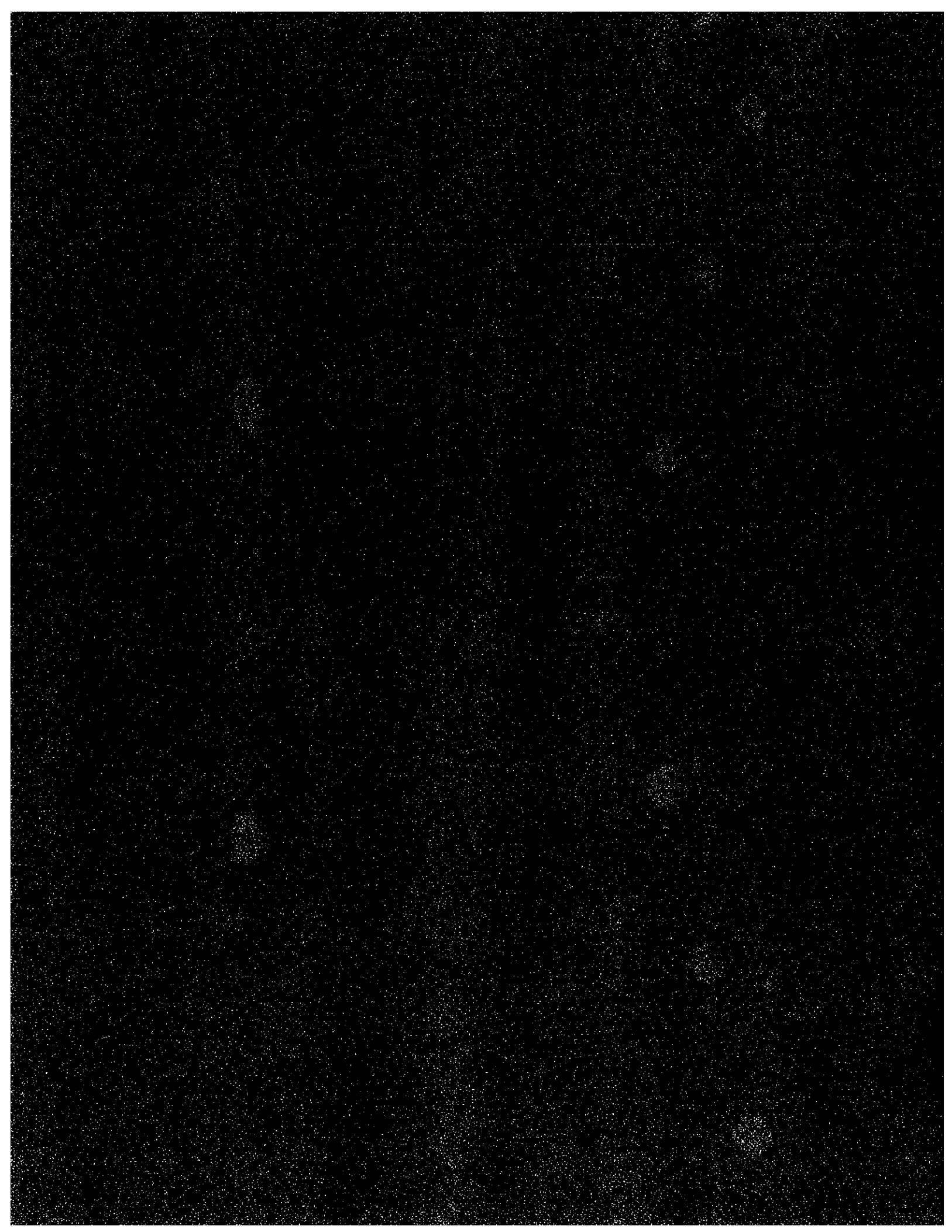
Bill of Materials for the MTX-200 PCB ----- cont.

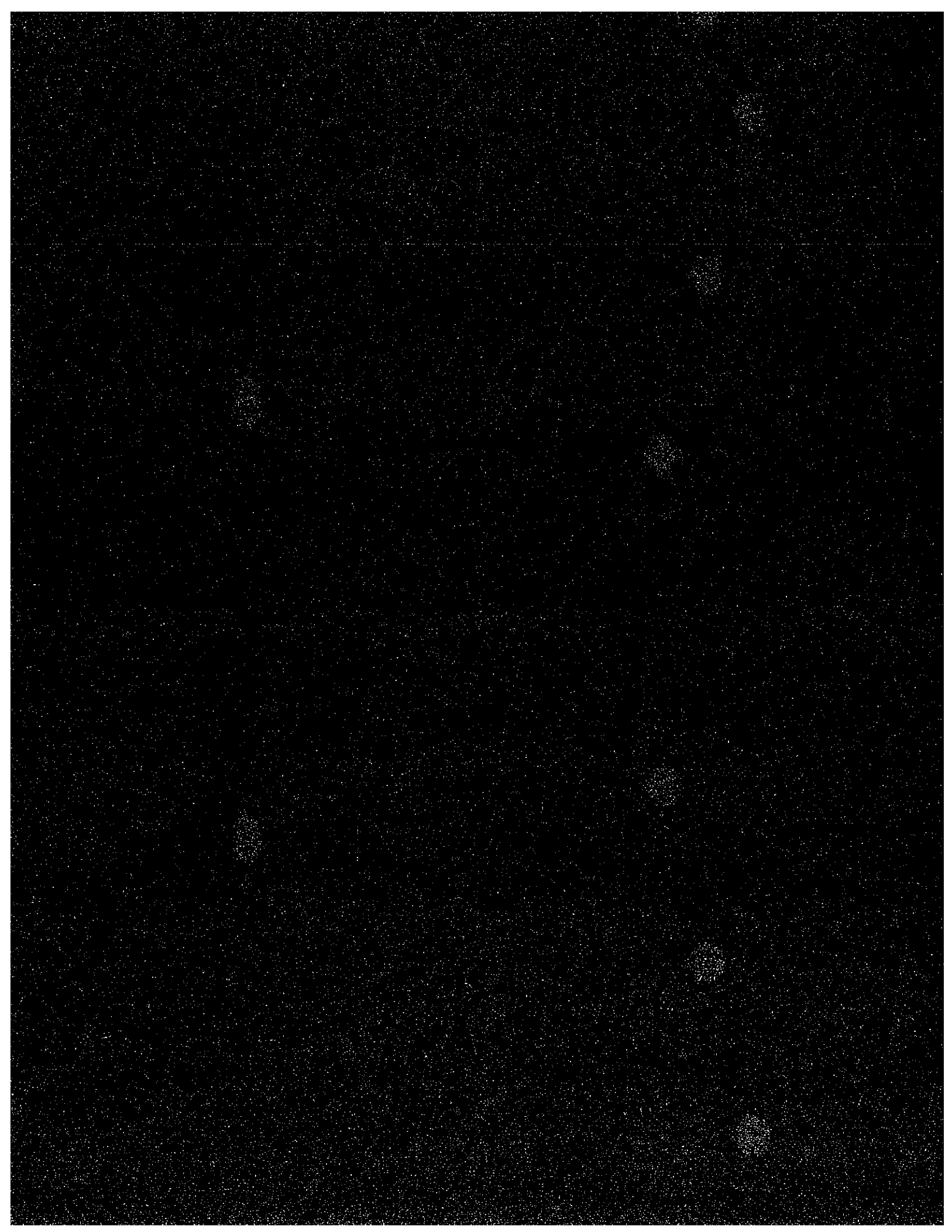
Device	Description	Part #	Designator
Regulator	1403 REF 2.5V IC	480152	IC69
Regulator	LM2930T POS 5V TO220	480153	VR1 VR2
Regulator	LM320T-5.0 NEG 5V REG TO-220	480155	VR3

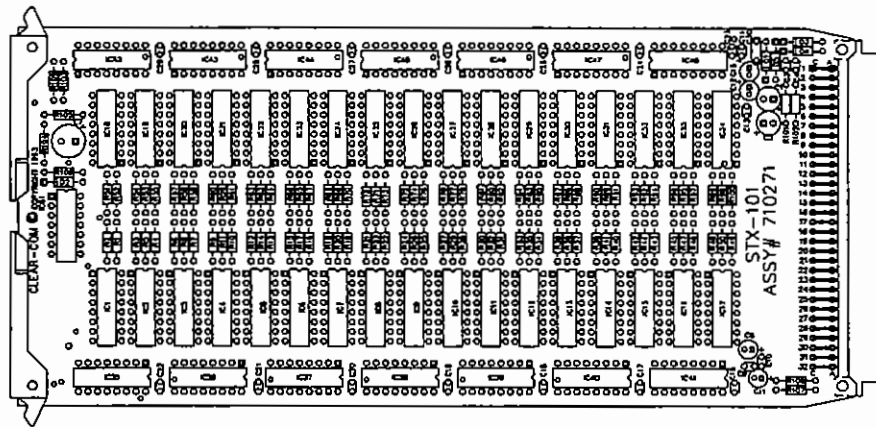
Miscellaneous

Device	Description	Part #	Designator
Transformer	2:1 PULSE TRANSFORMER	560023	T1 T2
Connector	EURO CARD RT ANG 64 pin	210174	J1 J2
Crystal	10.24MHZ OSCILLATOR	230005	Y2
Crystal	8.000MHz PARALLEL	230003	Y1
LED	T1 RT ANG 5mA AMBER LED	390029	LED4
LED	T1 RT ANG 5mA GREEN LED	390028	LED1 LED5
LED	T1 RT ANG 5mA RED LED	390027	LED3 LED7 LED10 LED11 LED12

MTX-200







Matrix Plus II System

STX-101

CROSSPOINT EXPANSION CARD

Introduction

This Section provides troubleshooting information, block diagrams, schematics, assembly drawings and components list for the STX-101 Expansion Crosspoint Card.

Troubleshooting

The STX-101 Expansion Crosspoint Card does not include any reset pushbuttons or LED indicators. It only assists the crosspoint card that is directly above it for those applications that require 51 or more audio ports up to the maximum of 100 audio ports. Therefore, check the crosspoint card directly above the STX-101 by referring to either the MTX-100 or MTX-200 Sections in this Maintenance Manual.

The STX-101 is a card containing crosspoint switches to expand a MTX-100 or MTX-200 from a 2 X 50 to a 2 X 100 set of switches per slot. The STX-101 has no active logic other than that needed to control the CMOS switches. The STX-101 is controlled by its companion MTX card directly above it. For smooth control during turn-on and other "HOT PATCH" situations the STX-101 has a sense line that senses the presence of a MTX card in the slot directly above it. If there is no MTX card installed directly above it in the frame the STX-101 will disable all of its talk switches until a MTX card is present. Also, this same sense line is used to inform the MTX card that a STX card is present.

STX-101

STX-101

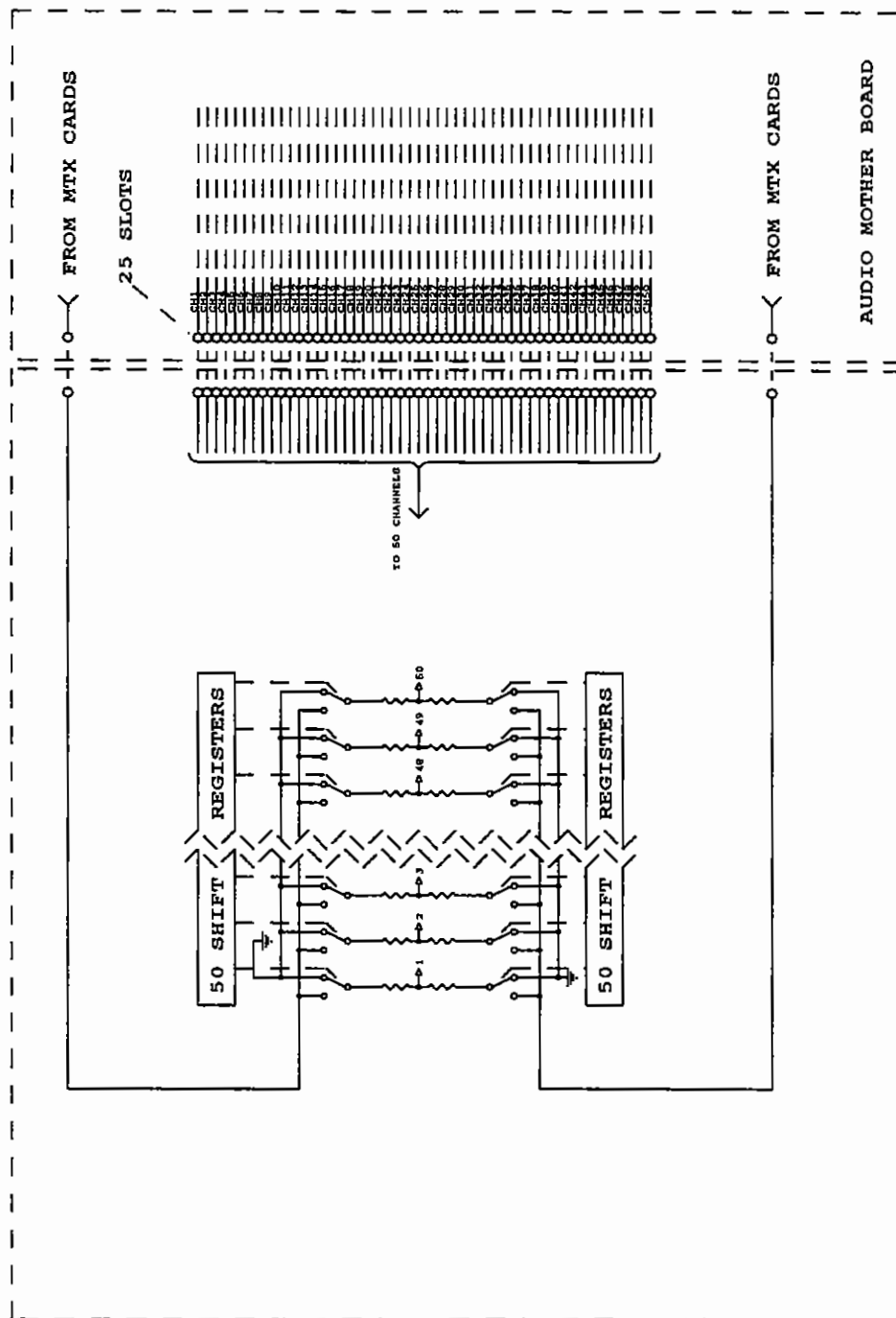


FIGURE M5-1 Block Diagram - STX-101

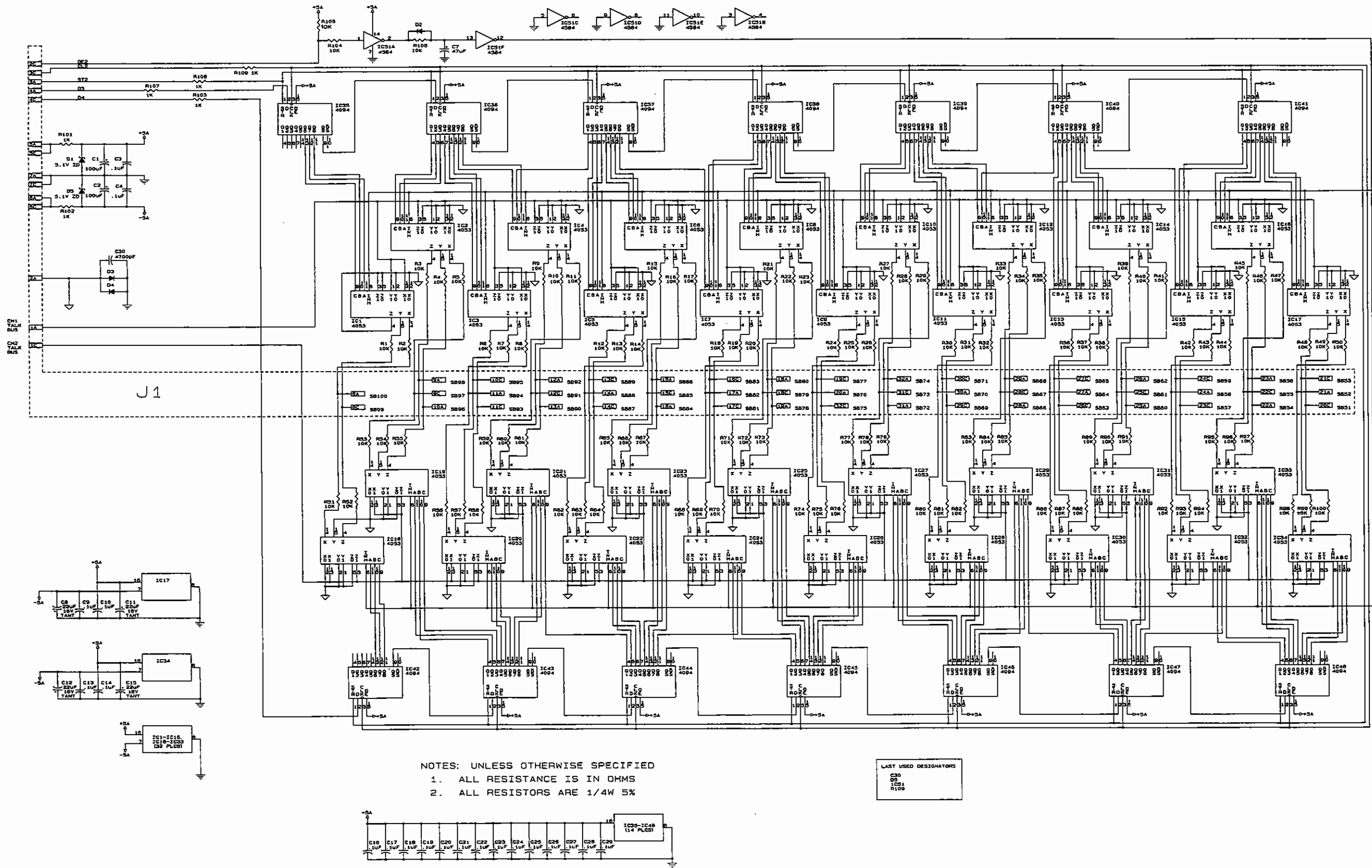


FIGURE M5-2 Schematic - STX-101 PCB, Rev. B

STX-101

STX-101

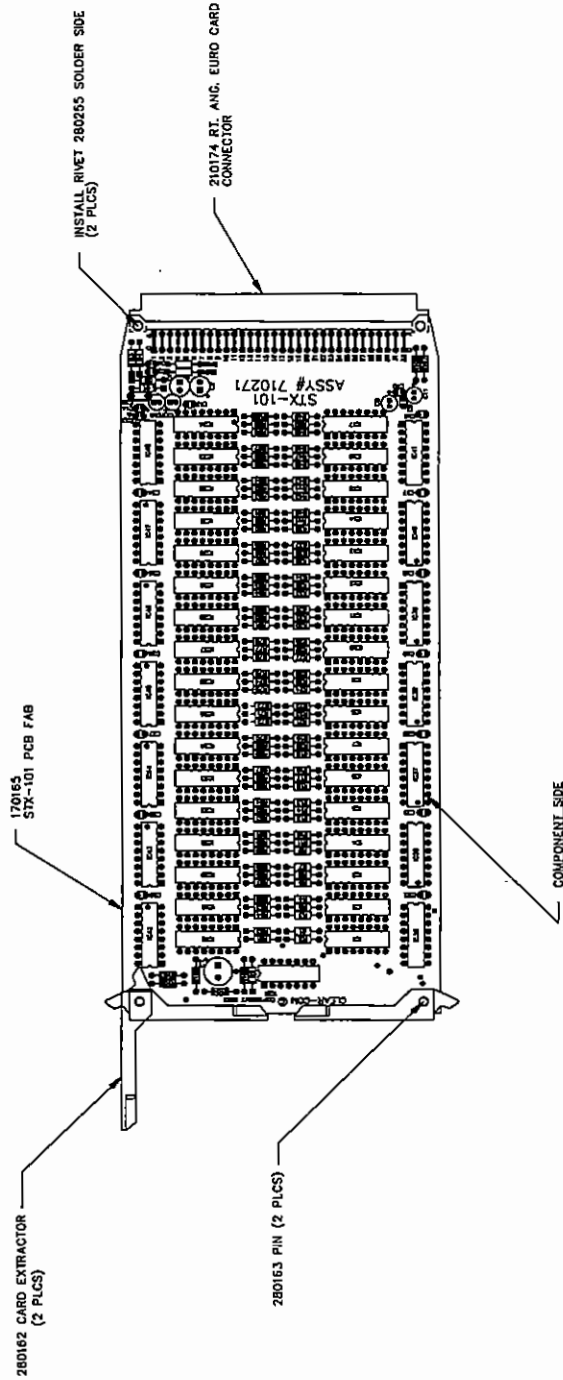


FIGURE M5-3 Assembly Drawing - STX-101, Rev. B

Bill of Materials for the STX-101 PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
0.0047	uF	Ceramic Disc	50V	10%	150016	C30
0.1	uF	Monolithic	50V	10%	150035	C3 C4 C9 C10 C13 C14 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29
22	uF	Aluminum	16V		150010	C8 C11 C12 C15
47	uF	Aluminum	35V		150081	C7
100	uF	Aluminum	25V	20%	150099	C1 C2

Resistors & Resistor Packs

Value		Power	Type	Tol.	Part #	Designator
1K	OHM	1/4	Carbon Film	5%	410010	R101 R102 R103 R107 R108 R109
10K	OHM	1/4	Carbon Film	5%	410016	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R100 R104 R105 R106

STX-101

Bill of Materials for the STX-101 PCB ----- cont.

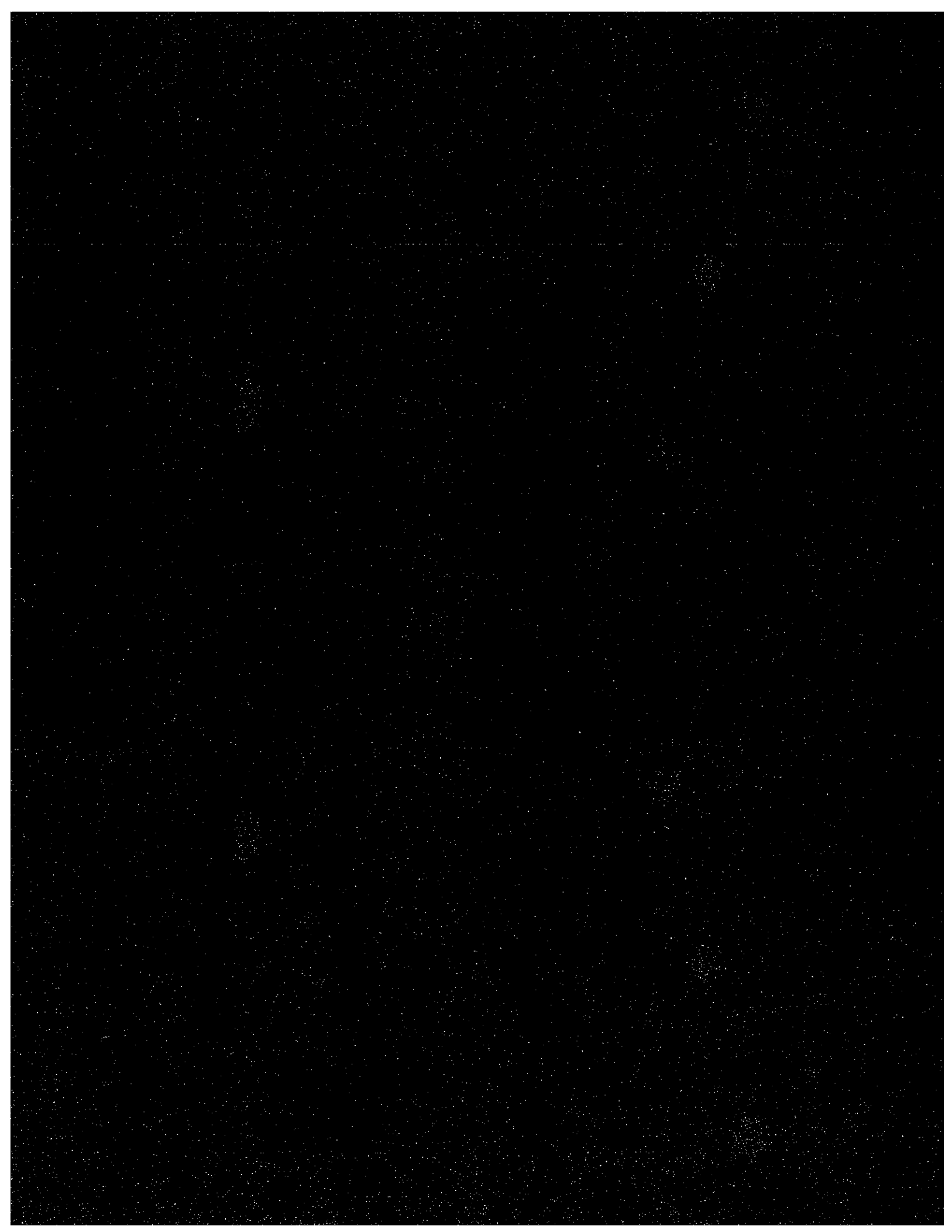
Diodes and Transistors

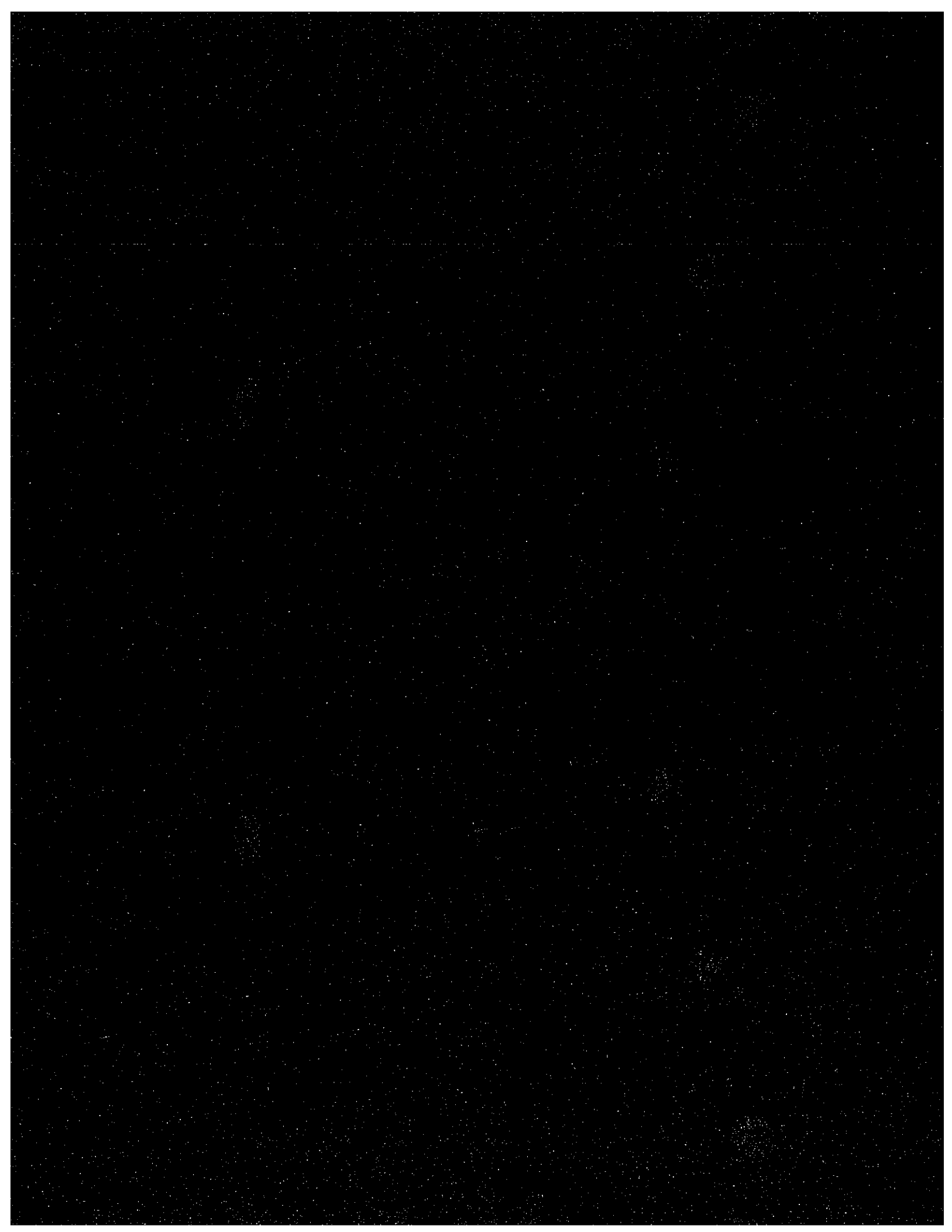
Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D2 D3 D4
Diode	1N5231B ZENER 5.1V .5W 5%	480038	D1 D5

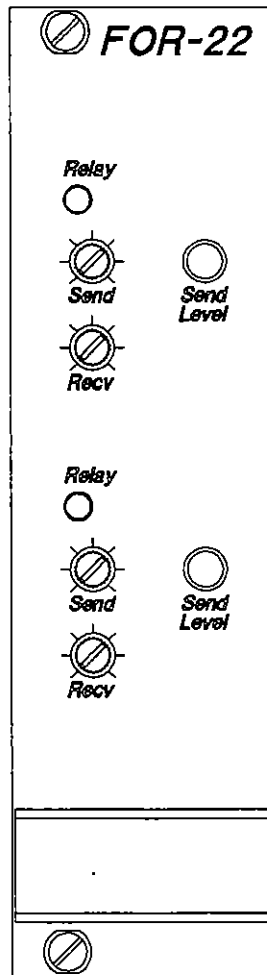
Integrated Circuits

Device	Description	Part #	Designator
Analog Switch	4053 TRIPLE 2CH ANALOG SW	480127	IC1 IC2 IC3 IC4 IC5 IC6 IC7 IC8 IC9 IC10 IC11 IC12 IC13 IC14 IC15 IC16 IC17 IC18 IC19 IC20 IC21 IC22 IC23 IC24 IC25 IC26 IC27 IC28 IC29 IC30 IC31 IC32 IC33 IC34 IC34
Logic Chip	4584B CMOS HEX SCMITT TRIG	480090	IC51
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC35 IC36 IC37 IC38 IC39 IC40 IC41 IC42 IC43 IC44 IC45 IC46 IC47 IC48

STX-101







Matrix Plus II System

FOR-22

DUAL 4-WIRE INTERFACE MODULE

Introduction

This Section provides block diagrams, schematics, assembly drawings and component lists for the FOR-22 Dual 4-Wire Interface Module.

FOR-22

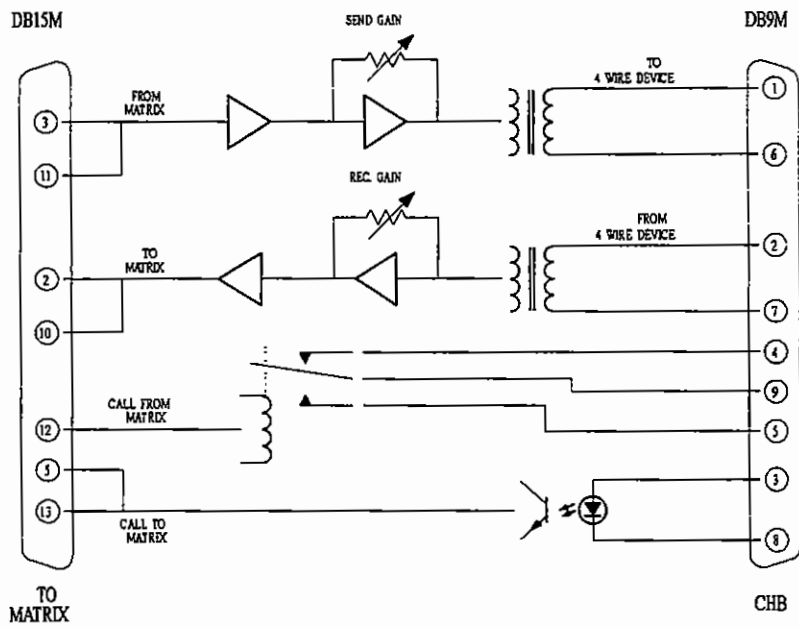
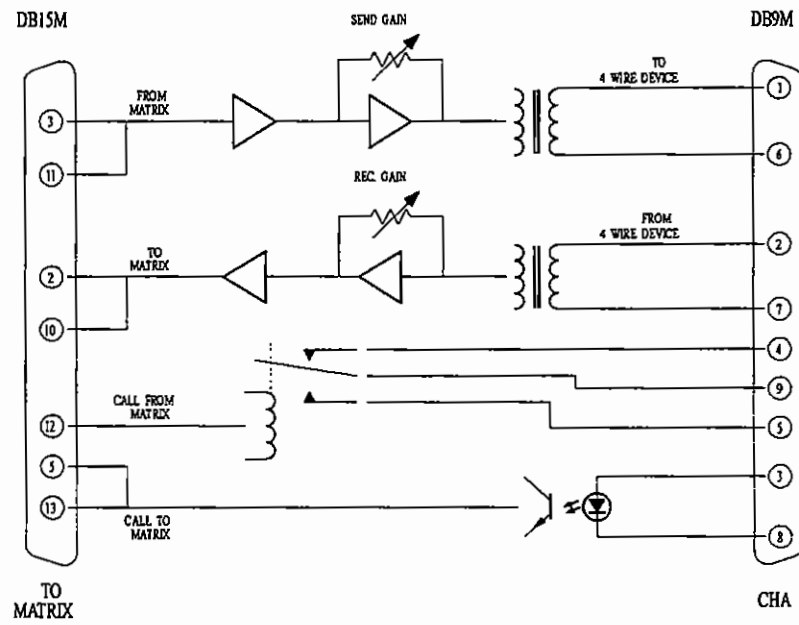


FIGURE I1-1 Block Diagram - FOR-22

NOTES:

1. THIS DRAWING DEPICTS ONE HALF OF THE ACTUAL CIRCUITRY
2. AS A DUAL INTERFACE TWO SETS OF IDENTICAL CIRCUITS ARE AVAILABLE CHANNEL 1 - "A" SIDE OF CONNECTOR (100 SERIES DESIGNATORS) CHANNEL 2 - "C" SIDE OF CONNECTOR (200 SERIES DESIGNATORS)
3. +/- BVDC SOURCE IS COMMON FOR BOTH CHANNELS
4. ALL RESISTORS ARE 1/4W, 5% IN UNITS OF OHMS UNLESS OTHERWISE SPECIFIED
5. ALL CAPACITORS ARE IN UNITS OF MICROFARADS UNLESS OTHERWISE SPECIFIED
6. ALL DIODES ARE 1N4148 UNLESS OTHERWISE SPECIFIED

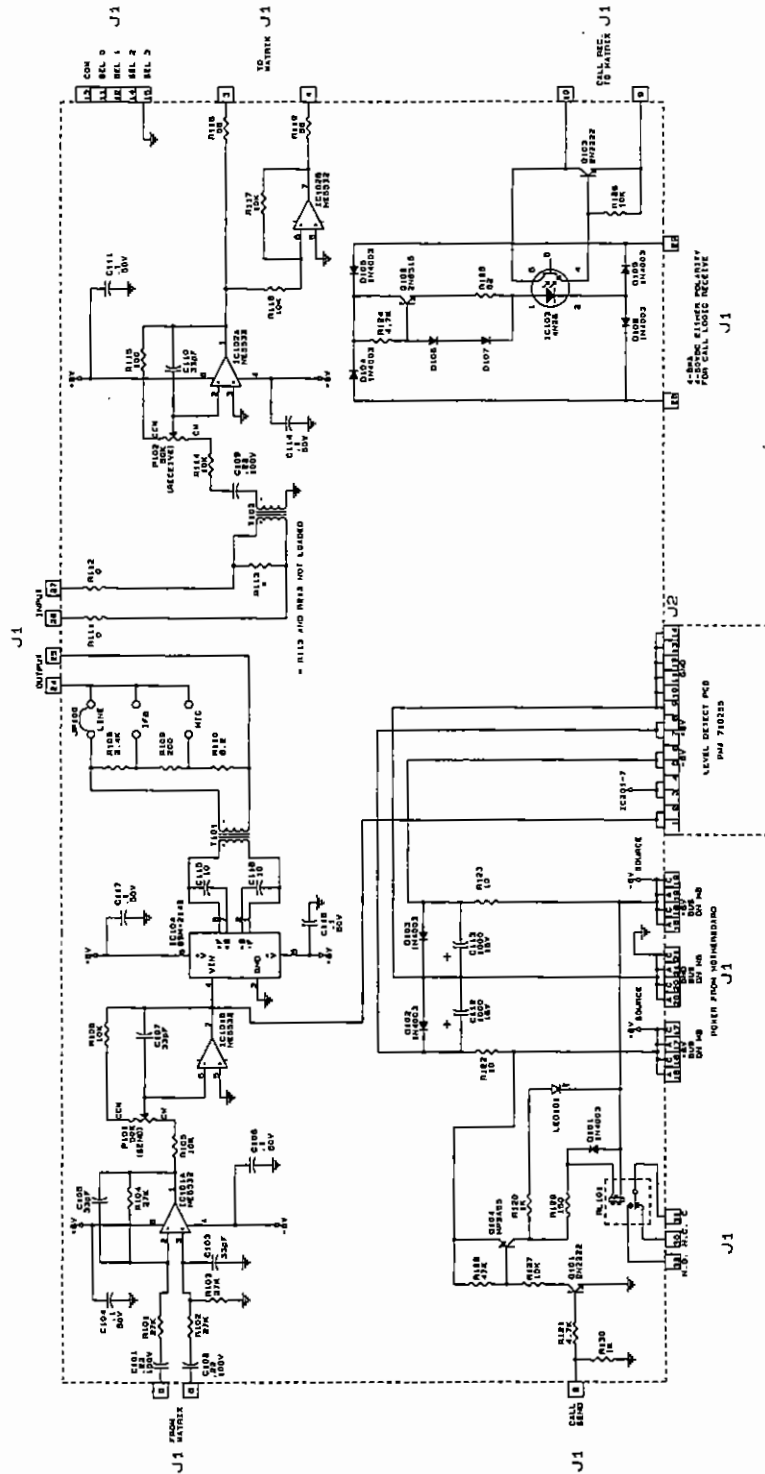


FIGURE I1-2 Schematic - FOR-22 Interface, Rev. A

FOR-22

FOR-22

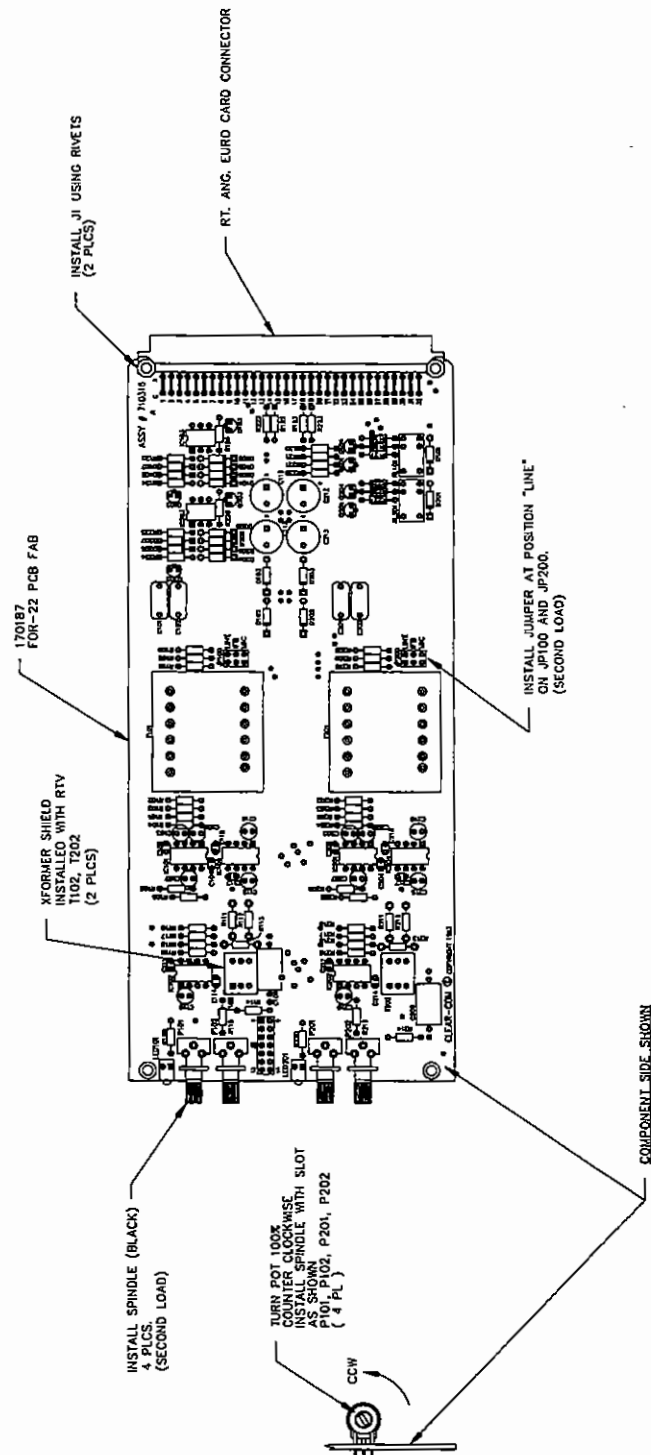


FIGURE I1-3 Assembly Drawing - FOR-22 Main PCB, Rev. A

Bill of Materials for the For-22 Module PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
33 pF	Monolithic	50V	10%	150128	C103 C105 C107 C110 C203 C205 C207 C210
0.1 uF	Monolithic	50V	10%	150035	C104 C106 C111 C114 C117 C118 C204 C206 C211 C214 C217 C218
0.22 uF	Mylar	V	10%	150134	C109 C209
0.22 uF	Mylar	100V	20%	150003	C101 C102 C201 C202
10 uF	Aluminum	35V	10%	150072	C115 C116 C215 C216
1000 uF	Aluminum	16V		150145	C112 C113 C212 C213

FOR-22

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
8.2 OHM	1/4	Carbon Film	5%	410166	R110 R210
10 OHM	1/4	Carbon Film	5%	410002	R122 R123 R222 R223
56 OHM	1/4	Carbon Film	5%	410135	R118 R119 R218 R219
82 OHM	1/4	Carbon Film	5%	410038	R125 R225
100 OHM	1/4	Carbon Film	5%	410071	R115 R215
150 OHM	1/4	Carbon Film	5%	410006	R129 R229
200 OHM	1/4	Carbon Film	5%	410072	R109 R209
1K OHM	1/4	Carbon Film	5%	410010	R120 R130 R220 R230
2.4K OHM	1/4	Carbon Film	5%	410103	R108 R208
4.7K OHM	1/4	Carbon Film	5%	410013	R121 R124 R221 R224
10K OHM	1/4	Carbon Film	5%	410016	R105 R106 R114 R116 R117 R126 R127 R205 R206 R214 R216 R217 R226 R227
27K OHM	1/4	Carbon Film	5%	410022	R101 R102 R103 R104 R201 R202 R203 R204
47K OHM	1/4	Carbon Film	5%	410021	R128 R228

Bill of Materials for the For-22 Module PCB ---- cont.

Diodes and Transistors

FOR-22

Device	Description	Part #	Designator
Diode	1N4003 RECT 1A 200PIV	480058	D101 D102 D103 D104 D105 D108 D109 D201 D202 D203 D204 D205 D208 D209
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D106 D107 D206 D207
Transistor	2N2222 NPN 30V	480006	Q101 Q103 Q201 Q203
Transistor	2N6515 NPN 250V	480059	Q102 Q202
Transistor	MPS-A55 PNP 60V	480050	Q104 Q204

Integrated Circuits

Device	Description	Part #	Designator
Analog IC	4N26 OPTO COMPILER	480106	IC103 IC203
Analog IC	SSM-2142 BAL DRIVER 8 PIN DIP	480198	IC104 IC204
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC101 IC102 IC201 IC202

Miscellaneous

Device	Description	Part #	Designator
LED	T1 RT ANG 5mA AMBER	390029	LED101 LED201
Pot	50K TRIMPOT	470059	P101 P102 P201 P202
Relay	SPDT 12V MINI PC RELAY	450006	RL101 RL201
Transformer	10K:10K MINIATURE	560034	T102 T202
Transformer	AUDIO XFMR 600:600	560036	T101 T201

FOR-22

FOR-22

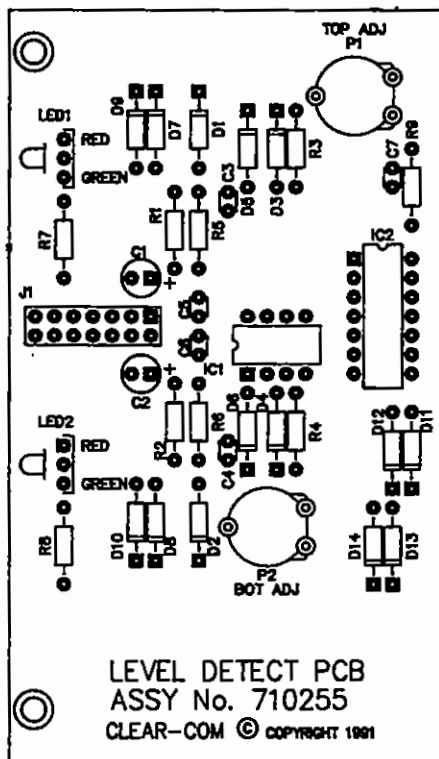


FIGURE I1-4 Assembly Drawing - FOR-22 Level Detect PCB, Rev. B

Bill of Materials for the FOR-22 LED PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
0.1 uF	Monolithic	50V	10%	150035	C5 C6 C7
0.22 uF	Monolithic	50V	20%	150133	C3 C4
0.47 uF	Aluminum	50V		150024	C1 C2

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
220 OHM	1/4	Carbon Film	5%	410007	R7 R8
24K OHM	1/4	Carbon Film	5%	410083	R3 R4
47K OHM	1/4	Carbon Film	5%	410021	R1 R2 R9
330K OHM	1/4	Carbon Film	5%	410033	R5 R6

Diodes and Transistors

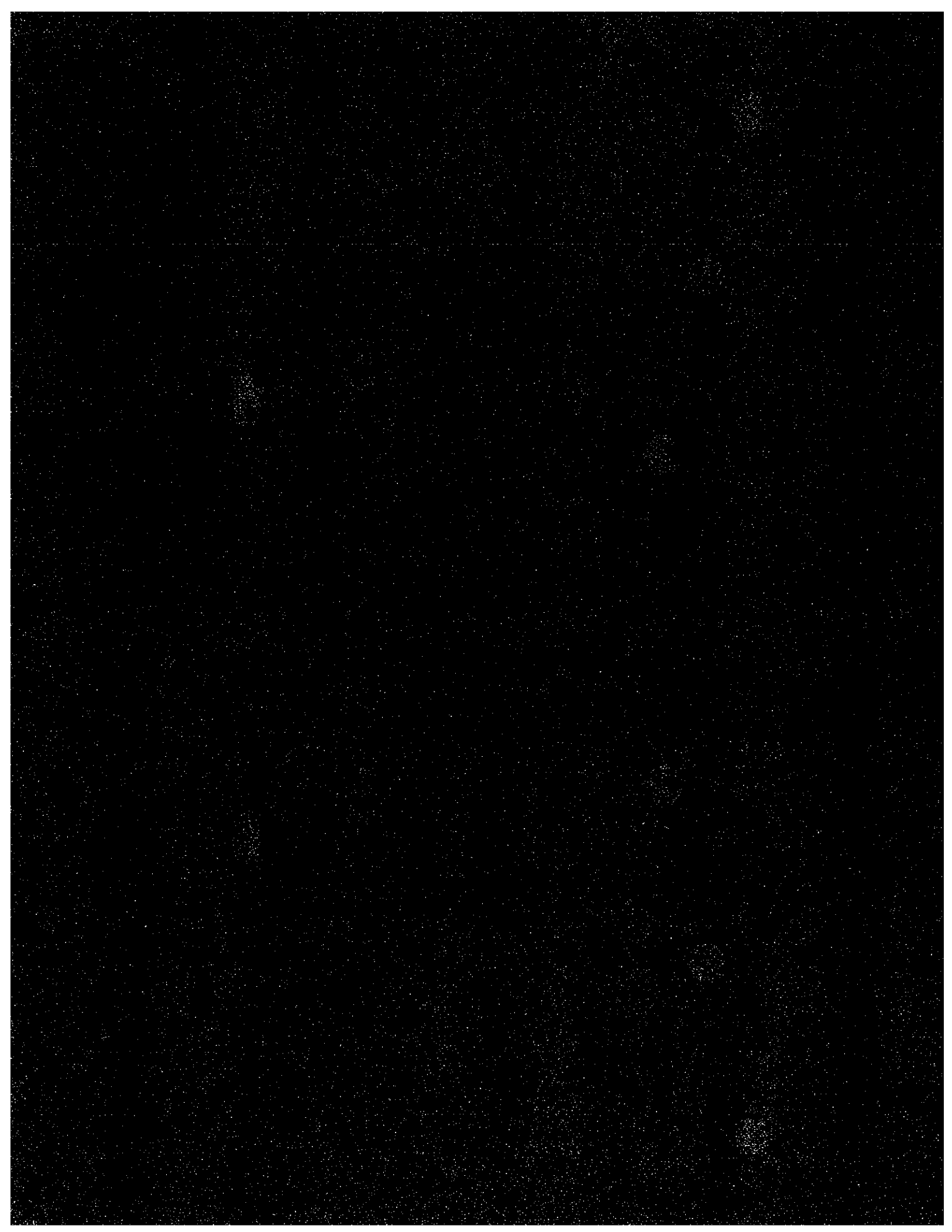
Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14

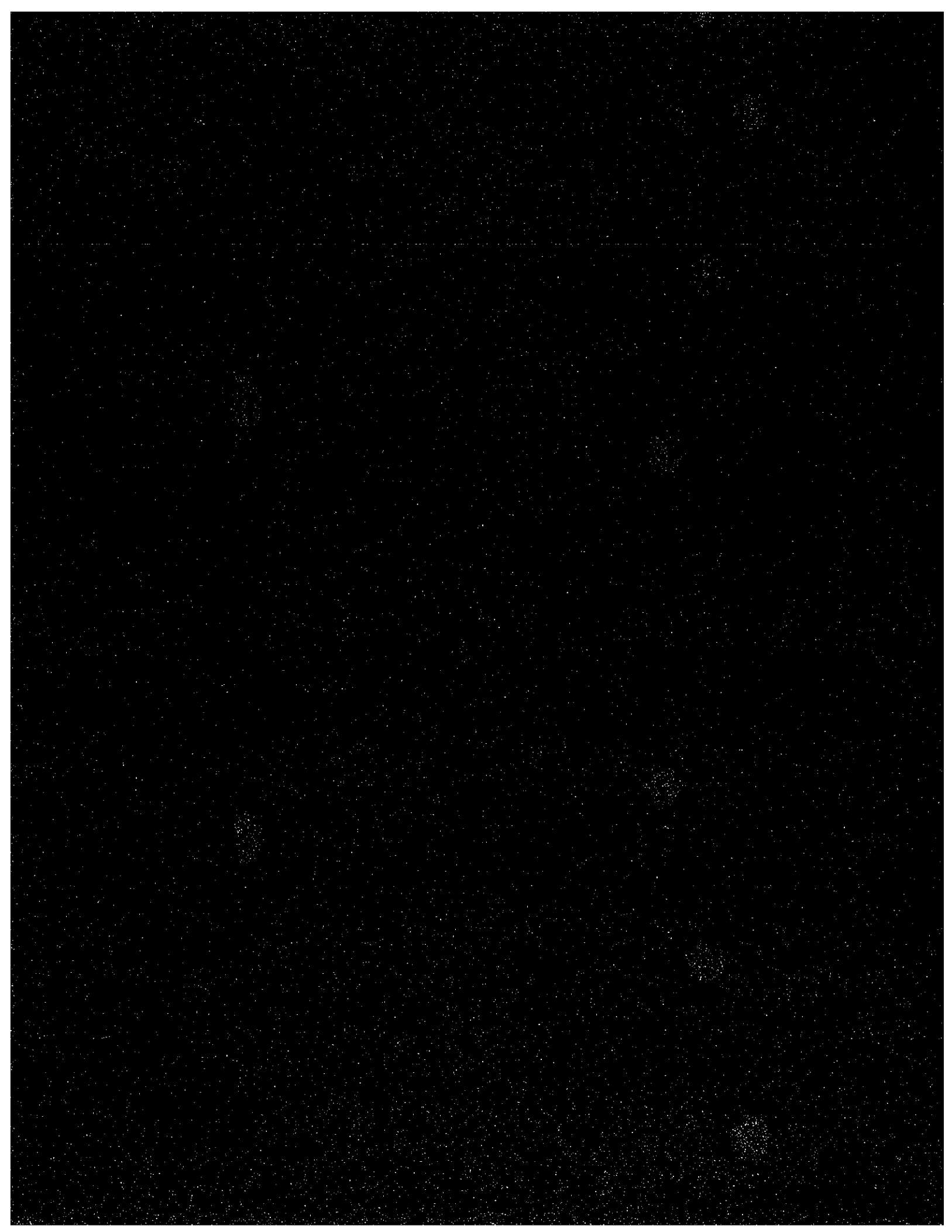
Integrated Circuits

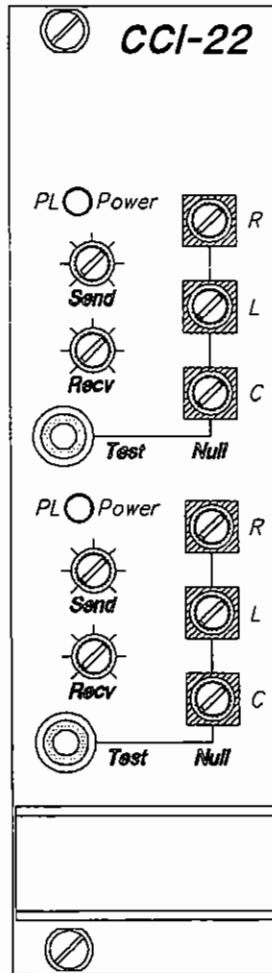
Device	Description	Part #	Designator
Op Amp	LM324 QUAD CMN OP AMP	480063	IC2
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC1 IC1

Miscellaneous

Device	Description	Part #	Designator
POT	100K TRIM POT	470050	P1 P2
LED	BI-COLOR RED/GREEN 3 LEAD	390032	LED1 LED2







Matrix Plus II System

CCI-22

DUAL PARTY-LINE INTERFACE MODULE

Introduction

This Section provides schematics, assembly drawings and component lists for the CCI-22 Dual Party-Line Interface Module.

CCI-22

CCI-22

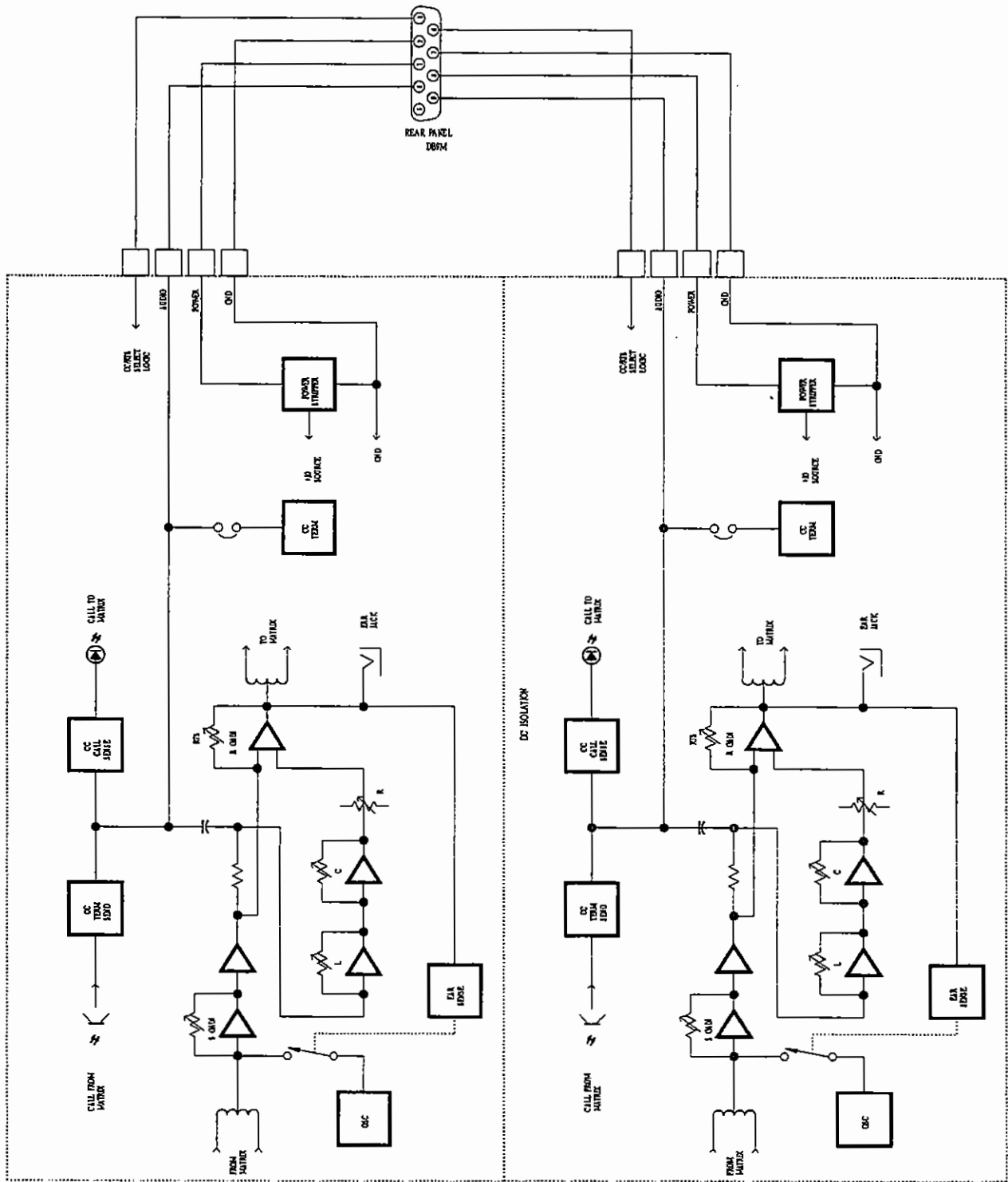


FIGURE I2-1 Block Diagram - CCI-22 Interface

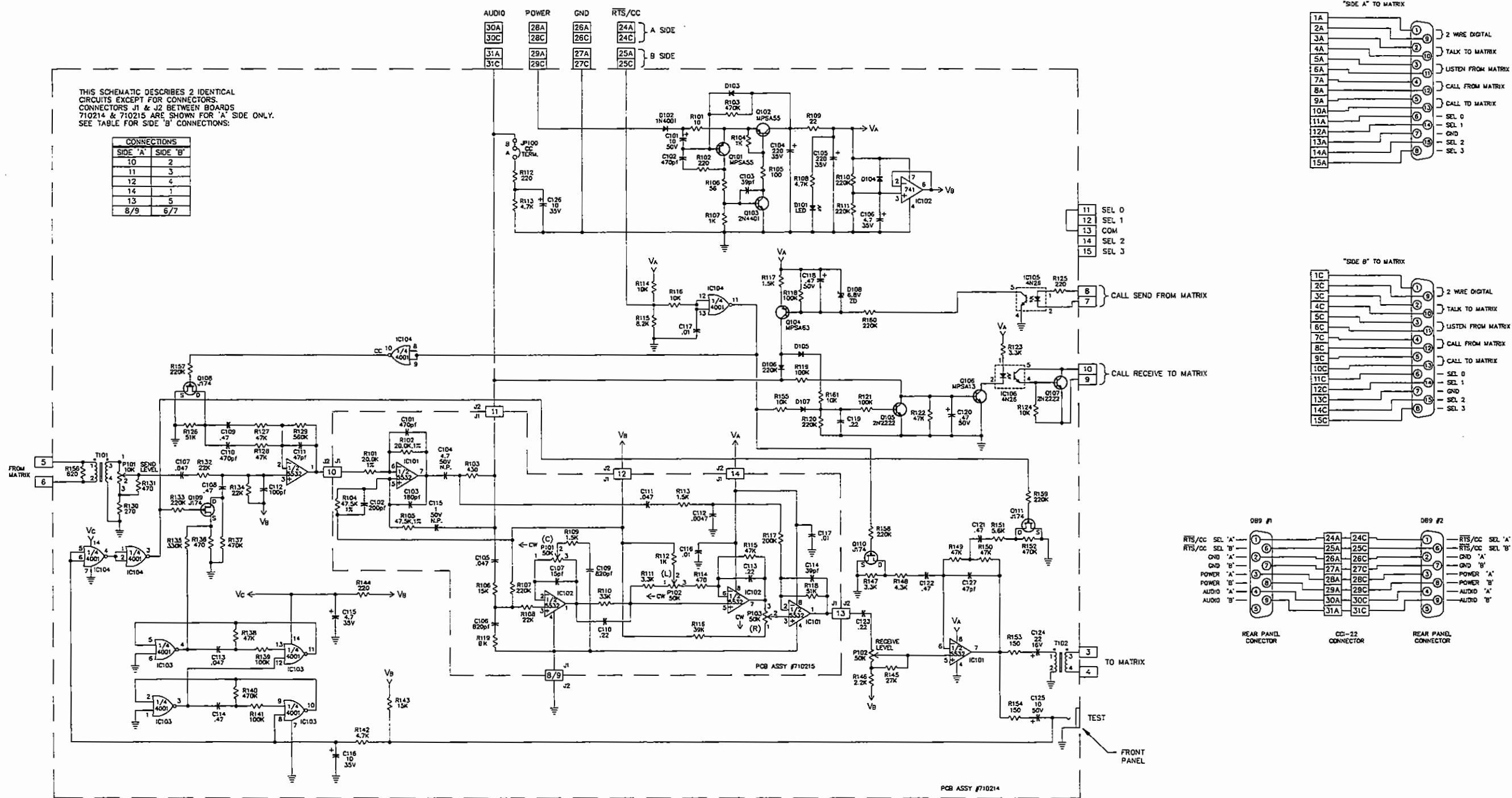


FIGURE I2-2 Schematic - CCI-22 Interface, Rev. A

CCI-22

CCI-22

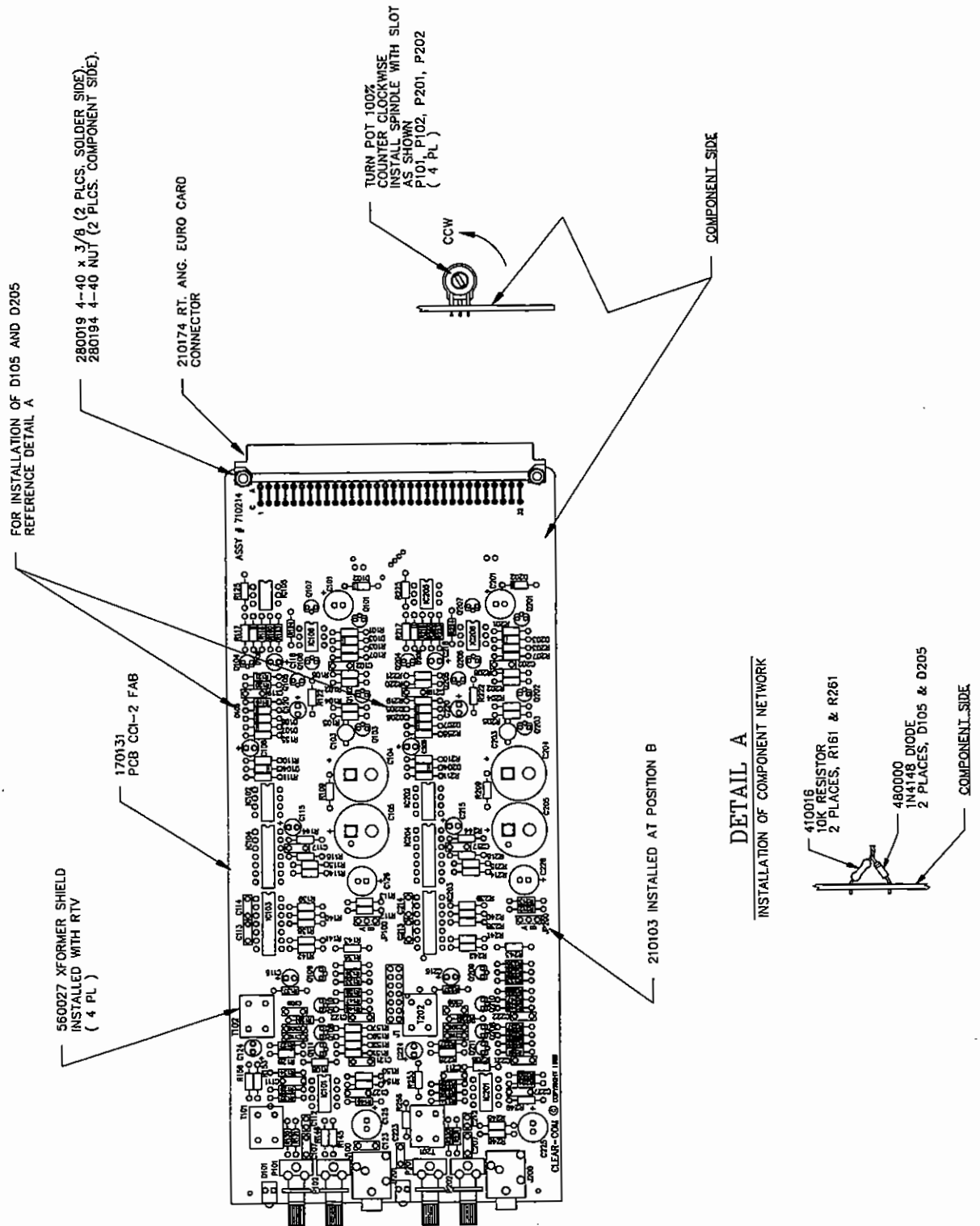


FIGURE 12-3 Assembly Drawing - CCI-22 Main PCB, Rev. D

Bill of Materials for the CCI-22 Module PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
39 pF	Ceramic Disc	50V	5%	150026	C103 C203
47 pF	Ceramic Disc	50V	10%	150041	C111 C127 C211 C227
100 pF	Monolithic	50V	20%	150104	C112 C212
470 pF	Ceramic Disc	50V	10%	150014	C102 C110 C202 C210
0.01 uF	Ceramic Disc	30V	20%	150012	C117 C217
0.047 uF	Monolithic	50V	10%	150078	C107 C113 C207 C213
0.22 uF	Monolithic	100V		150080	C119 C123 C219 C223
0.47 uF	Aluminum	50V		150024	C118 C120 C218 C220
0.47 uF	Monolithic	50V		150043	C108 C109 C114 C121 C122 C208 C209 C214 C221 C222
4.7 uF	Tantalum	35V		150044	C106 C115 C206 C215
10 uF	Aluminum	50V		150064	C101 C116 C125 C126 C201 C216 C225 C226
22 uF	Aluminum	16V		150010	C124 C224
220 uF	Aluminum	35V		150021	C104 C105 C204 C205

CCI-22

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
10 OHM	1/4	Carbon Film	5%	410002	R101 R201
22 OHM	1/4	Carbon Film	5%	410004	R109 R209
56 OHM	1/4	Carbon Film	5%	410135	R106 R206
100 OHM	1/4	Carbon Film	5%	410071	R105 R205
150 OHM	1/4	Carbon Film	5%	410006	R153 R154 R253 R254
220 OHM	1/4	Carbon Film	5%	410007	R102 R112 R125 R144 R202 R212 R225 R244
270 OHM	1/4	Carbon Film	5%	410009	R130 R230
470 OHM	1/4	Carbon Film	5%	410042	R131 R136 R231 R236
620 OHM	1/4	Carbon Film	5%	410054	R156 R256
1K OHM	1/4	Carbon Film	5%	410010	R104 R107 R204 R207
1.5K OHM	1/4	Carbon Film	5%	410055	R117 R217
2.2K OHM	1/4	Carbon Film	5%	410011	R146 R246
3.3K OHM	1/4	Carbon Film	5%	410015	R123 R147 R223 R247
4.3K OHM	1/4	Carbon Film	5%	410158	R148 R248
4.7K OHM	1/4	Carbon Film	5%	410013	R108 R113 R142 R208 R213 R242
5.6K OHM	1/4	Carbon Film	5%	410056	R151 R251
8.2K OHM	1/4	Carbon Film	5%	410037	R115 R215

Bill of Materials for the CCI-22 Module PCB ---- cont.

10K	OHM	1/4	Carbon Film	5%	410016	R114 R116 R124 R155 R161 R214 R216 R224 R255 R261
15K	OHM	1/4	Carbon Film	5%	410017	R143 R243
22K	OHM	1/4	Carbon Film	5%	410018	R132 R134 R232 R234
27K	OHM	1/4	Carbon Film	5%	410022	R145 R245
47K	OHM	1/4	Carbon Film	5%	410021	R122 R127 R128 R138 R149 R150 R222 R227 R228 R238 R249 R250
51K	OHM	1/4	Carbon Film	5%	410136	R126 R226
100K	OHM	1/4	Carbon Film	5%	410024	R118 R119 R121 R139 R141 R218 R219 R221 R239 R241
220K	OHM	1/4	Carbon Film	5%	410028	R110 R111 R120 R133 R157 R158 R159 R160 R210 R211 R220 R233 R257 R258 R259 R260
330K	OHM	1/4	Carbon Film	5%	410033	R135 R235
470K	OHM	1/4	Carbon Film	5%	410030	R103 R137 R140 R152 R203 R237 R240 R252
560K	OHM	1/4	Carbon Film	5%	410034	R129 R229

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Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D102 D104 D202 D204
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D103 D105 D106 D107 D203 D205 D206 D207
Diode	1N957B ZENER 6.8V .4W 5%	480026	D108 D208
Transistor	2N2222 NPN 30V	480006	Q105 Q107 Q205 Q207
Transistor	2N4401 NPN 40V	480047	Q103 Q203
Transistor	J174 JFET PCHAN 8V VGS	480079	Q108 Q109 Q110 Q111 Q208 Q209 Q210 Q211
Transistor	MPS-A13 NPN 30V DARL	480004	Q106 Q206
Transistor	MPS-A55 PNP 60V	480050	Q101 Q102 Q201 Q202
Transistor	MPS-A63 PNP 30V DARL	480008	Q104 Q204

Bill of Materials for the CCI-22 Module PCB ---- cont.**Integrated Circuits**

Device	Description	Part #	Designator
Analog IC	4N26 OPTO COMPILER	480106	IC105 IC106 IC205 IC206
Logic Chip	4001 CMOS QUAD 2 IN NOR	480112	IC103 IC104 IC203 IC204
Op Amp	LM741 IC OP AMP 8-PIN DIP	480018	IC102 IC202
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC101 IC201

Miscellaneous

Device	Description	Part #	Designator
Connector	3 COND MINI PHONE JACK	210128	J100 J200
LED	T1 RT ANG 5mA GREEN	390028	D101 D201
Pot	10K TRIMPOT	470058	P101 P201
Pot	50K TRIMPOT	470059	P102 P202
Transformer	600 OHM 1:1 AUDIO TRANS	560026	T101 T102 T201 T202

CCI-22

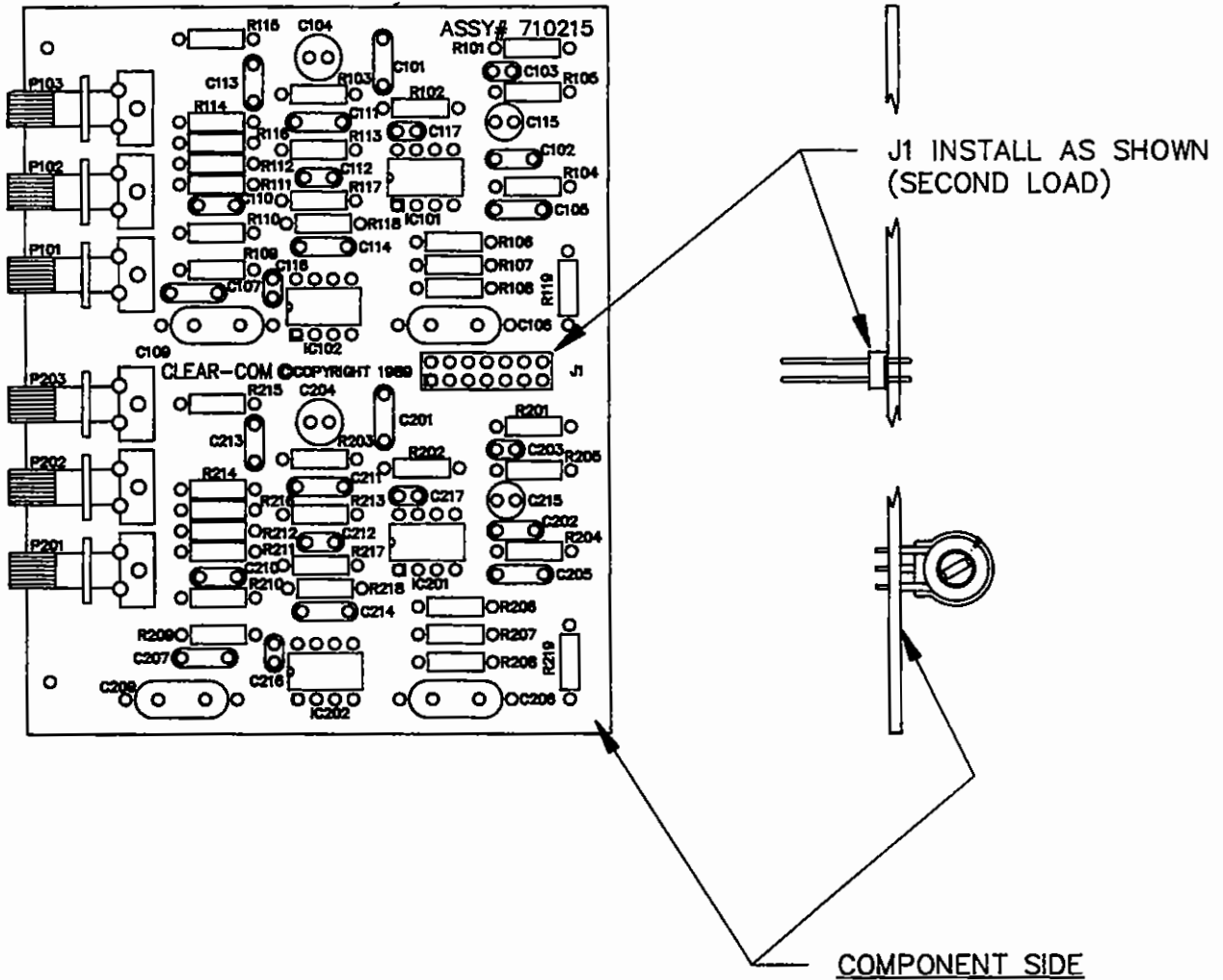


FIGURE I2-4 Assembly Drawing - CCI-22 Null PCB, Rev. D

Bill of Materials for the CCI-22 Null PCB

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
15 pF	Ceramic Disc	1000V	10%	150013	C107 C207
39 pF	Ceramic Disc	50V	5%	150026	C114 C214
180 pF	Monolithic	50V		150144	C103 C203
200 pF	Ceramic Disc	50V	10%	150007	C102 C202
470 pF	Ceramic Disc	50V	10%	150014	C101 C201
820 pF	Ceramic Disc	50V	10%	150049	C106 C109 C206 C209
0.0047 uF	Mylar	50V	10%	150068	C112 C212
0.01 uF	Monolithic	50V	20%	150109	C116 C117 C216 C217
0.047 uF	Metal Polyester	50V	10%	150005	C105 C111 C205 C211
0.22 uF	Monolithic	100V		150080	C110 C113 C210 C213
1 uF	Aluminum	50V	10%	150002	C115 C215
4.7 uF	Aluminum	50V		150087	C104 C204

CCI-22

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
430 OHM	1/4	Carbon Film	5%	410106	R103 R203
470 OHM	1/4	Carbon Film	5%	410042	R114 R214
1K OHM	1/4	Carbon Film	5%	410010	R112 R212
1.5K OHM	1/4	Carbon Film	5%	410055	R109 R113 R209 R213
3.3K OHM	1/4	Carbon Film	5%	410015	R111 R211
15K OHM	1/4	Carbon Film	5%	410017	R106 R206
20.0K OHM	1/4	Carbon Film	1%	410086	R101 R102 R201 R202
22K OHM	1/4	Carbon Film	5%	410018	R108 R208
33K OHM	1/4	Carbon Film	5%	410020	R110 R210
39K OHM	1/4	Carbon Film	5%	410019	R116 R216
47K OHM	1/4	Carbon Film	5%	410021	R115 R215
47.5K OHM	1/8	Carbon Film	1%	410105	R104 R105 R204 R205
51K OHM	1/4	Carbon Film	5%	410136	R118 R218
200K OHM	1/4	Carbon Film	5%	410109	R117 R217
220K OHM	1/4	Carbon Film	5%	410028	R107 R207

Bill of Materials for the CCI-22 Null PCB ---- cont.

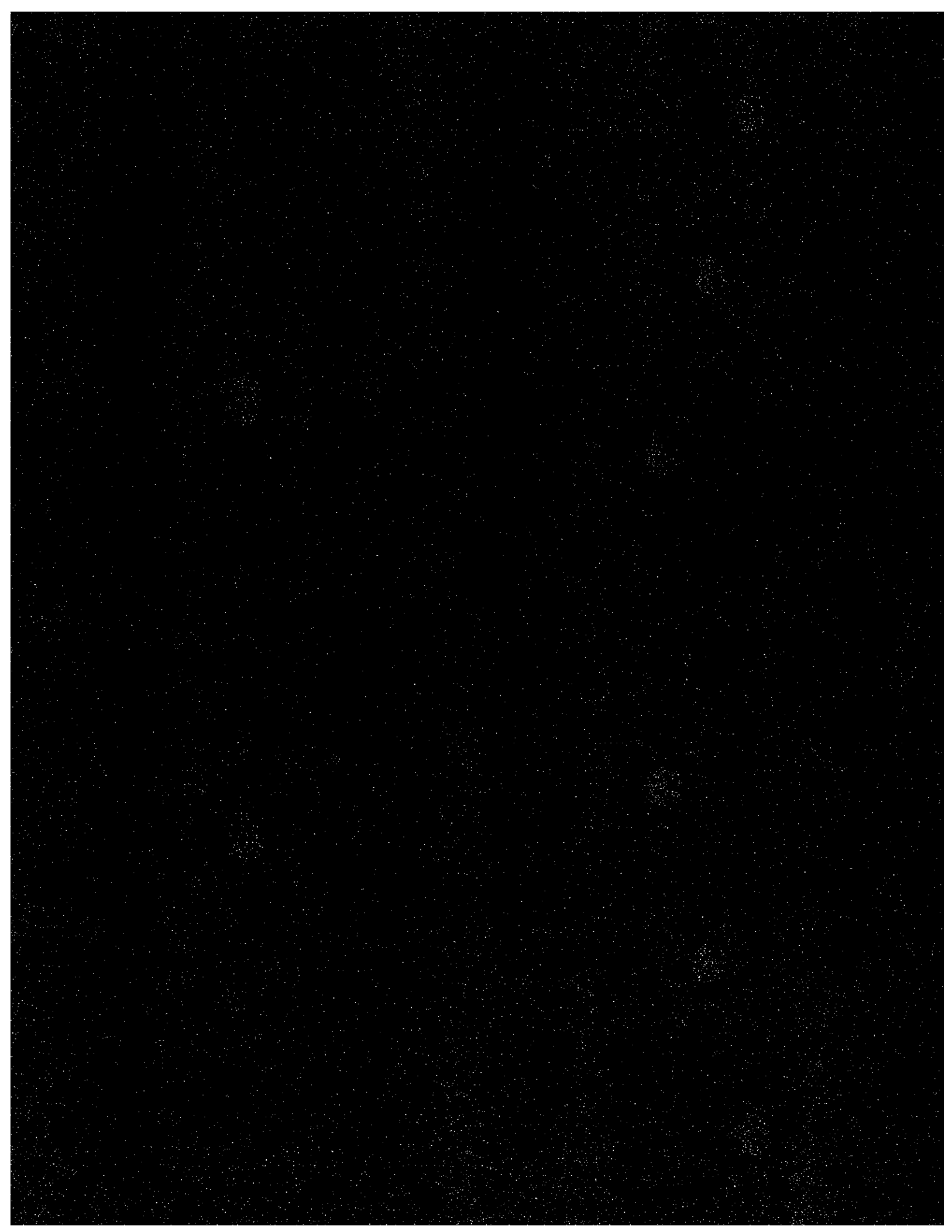
Integrated Circuits

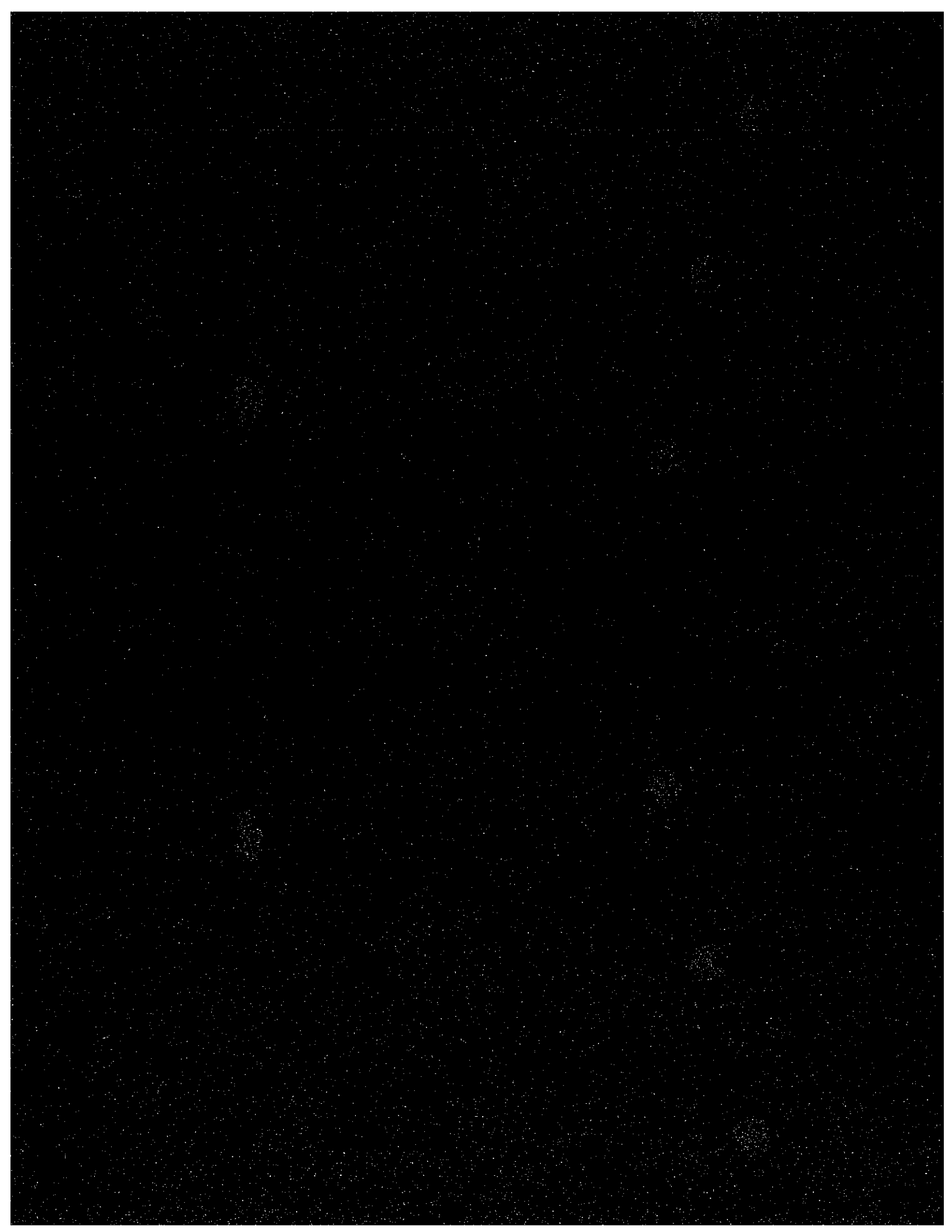
Device	Description	Part #	Designator
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC101 IC102 IC201 IC202

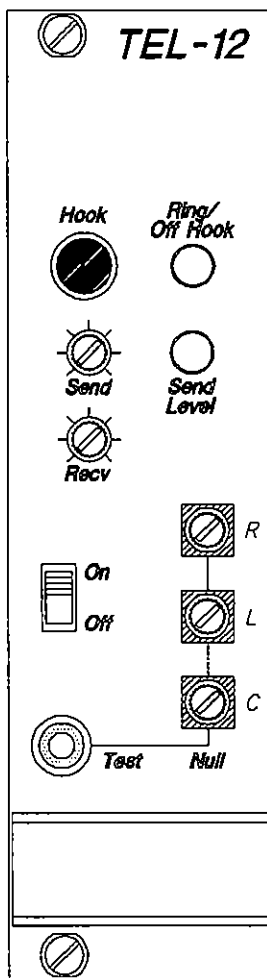
Miscellaneous

Device	Description	Part #	Designator
P101 P102 P103 P201 P202 P203	50K TRIMPOT PIHER#PT10WH-50K	470059	
240057	PIHER TRIMPOT SHAFT #5116 GREY FOR PT10		

CCI-22







Matrix Plus II System

TEL-12

TELEPHONE INTERFACE MODULE

Introduction

This Section provides block diagrams, schematics, assembly drawings and components list for the TEL-12 Telephone Interface Module.

TEL-12

TEL-12

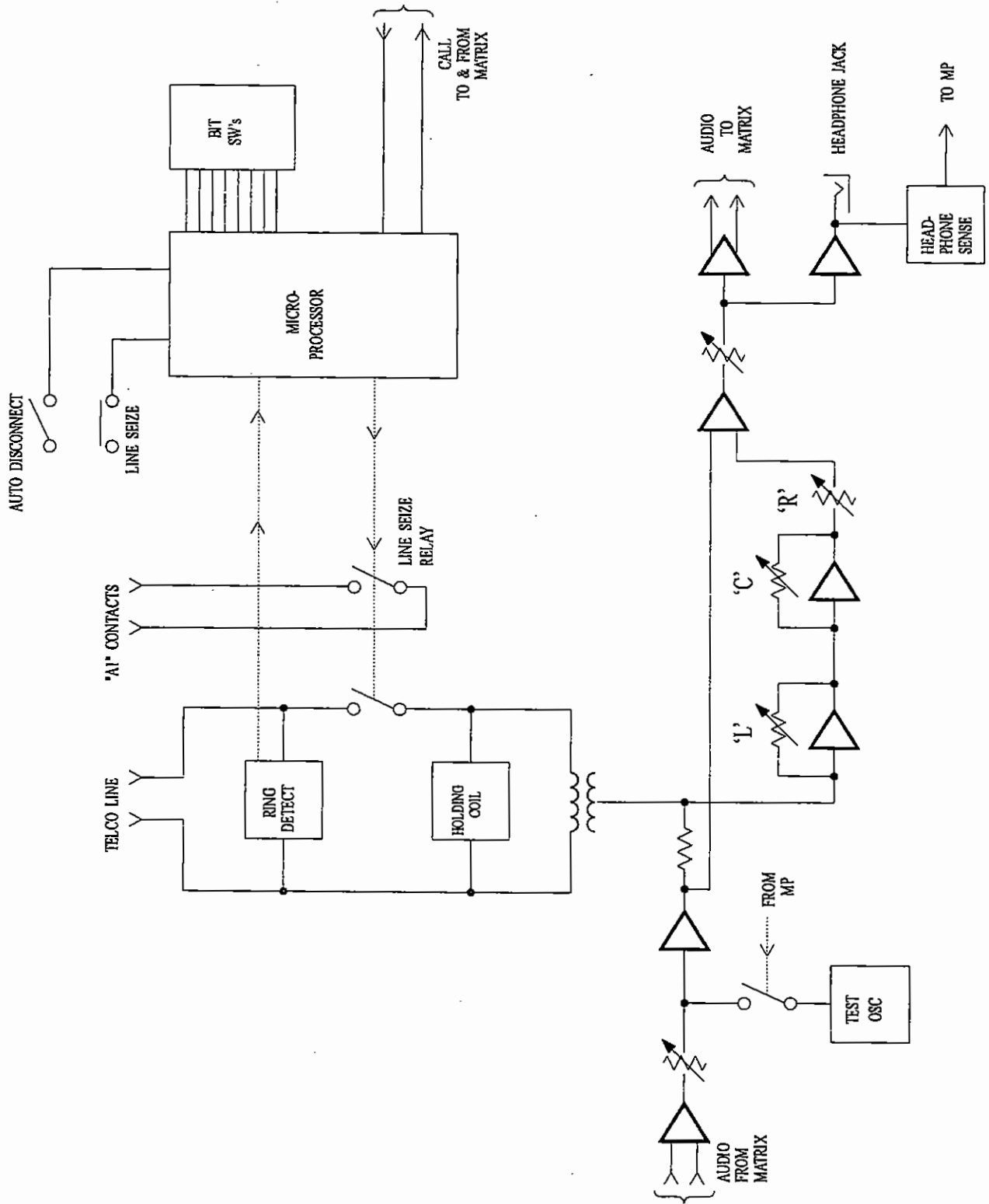
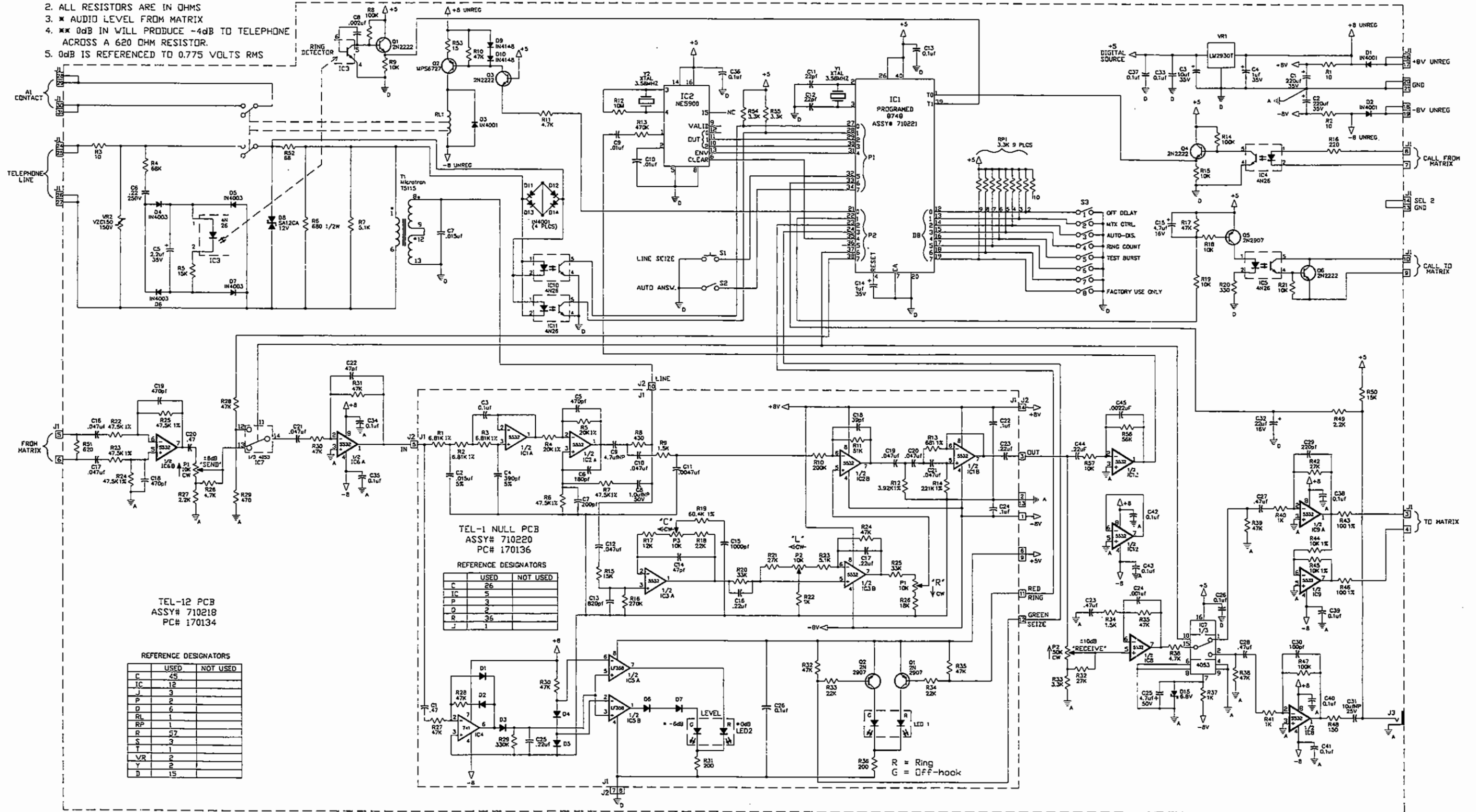


FIGURE I3-1 Block Diagram - TEL-12 Interface

NOTES: (UNLESS OTHERWISE SPECIFIED)

- 1. ALL RESISTORS ARE 1/4 WATT
- 2. ALL RESISTORS ARE IN OHMS
- 3. * AUDIO LEVEL FROM MATRIX
- 4. ** 0dB IN WILL PRODUCE -4dB TO TELEPHONE ACROSS A 620 OHM RESISTOR.
- 5. 0dB IS REFERENCED TO 0.775 VOLTS RMS



TEL-12 PCB
ASSY# 710218
PC# 170134

REFERENCE DESIGNATORS

	USED	NOT USED
C	45	
IC	12	
J	3	
P	2	
D	6	
RL	1	
RP	1	
R	57	
S	3	
T	1	
VR	2	
Y	2	
B	15	

TEL-1 NULL PCB
ASSY# 710220
PC# 170136

REFERENCE DESIGNATORS

	USED	NOT USED
C	26	
IC	5	
P	3	
D	2	
R	35	
J	1	

ALL J1 CONTACTS A+C SIDES TIED TOGETHER
J2 CONTACTS ARE NUMBERED:



FIGURE I3-2 Schematic - TEL-12 Interface, Rev. A

TEL-12

TEL-12

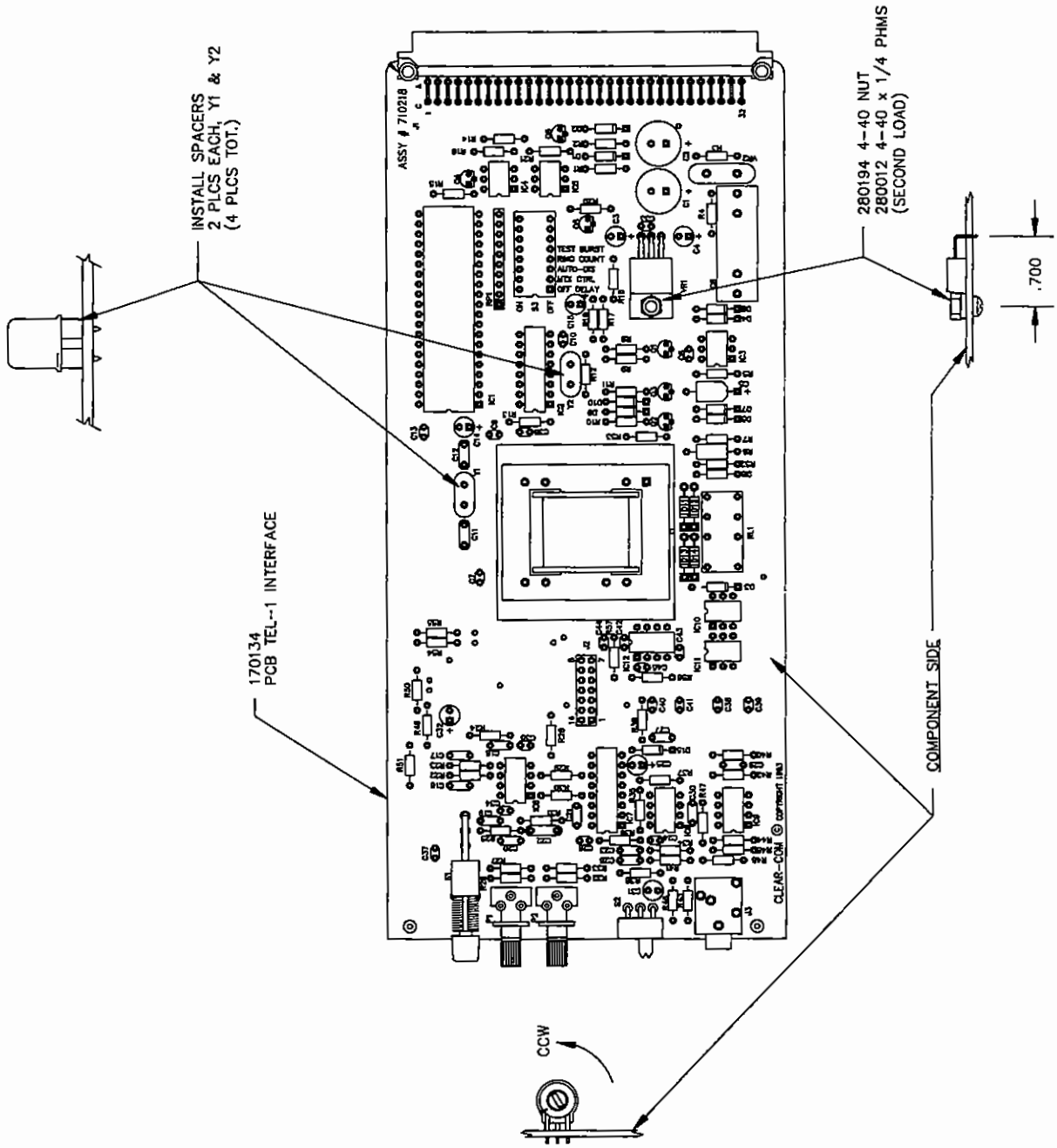


FIGURE I3-3 Assembly Drawing - TEL-12 Main PCB, Rev. D

Bill of Materials for the TEL-12 Module PCB

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
22 pF	Ceramic Disc	50V	10%	150098	C11 C12
47 pF	Ceramic Disc	50V	10%	150041	C22
100 pF	Ceramic Disc	50V	10%	150006	C30
220 pF	Monolithic	50V	10%	150074	C29
470 pF	Monolithic	50V	20%	150102	C18 C19
0.001 uF	Monolithic	50V	20%	150113	C24
0.0022 uF	Monolithic	50V	10%	150108	C8 C45
0.01 uF	Monolithic	50V	20%	150109	C9 C10
0.015 uF	Metal Polyester	50V	5%	150093	C7
0.047 uF	Metal Polyester	50V	10%	150005	C16 C17 C21
0.1 uF	Monolithic	100V	20%	150112	C13 C26 C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43
0.22 uF	Mylar	V	10%	150134	C6
0.22 uF	Monolithic	50V	20%	150133	C44
0.47 uF	Monolithic	50V		150043	C20 C23 C27 C28
1 uF	Tantalum	35V	20%	150116	C4 C14
2.2 uF	Tantalum	35V	10%	150019	C5
4.7 uF	Tantalum	16V		150030	C15 C25
10 uF	Aluminum	35V	10%	150072	C31
10 uF	Aluminum	50V		150064	C3
22 uF	Aluminum	16V		150010	C32
220 uF	Aluminum	35V		150021	C1 C2

TEL-12

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
		Varistor - 150V		480161	VR2
10 OHM	1/4	Carbon Film	5%	410002	R1 R2 R3
15 OHM	1/4	Carbon Film	5%	410003	R53
68 OHM	1/4	Carbon Film	5%	410057	R52
100 OHM	1/8	Metal Film	1%	410156	R43 R46
150 OHM	1/4	Carbon Film	5%	410006	R48
220 OHM	1/4	Carbon Film	5%	410007	R16
330 OHM	1/4	Carbon Film	5%	410061	R20
470 OHM	1/4	Carbon Film	5%	410042	R29
620 OHM	1/4	Carbon Film	5%	410054	R51
680 OHM	1/2	Carbon Film	5%	410165	R6
1K OHM	1/4	Carbon Film	5%	410010	R37 R40 R41

Bill of Materials for the TEL-12 Module PCB ---- cont.

1.5K	OHM	1/4	Carbon Film	5%	410055	R34
2.2K	OHM	1/4	Carbon Film	5%	410011	R27 R49
3.3K	OHM		X 9 SIP Bussed		415000	RP1
3.3K	OHM	1/4	Carbon Film	5%	410015	R33 R54 R55
4.7K	OHM	1/4	Carbon Film	5%	410013	R11 R26 R36
5.1K	OHM	1/4	Carbon Film	5%	410138	R7
10K	OHM	1/4	Metal Film	1%	410089	R44 R45
10K	OHM	1/4	Carbon Film	5%	410016	R9 R15 R18 R19 R21 R57
15K	OHM	1/4	Carbon Film	5%	410017	R5 R50
27K	OHM	1/4	Carbon Film	5%	410022	R32 R42
47K	OHM	1/4	Carbon Film	5%	410021	R10 R17 R28 R30 R31 R35 R38 R39
47.5K	OHM	1/8	Carbon Film	1%	410105	R22 R23 R24 R25
56K	OHM	1/4	Carbon Film	5%	410023	R56
68K	OHM	1/4	Carbon Film	5%	410025	R4
100K	OHM	1/4	Carbon Film	5%	410024	R8 R14 R47
470K	OHM	1/4	Carbon Film	5%	410030	R13
10M	OHM	1/4	Carbon Film	5%	410059	R12

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D1 D2 D3 D11 D12 D13 D14
Diode	1N4003 RECT 1A 200PIV	480058	D4 D5 D6 D7
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D9 D10
Diode	1N957B ZENER 6.8V .4W 5%	480026	D15
Diode	SA-12-CA ZENER 12V	480160	D8
Transistor	2N2222 NPN 30V	480006	Q1 Q3 Q4 Q6
Transistor	2N2907 OR 2N4143 PNP 30V	480007	Q5
Transistor	MPS6727 PNP 40V 1W TO-92	480096	Q2

Integrated Circuits

Device	Description	Part #	Designator
Analog IC	4N26 OPTO COMPILER	480106	IC3 IC4 IC5 IC10 IC11
Analog Switch	4053 TRIPLE 2CH SWITCH	480127	IC7
Interface Chip	NE5900 CALL PROG DECODE	480159	IC2
Op Amp	NE5532 DUAL OP AMP	480070	IC6 IC8 IC9 IC12
Regulator	LM2930T POS 5V TO220	480153	VR1

Bill of Materials for the TEL-12 Module PCB ---- cont.**Miscellaneous**

Device	Description	Part #	Designator
Connector	3 COND MINI PHONE JACK	210128	J3
Crystal	3.579545MHZ PARALLEL	230001	Y1 Y2
Pot	10K TRIMPOT	470058	P1
Pot	50K TRIMPOT	470059	P2
Programed IC	TEL-12 PROGRAMMED MICRO.	710221	
Relay	DPDT 12V RELAY	450007	RL1
Switch	8 POS DIP	510078	S3
Switch	SPDT MINI PC SLIDE RT ANGLE	510074	S2
Switch	SPDT SNAP-ACTION	510043	S1
Transformer	TELCO COUPLING	560029	T1

TEL-12

TEL-12

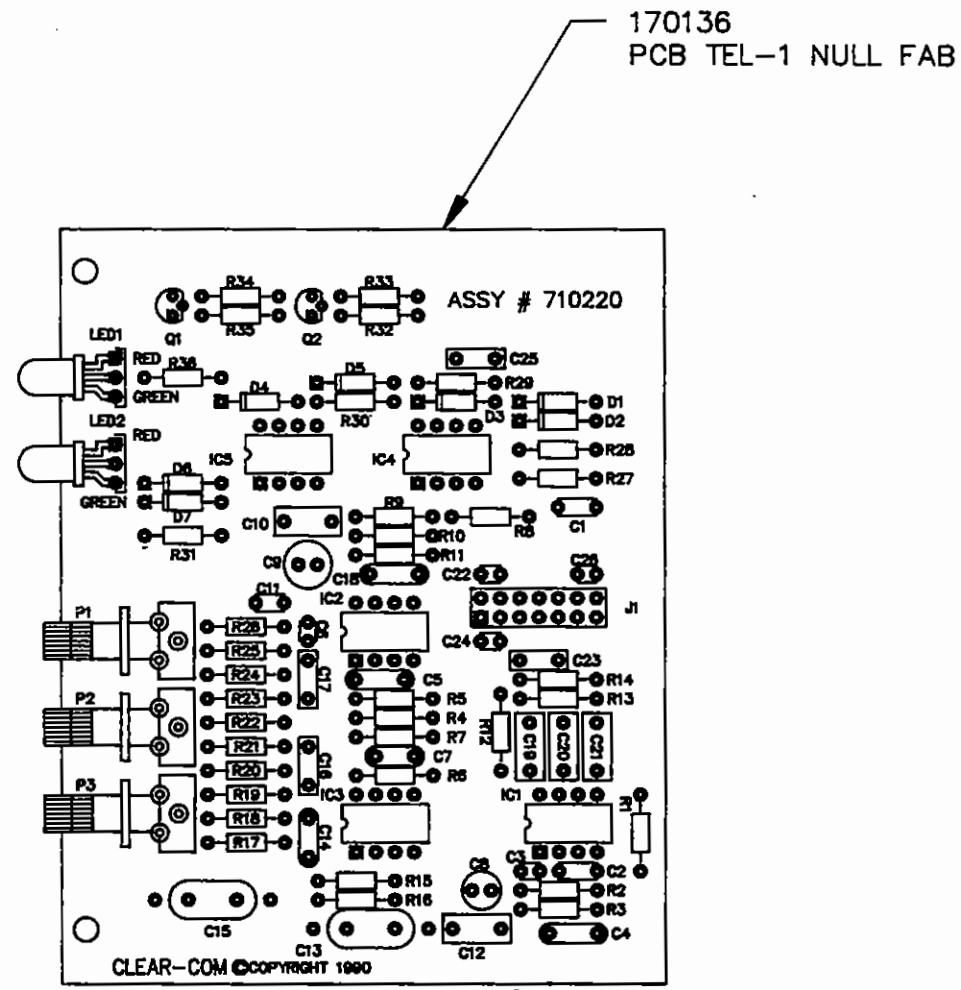


FIGURE I3-4 Assembly Drawing - TEL-12 Null Detect PCB, Rev. D

Bill of Materials for the TEL-12 Null PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator	
39	pF	Ceramic Disc	50V	5%	150026	C18
47	pF	Ceramic Disc	50V	10%	150041	C14
180	pF	Monolithic	50V		150144	C6
200	pF	Ceramic Disc	50V	10%	150007	C7
390	pF	Ceramic Disc	50V	5%	150017	C4
470	pF	Ceramic Disc	50V	10%	150014	C5
820	pF	Ceramic Disc	50V	10%	150049	C13
1000	pF	Polystyrene	50V	2.5%	150119	C15
0.0047	uF	Mylar	50V	10%	150068	C11
0.015	uF	Metal Polyester	50V	5%	150093	C2
0.047	uF	Metal Polyester	50V	10%	150005	C10 C12 C19 C20 C21
0.1	uF	Monolithic	100V	20%	150112	C3 C22 C24 C26
0.22	uF	Monolithic	100V		150080	C16 C17 C23 C25
0.47	uF	Monolithic	50V		150043	C1
1	uF	Aluminum	50V	10%	150002	C8
4.7	uF	Aluminum	50V		150087	C9

TEL-12

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator	
200	OHM	1/4	Carbon Film	5%	410072	R31 R36
430	OHM	1/4	Carbon Film	5%	410106	R8
681	OHM	1/4	Metal Film	1%	410161	R13
1K	OHM	1/4	Carbon Film	5%	410010	R22
1.5K	OHM	1/4	Carbon Film	5%	410055	R9
3.92K	OHM	1/4	Metal Film	1%	410160	R12
5.1K	OHM	1/4	Carbon Film	5%	410138	R23
6.81K	OHM	1/8	Carbon Film	1%	410063	R1 R2 R3
12K	OHM	1/4	Carbon Film	5%	410031	R17
15K	OHM	1/4	Carbon Film	5%	410017	R15
18K	OHM	1/4	Carbon Film	5%	410032	R26
20.0K	OHM	1/4	Carbon Film	1%	410086	R4 R5
22K	OHM	1/4	Carbon Film	5%	410018	R18 R33 R34
27K	OHM	1/4	Carbon Film	5%	410022	R21
33K	OHM	1/4	Carbon Film	5%	410020	R20 R25
47K	OHM	1/4	Carbon Film	5%	410021	R24 R27 R28 R30 R32 R35
47.5K	OHM	1/8	Carbon Film	1%	410105	R6 R7

Bill of Materials for the TEL-12 Null PCB ---- cont.

51K	OHM	1/4	Carbon Film	5%	410136	R11
60K	OHM	1/4	Metal Film	1%	410164	R19
200K	OHM	1/4	Carbon Film	5%	410109	R10
221K	OHM	1/4	Metal Film	1%	410162	R14
270K	OHM	1/4	Carbon Film	5%	410047	R16
330K	OHM	1/4	Carbon Film	5%	410033	R29

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D2 D3 D4 D5 D6 D7
Transistor	2N2907 OR 2N4143 PNP 30V	480007	Q1 Q2

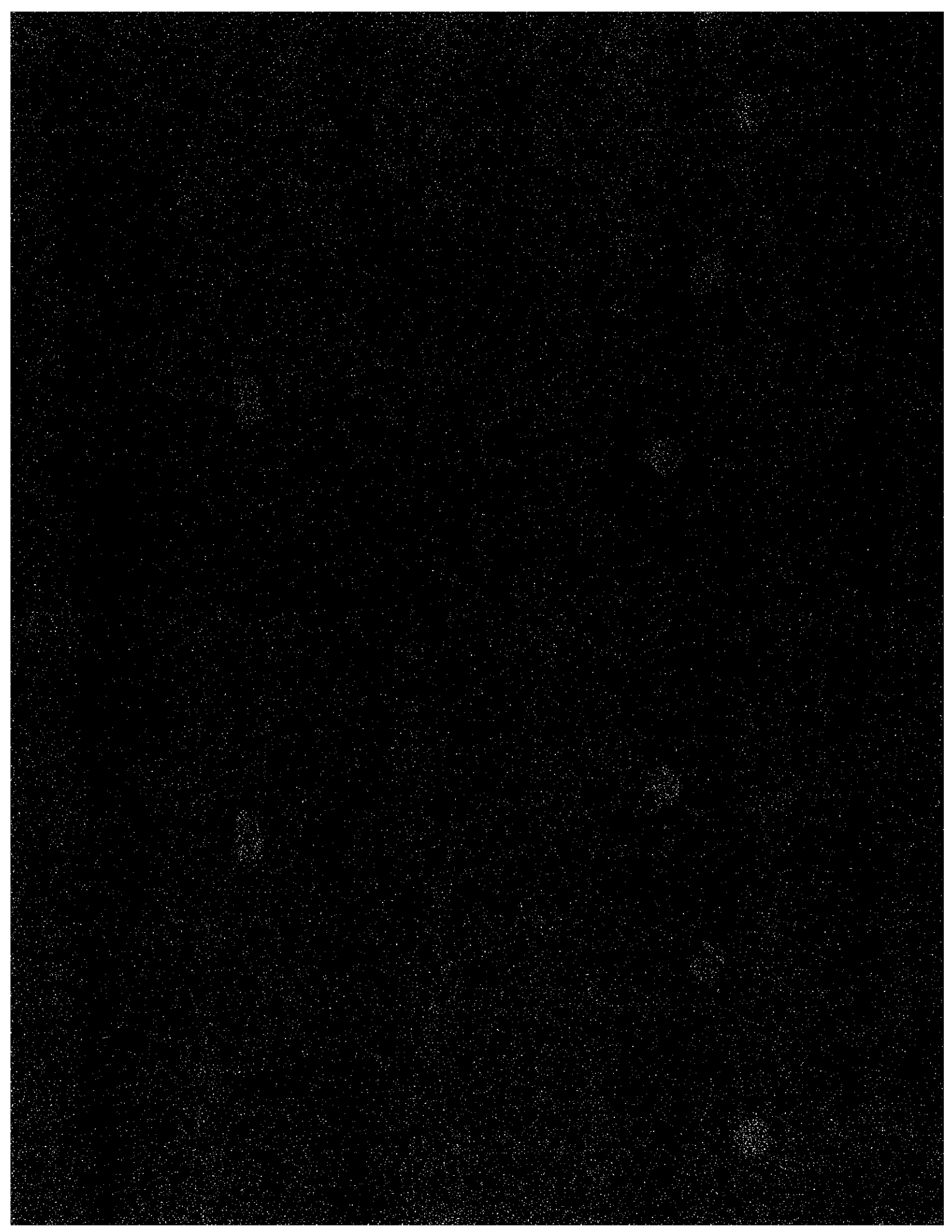
Integrated Circuits

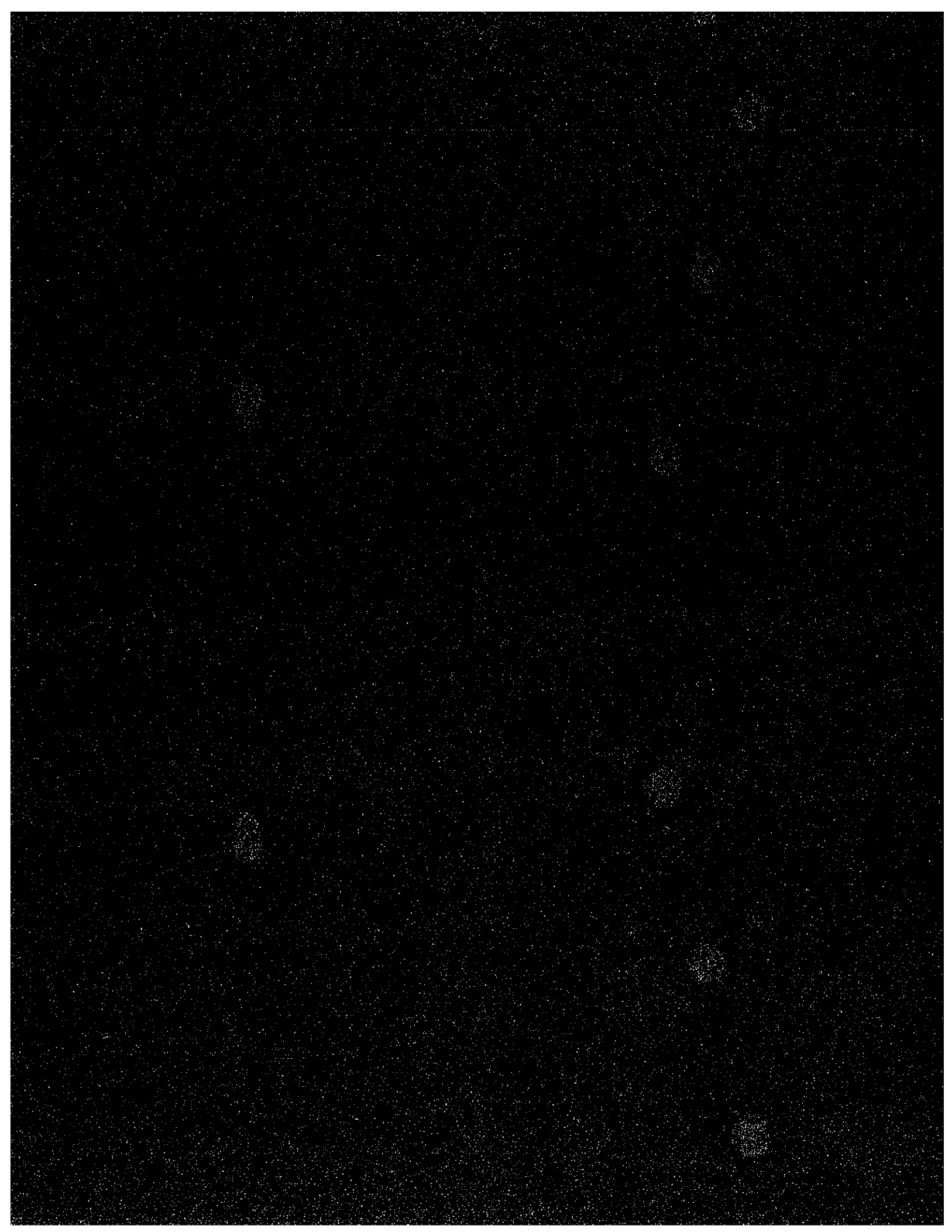
Device	Description	Part #	Designator
Op Amp	LM358 DUAL OP AMP	480075	IC5 IC5
Op Amp	LM741 IC OP AMP 8-PIN DIP	480018	IC4
Op Amp	NE5532 DUAL LO NOISE OP AMP	480070	IC1 IC2 IC3

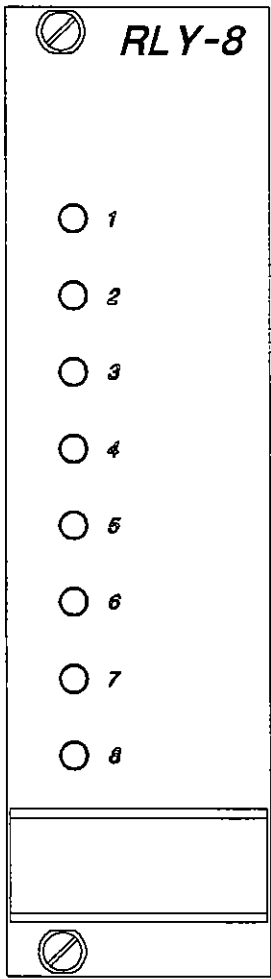
Miscellaneous

Device	Description	Part #	Designator
Pot	10K TRIMPOT	470058	P1 P2 P3
LED	BI-COLOR RED/GREEN 3-LEAD	390032	LED1 LED2

TEL-12







Matrix Plus II System **RLY-8**
RELAY INTERFACE MODULE

Introduction

This Section provides block diagrams, schematics, assembly drawings and components list for the RLY-8 Relay Interface Module.

RLY-8

RLY-8

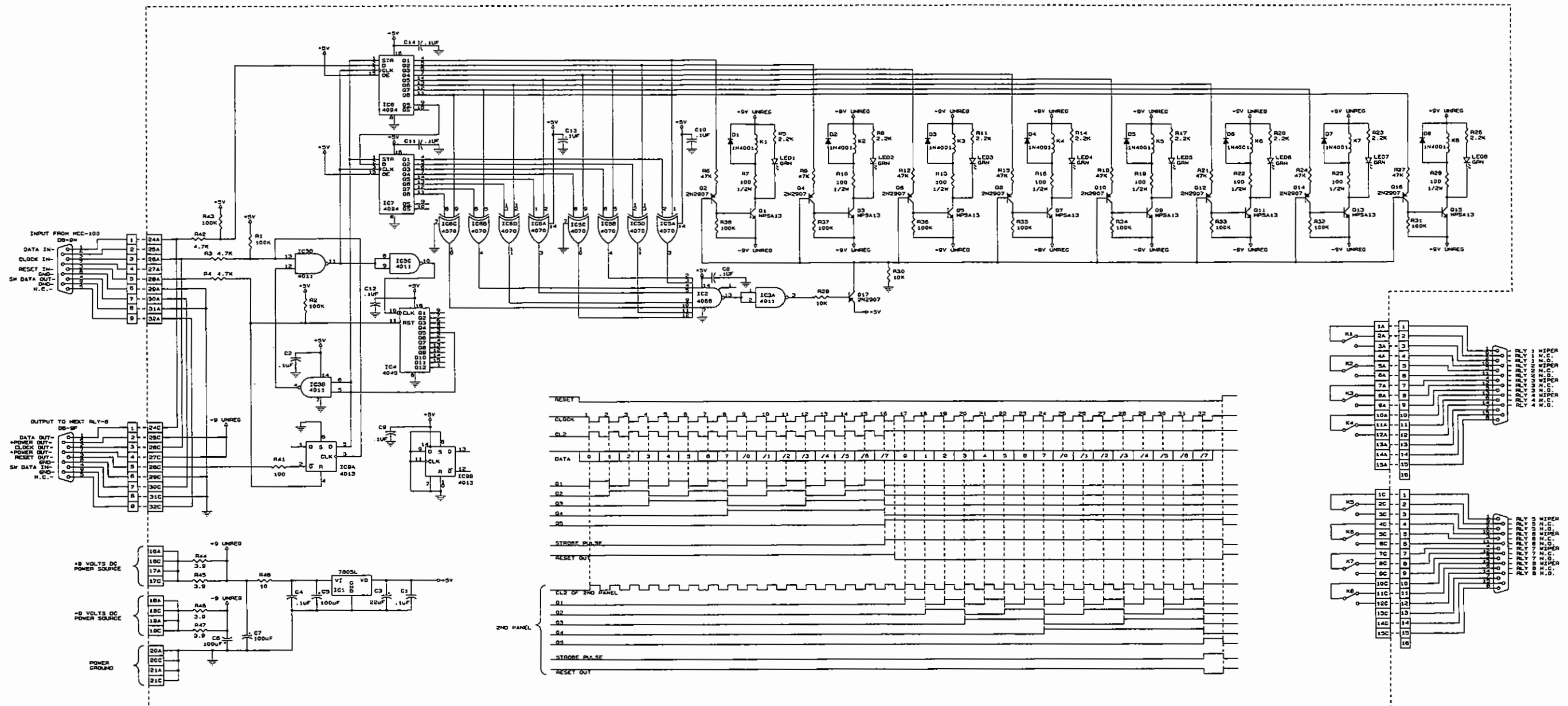


FIGURE I4-1 Schematic - RLY-8 Interface, Rev. A

RLY-8

RLY-8

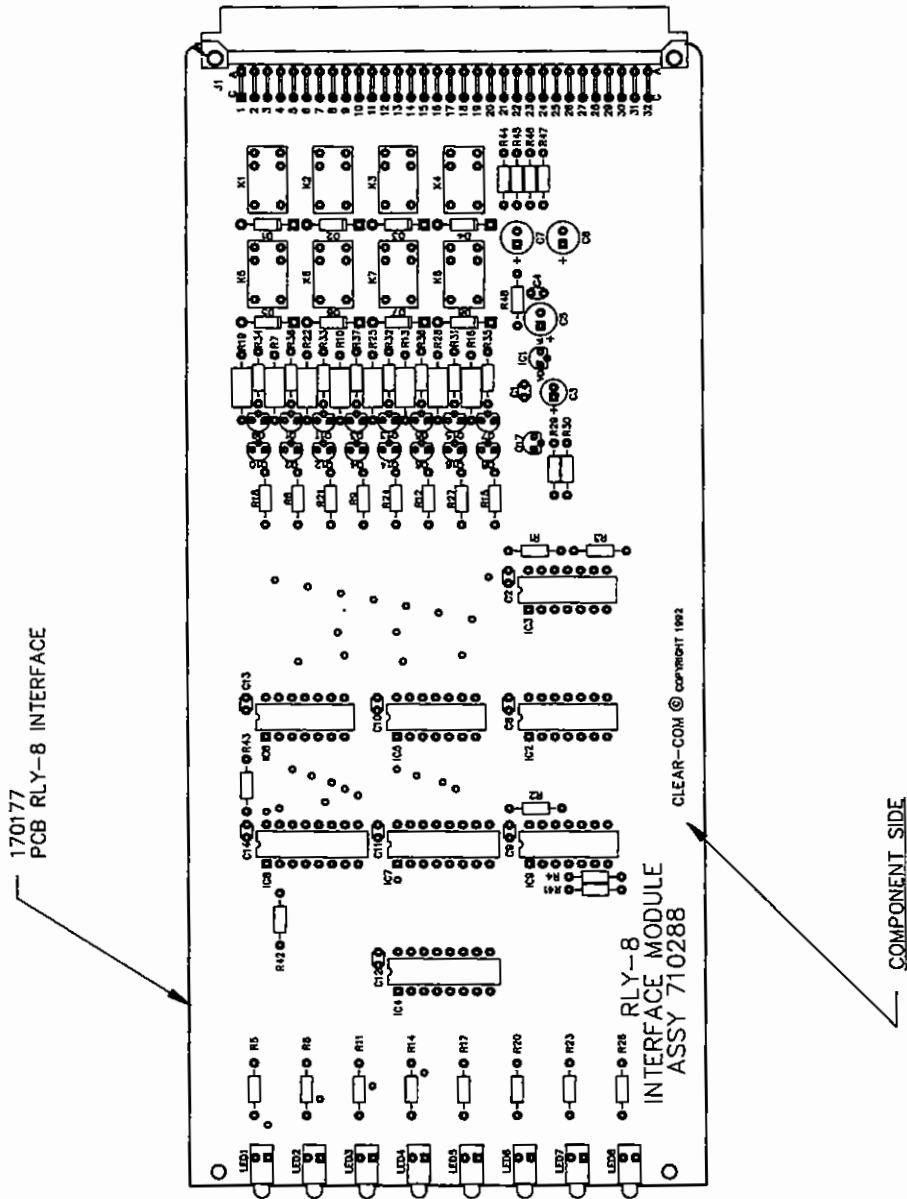


FIGURE I4-2 Assembly Drawing - RLY-8 PCB, Rev. b

Bill of Materials for the RLY-8 PCB

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
0.1 uF	Monolithic	50V	10%	150035	C1 C2 C4 C8 C9 C10 C11 C12 C13 C14
22 uF	Aluminum	16V	20%	150142	C3
100 uF	Aluminum	35V		150136	C5 C6 C7

Resistors & Resistor Packs

Value	Power	Type	Tol.	Part #	Designator
3.9 OHM	1/4	Carbon Film	5%	410001	R44 R45 R46 R47
10 OHM	1/4	Carbon Film	5%	410002	R48
100 OHM	1/4	Carbon Film	5%	410071	R41
100 OHM	1/2	Carbon Film	5%	410094	R7 R10 R13 R16 R19 R22 R25 R28
2.2K OHM	1/4	Carbon Film	5%	410011	R5 R8 R11 R14 R17 R20 R23 R26
4.7K OHM	1/4	Carbon Film	5%	410013	R3 R4 R42
10K OHM	1/4	Carbon Film	5%	410016	R29 R30
47K OHM	1/4	Carbon Film	5%	410021	R6 R9 R12 R15 R18 R21 R24 R27
100K OHM	1/4	Carbon Film	5%	410024	R1 R2 R31 R32 R33 R34 R35 R36 R37 R38 R43

Diodes and Transistors

Device	Description	Part #	Designator
Diode	1N4001 RECT 1A 50PIV	480001	D1 D2 D3 D4 D5 D6 D7 D8
Transistor	2N2907 OR 2N4143 PNP 30V	480007	Q2 Q4 Q6 Q8 Q10 Q12 Q14 Q16 Q17
Transistor	MPS-A13 NPN 30V DARL	480004	Q1 Q3 Q5 Q7 Q9 Q11 Q13 Q15

Bill of Materials for the RLY-8 PCB ---- cont.

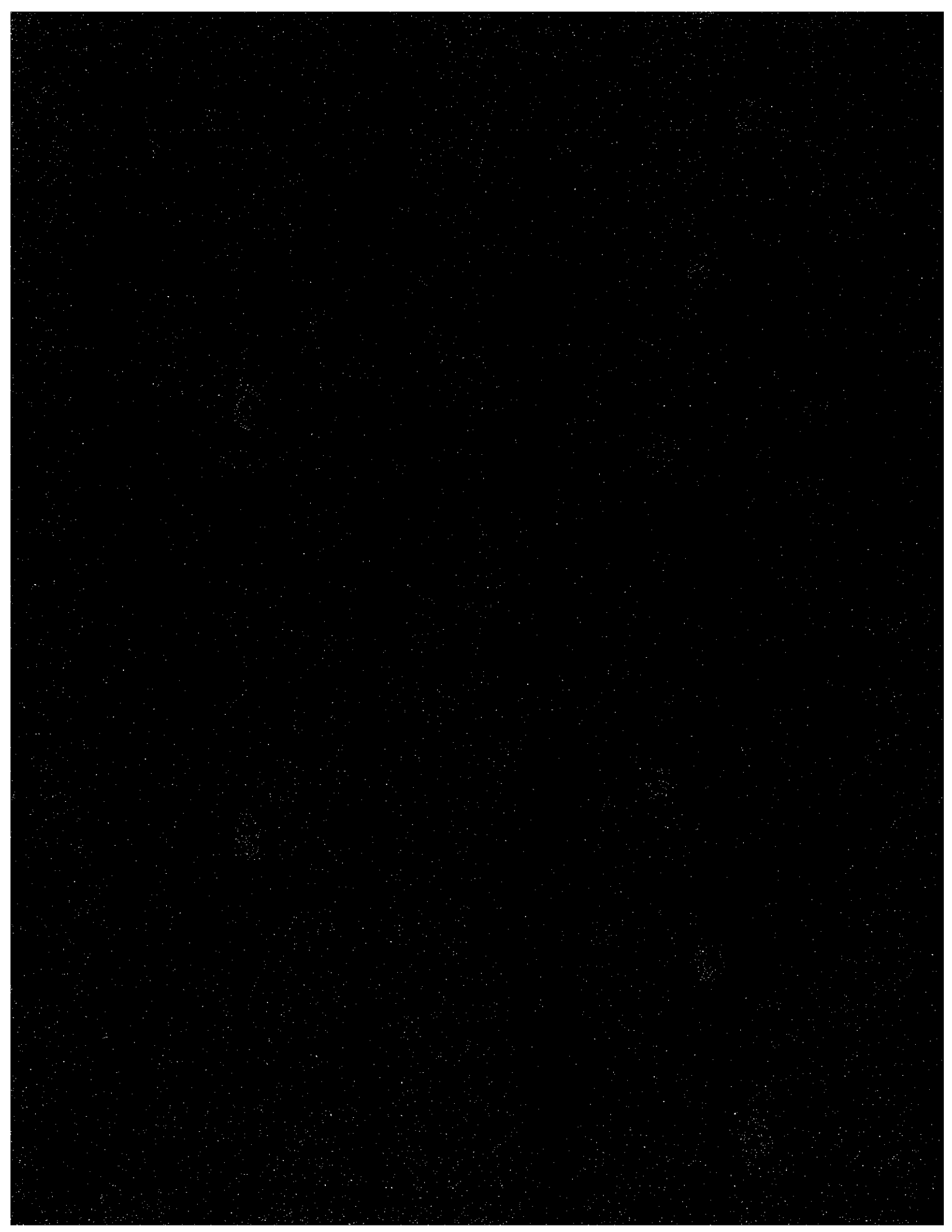
Integrated Circuits

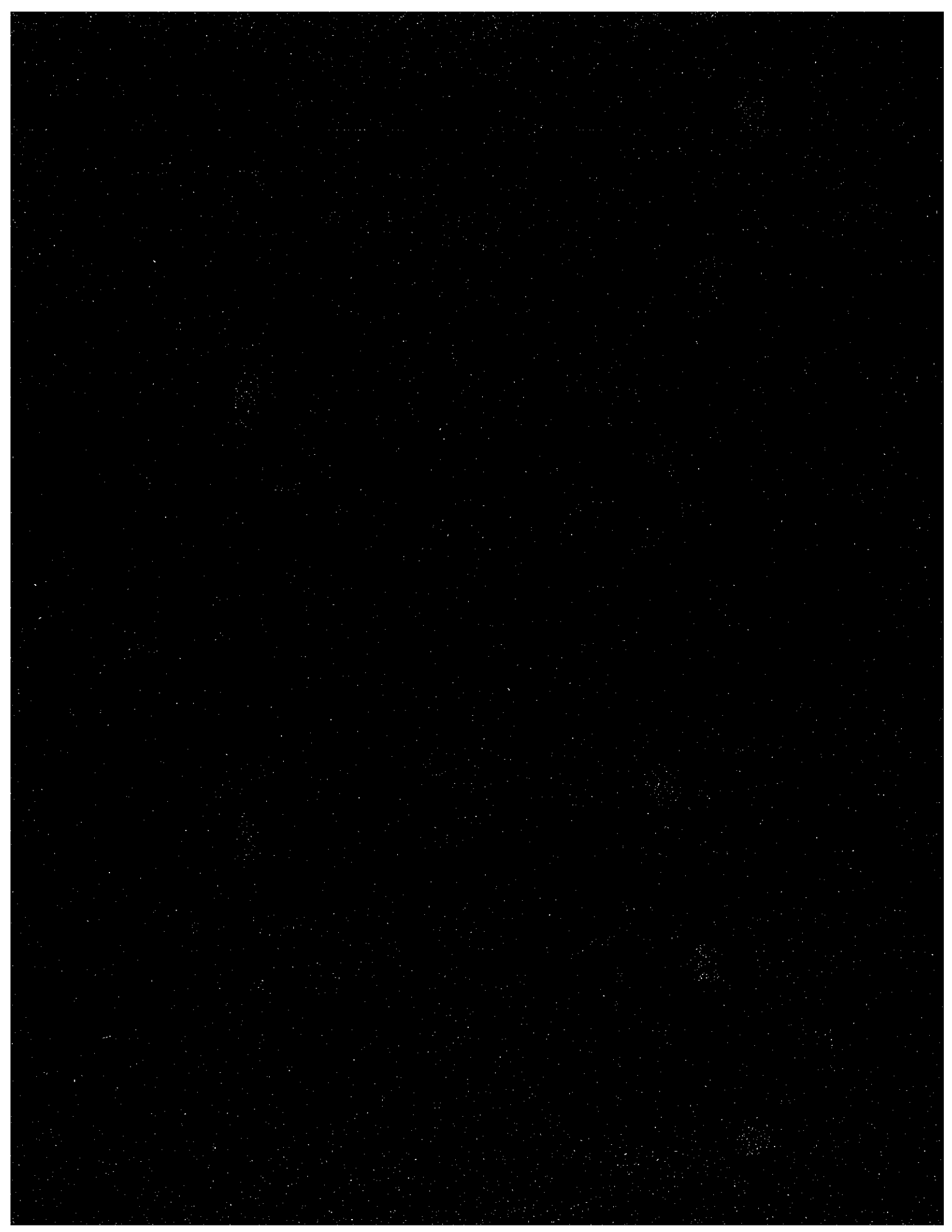
Device	Description	Part #	Designator
Logic Chip	4040 CMOS 12 STAGE COUNTER	480108	IC4
Logic Chip	4070B CMOS QUAD XOR GATE	480067	IC5 IC6
Logic Chip	4011 CMOS QUAD 2 IN NAND	480111	IC3
Logic Chip	4013 CMOS DUAL D FLIP FLOP	480171	IC9
Logic Chip	4068 CMOS 8-INPUT NAND	480191	IC2 IC2
Logic Chip	4094B CMOS SHIFT REGISTER	480107	IC7 IC8
Regulator	7805L POS 5V REG. TO-92	480088	IC1

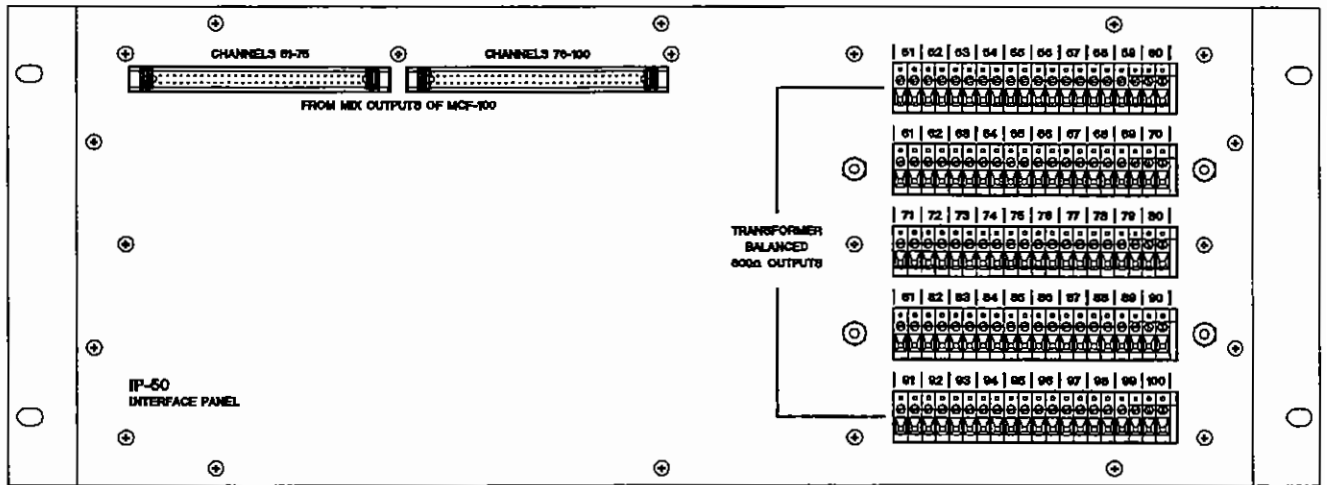
Miscellaneous

Device	Description	Part #	Designator
Relay	SPDT 12V MINI PC RELAY	450006	K1 K2 K3 K4 K5 K6 K7 K8
LED	T1 RT ANG PC MTG 5mA GRN	390028	LED1 LED2 LED3 LED4 LED5 LED6 LED7 LED8

RLY-8







Matrix Plus II System
INTERFACE

IP-50
PANEL

Introduction

This Section provides the schematic for the IP-50 Frame Interface Panel. The IP-50 is a all passive device and therefore does not require much maintenance work.

Description

The IP-50 is an interface panel for the purpose of directly using the extra 50 outputs of a MCF-100 frame that normally connect to a SCF-101 frame for expansion beyond 50 ports. With the IP-50 these 50 outputs can be used as outputs only for such uses as IFB feeds and paging systems.

The IP-50 is a passive device providing transformer isolation and a convenient pair of screw terminals for each output of the fifty channels.

The outputs from STX-101 cards in the MCF-100 that would normally feed to the SCF-101 are now available as outputs for direct connection to the inputs of external devices. Each channel in the MCF-100 frame that needs to have access to these outputs must have a companion STX-101 installed in the slot below its MTX matrix card.

IP-50

IP-50

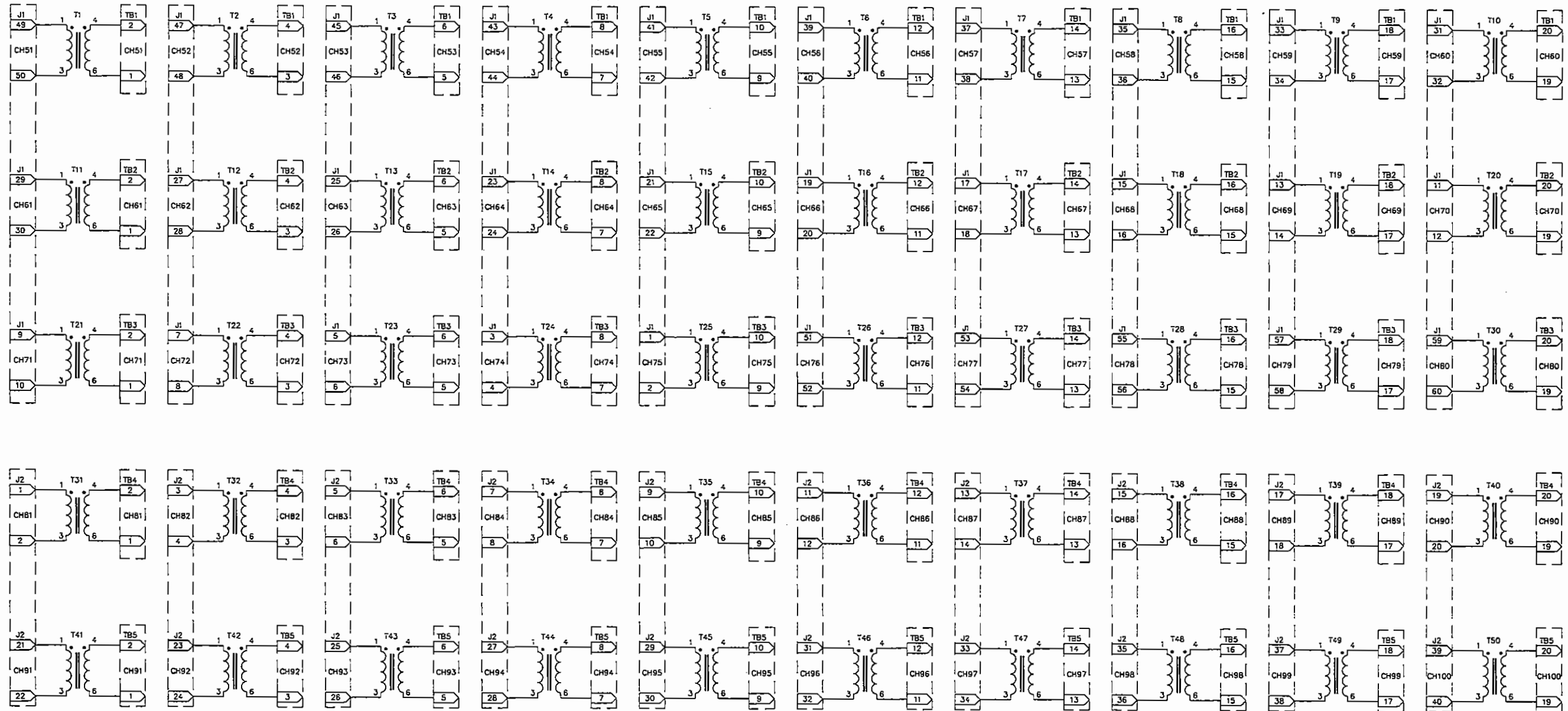
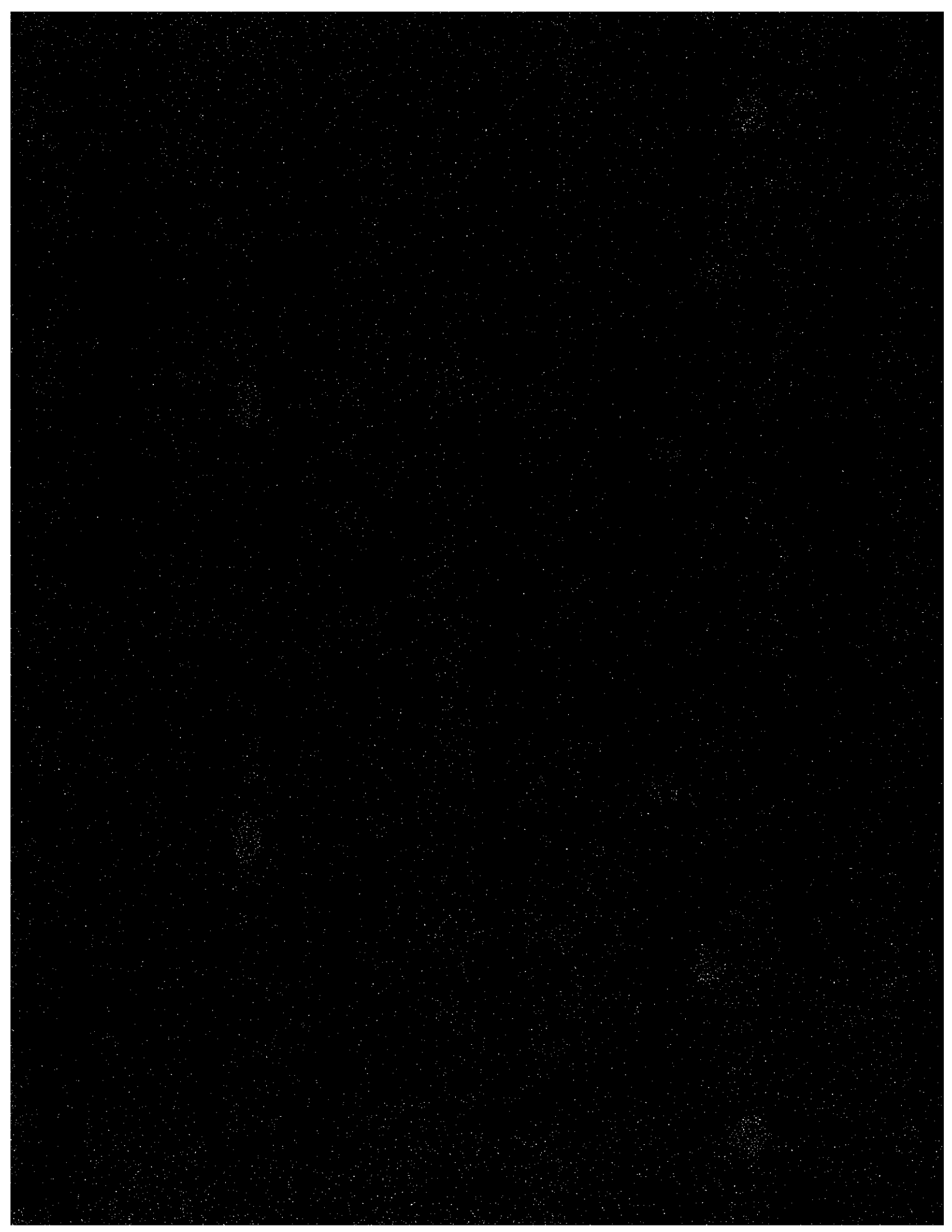
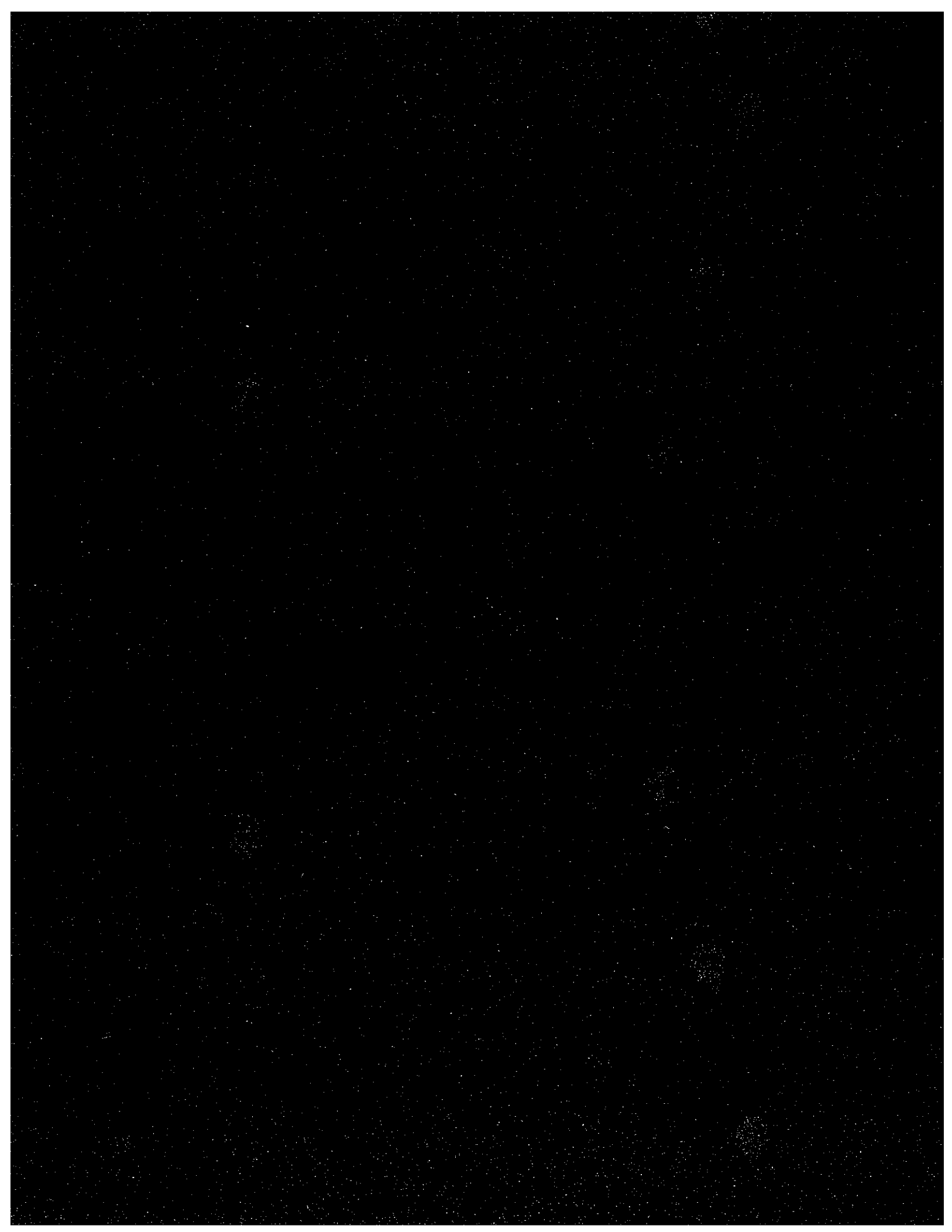
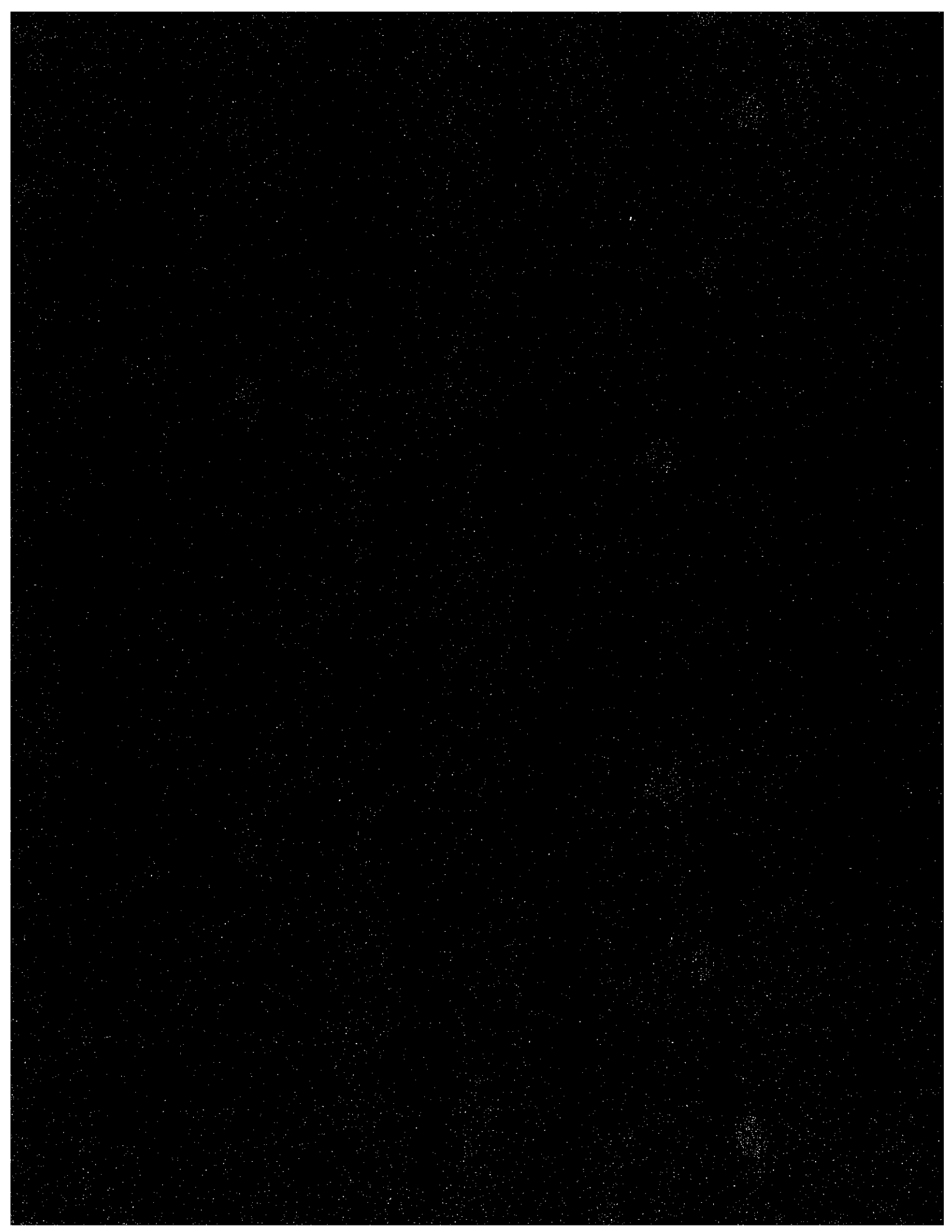
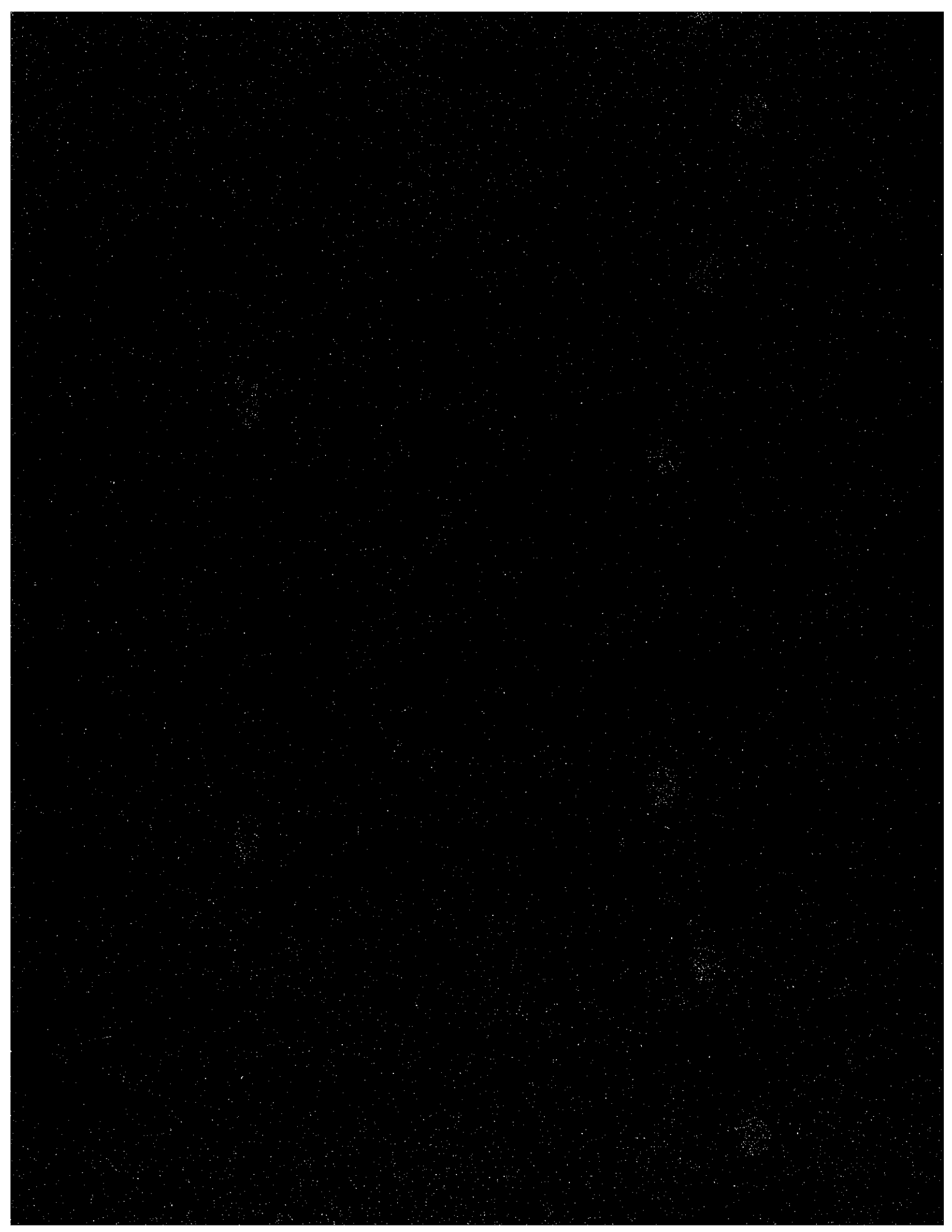


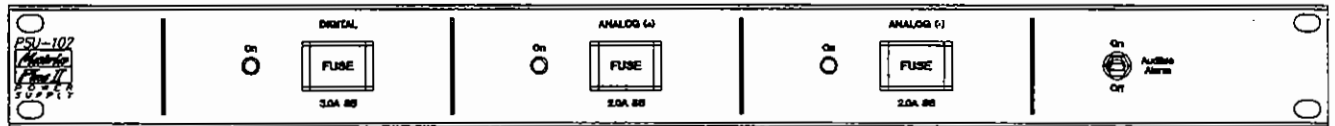
FIGURE I5-1 Schematic - IP-50, Rev. A











Matrix Plus II System

PSU-102

P O W E R S U P P L Y M O D U L E

Introduction

This Section provides troubleshooting information, schematics, assembly drawings and components list for the PSU-102 Power Supply Module.

Description

Your application may have two or more PSU-102 Power Supplies installed and which can be powered by a separate mains AC supply. The DC outputs of the supply are connected together (through blocking diodes) so that if one supply fails, the other can power the system.

Each PSU-102 supply has three DC outputs: ± 8 volts for analog circuits and +8 volts for digital circuits. The 8-volt supplies are regulated down to 5 volts by regulators in the matrix cards.

Each of three DC outputs on each PSU-102 has a green led, when lit, indicates that the associated output has DC voltage present on it.

The front panel also has a Alarm Enable Switch allowing an alarm to sound if one of the three supplies is down. However, this internal alarm is powered from the Digital +8 Volt supply and therefore if that supply fails the alarm will not work. If two PSU-102s are paralleled for redundancy the audible alarm will work even if the +8 Digital supply fails because it will be powered from the other PSU-102 that is in parallel. The audible alarm is only useful in redundant operations. In a single power supply operation if a supply fails the entire matrix goes down. In a redundant operation if one supply fails, maintenance personnel would like to know before the second supply also fails preventing a system failure.

There is also a set of isolated relay contacts available on the rear panel for wiring to an external remote alarm. The relay contacts will operate properly when any of the supplies fail.

PSU-102

Output Voltage Adjustment

The internal regulated power supplies used have an output voltage adjustment. If it is necessary to adjust these supplies, set them for 9 VDC +/- 0.1 V under a 1 Amp. load. Through out these manuals the output voltages are referred to as 8 Volts when in actuality the voltage presented to the frame is about 8.4 to 8.5 VDC after the blocking diodes.

PSU-102

Regulated Power Supply Module Service

The regulated power supply module used in the PSU-102 is purchased as a finished unit by Clear-Com. The manufacturer does not supply schematics, therefore we cannot make them available. If the unit fails, it is unrepairable beyond replacing the input fuse on the unit.

Miscellaneous Bill of Materials for the PSU-102

Device	Description	Part #	Designator
Buzzer	PIEZO-A-LERT	500121	
Cable	CABLE ASY POWER 10 PIN	730178	
Connector	FILTRD AC LINE CON	210176	
Cord	POWER CORD	610022	
Fuse	1/2A SLO-BLO 20MM FUSE	520030	
Fuse	2A SLO-BLO 20MM X 5MM FUSE	520039	
Fuse	3A SLO-BLO 20MM X 5MM FUSE	520040	
Fuseholder	20MM FUSHOLDER	520031	
Led	GREEN PANEL 12V	390046	
Power Supply	40 W 9 V SWITCHING	400010	
Switch	SPDT MINI TOGGLE	510040	

PSU-102

PSU-102

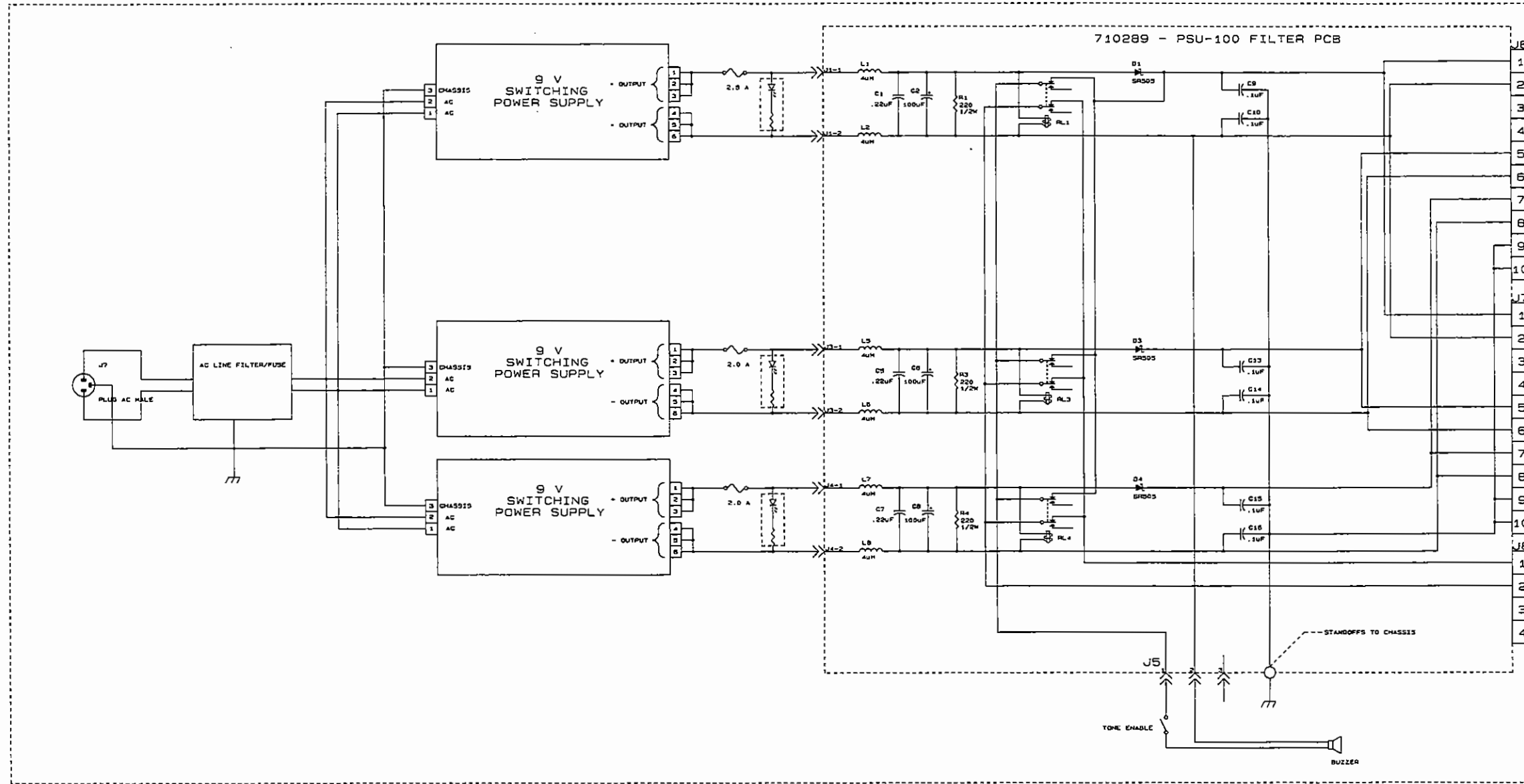


FIGURE F1-1 Schematic - PSU-102 Power Supply, Rev. A

PSU-102

PSU-102

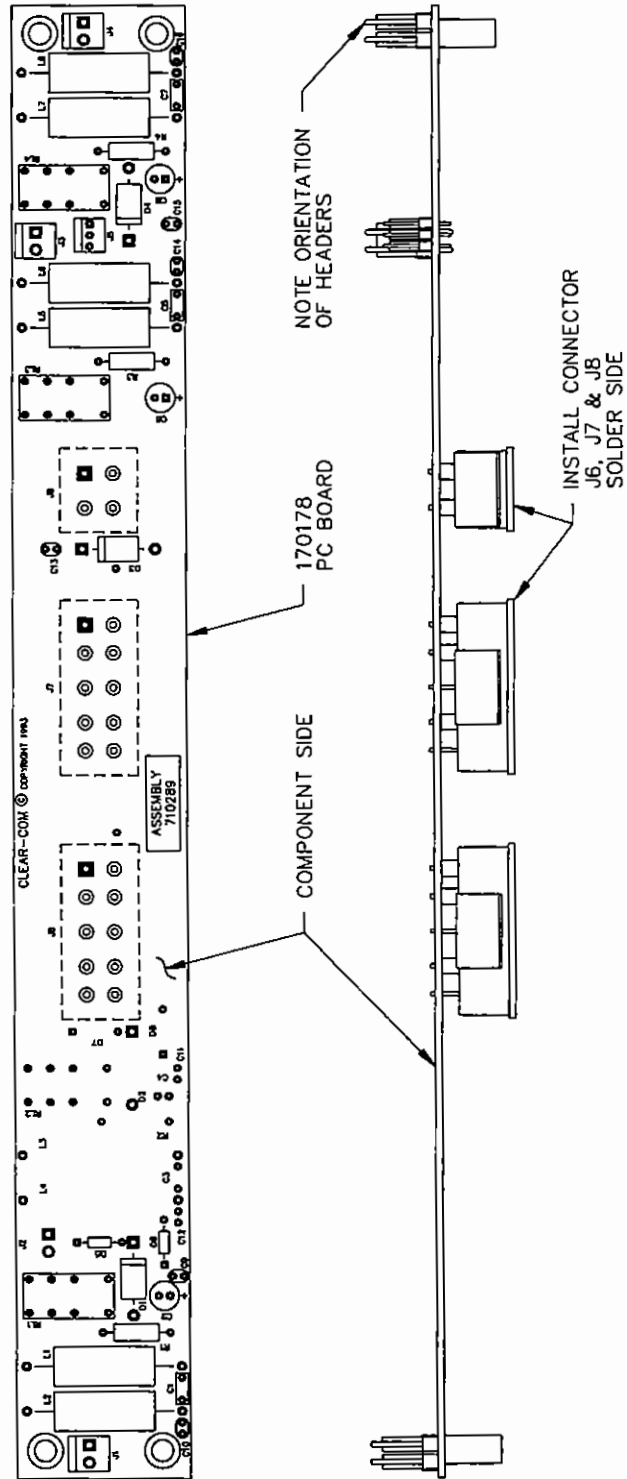


FIGURE F1-2 Assembly Drawing - PSU-102 Rear PCB, Rev. A

Bill of Material for the Filter PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator	
0.1	uF	Monolithic	50V	10%	150035	C9 C10 C13 C14 C15 C16
0.22	uF	Monolithic	50V	10%	150034	C1 C5 C7
100	uF	Aluminum	25V	20%	150099	C2 C6 C8

Resistors & Resistor Packs

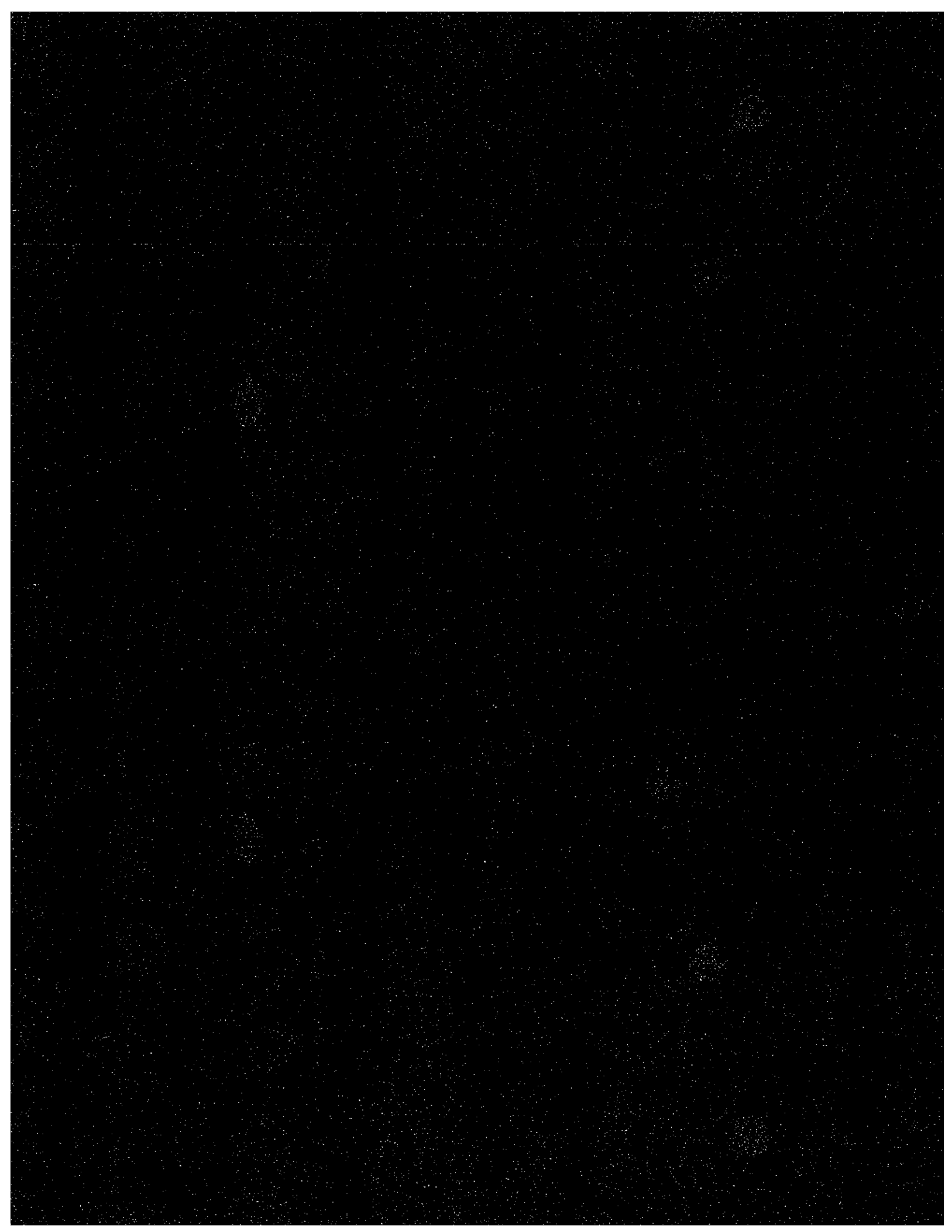
Value	Power	Type	Value	Tol.	Part #	Designator
220	OHM	1/2	Carbon Film	5%	410108	R1 R3 R4

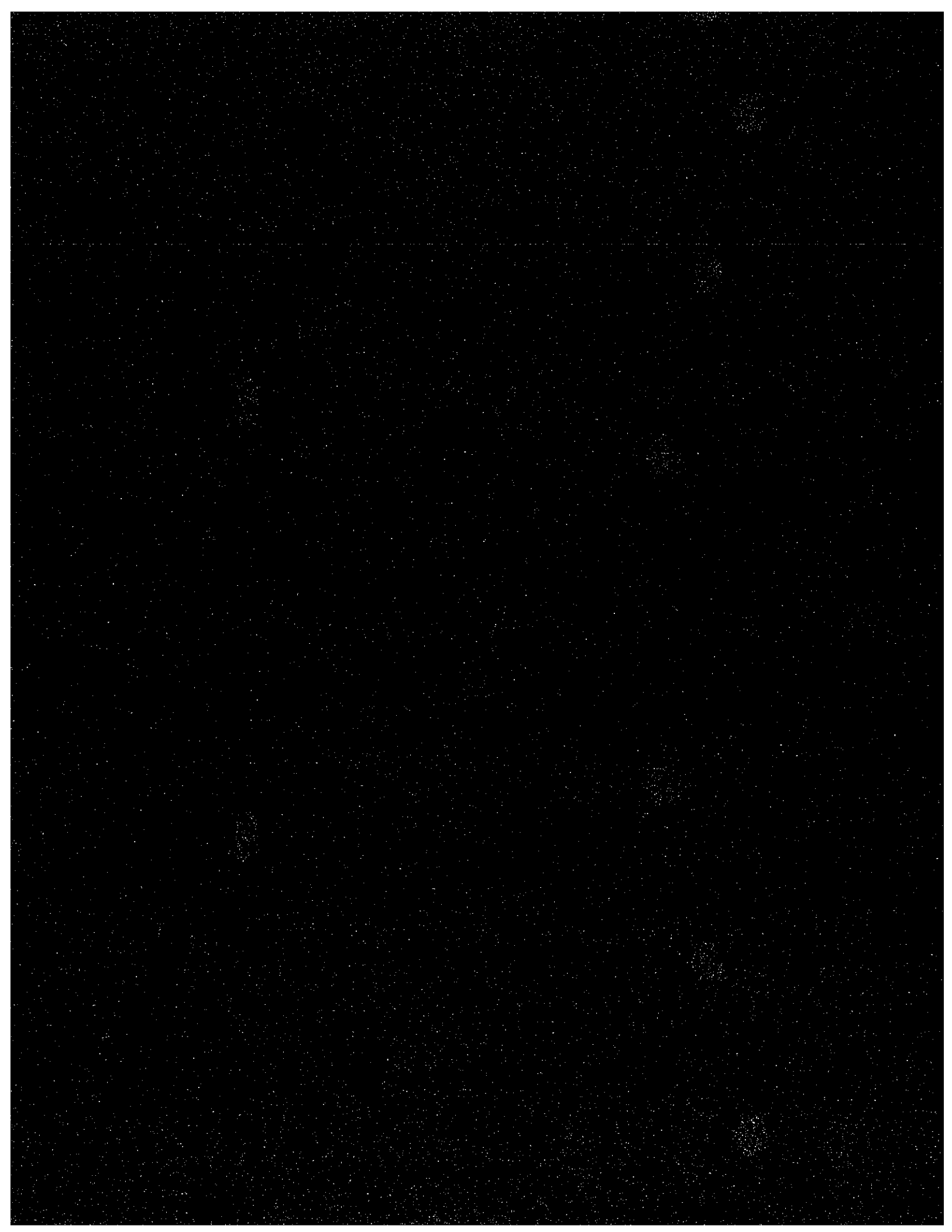
Diodes and Transistors

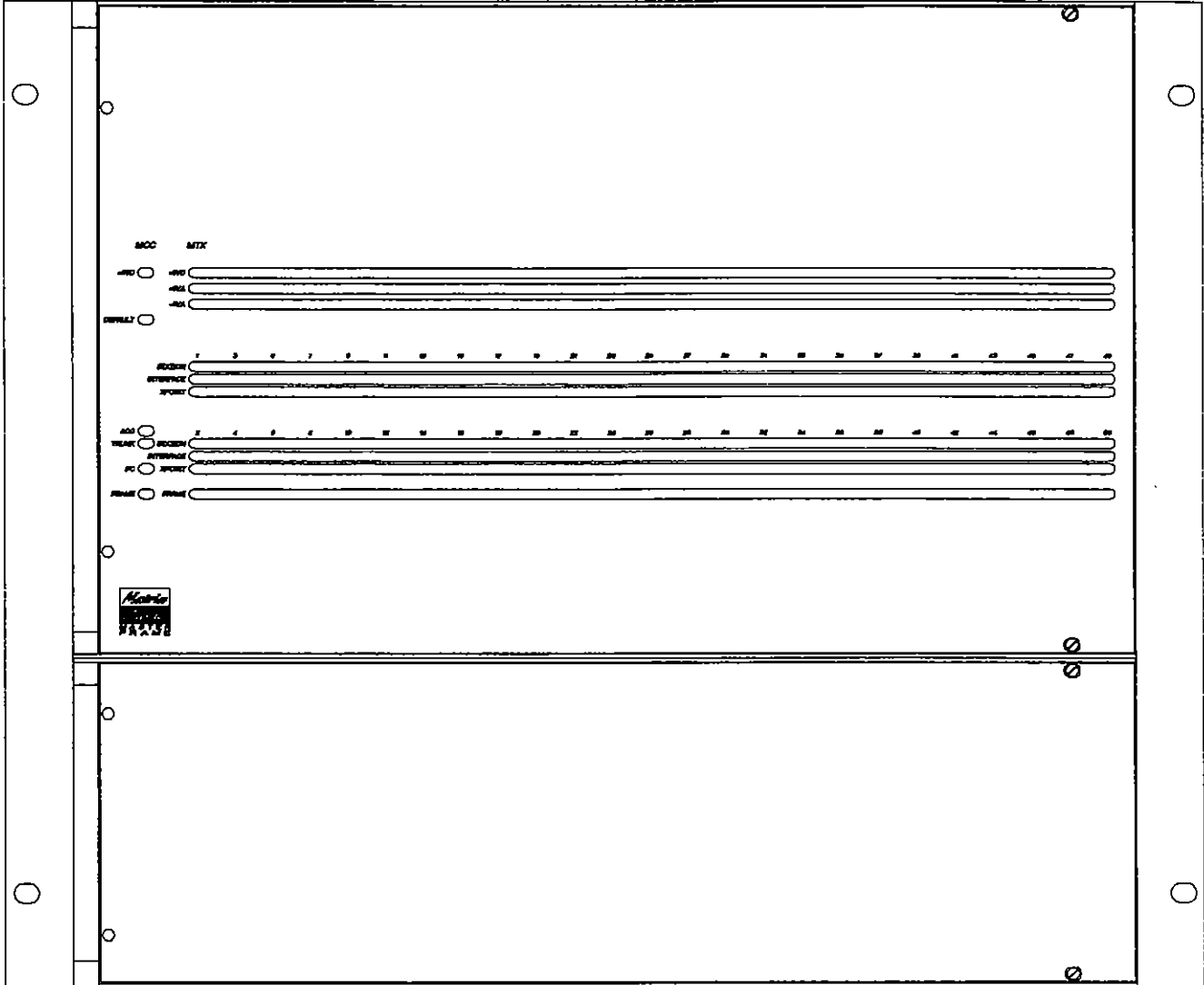
Device	Description	Part #	Designator
Diode	SR505 SHTKY 5A 50V	480178	D1 D3 D4

Miscellaneous

Device	Description	Part #	Designator
210267	10 PIN TAPPED SOCKET CON PANEL MOUNT J6 J7		
180004	4 MICRO HENRY FERRITE CORE HASH CHOKE L1 L2 L5 L6 L7 L8		
210270	4 PIN TAPPED F JONES SOCKET PANEL MOUNT J8		
	DPDT 12V RELAY ITT#RZ-12W-C	450007	RL1 RL3 RL4







Matrix Plus II System

MCF-100

MASTER CARD FRAME 50x100 - 25 SLOT

Introduction

This Section provides schematic diagrams of the MCF-100 Master Card Frame, assembly drawings, and Bills of Materials for two of the PCBs that have active components.

The MCF-100 Card Frame is the first of two frames needed to construct a 100 X 100 matrix system. The MCF-100 has enough card slots to house one CPU-100 System Controller Card, up to 25 MTX-100 or MTX-200 Matrix Cards, and up to 25 STX-101 Crosspoint Expansion Cards. The rear panel contains all of the connectors needed to support the possible 50 ports and communication to the external PC, other matrix frames, and Accessory devices.

Internally, the mother boards that interconnect the various cards between each other and the rear panel are all passive devices. However, to allow expansion of the internal intercom mix buses, there is active circuitry internal to the frame. In the following documentation schematics are provided for the entire frame, however assembly drawings and Bills of Materials are only provided for the active sections of the frame.

Mechanical frame parts and passive PCBs usually do not need much service work and therefore are not listed in detail. If more detail is needed, call Clear-Com service department

MCF-100

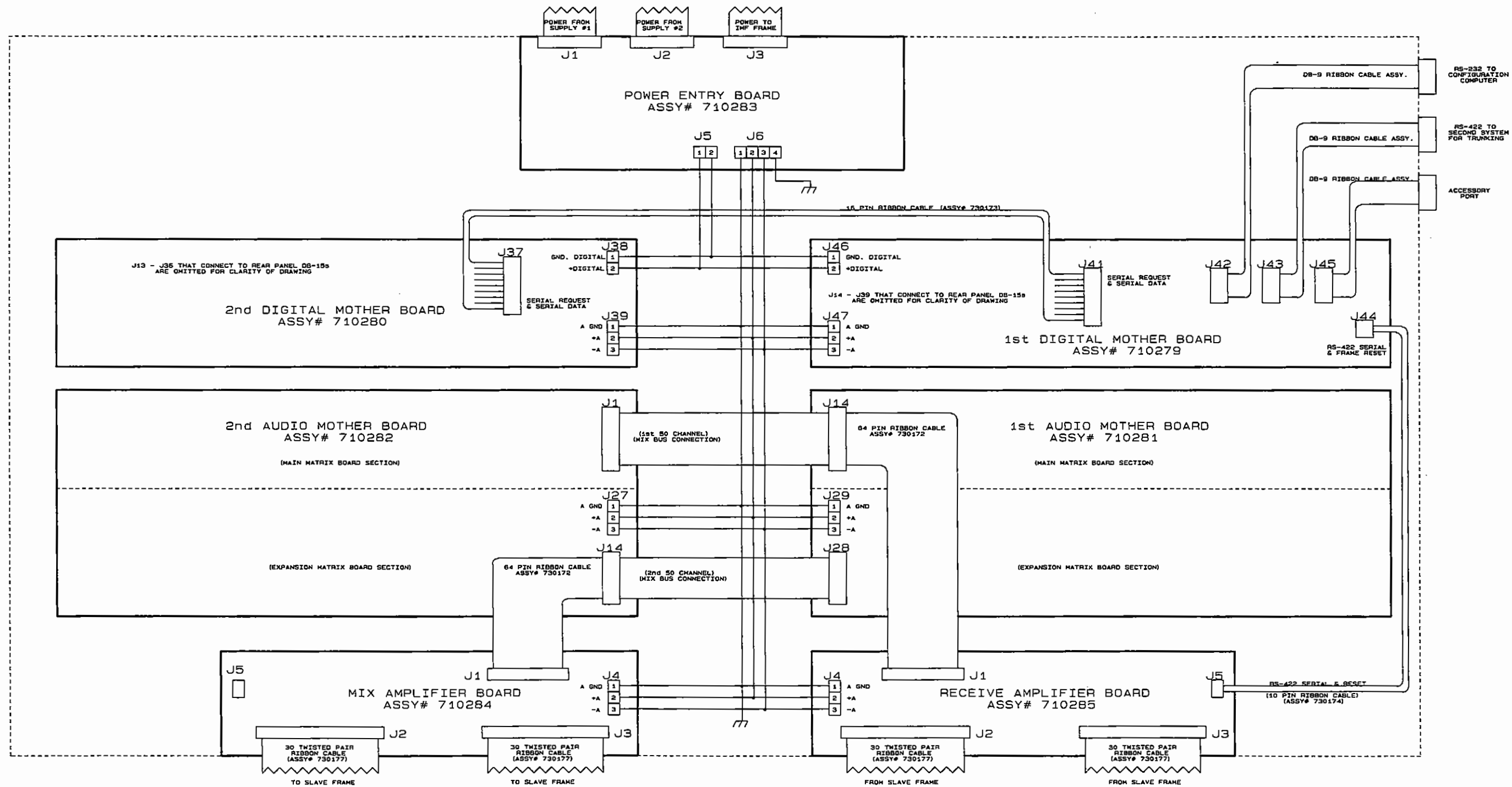


FIGURE F2-1 Schematic, Overall - MCF-100 Frame, Rev. B

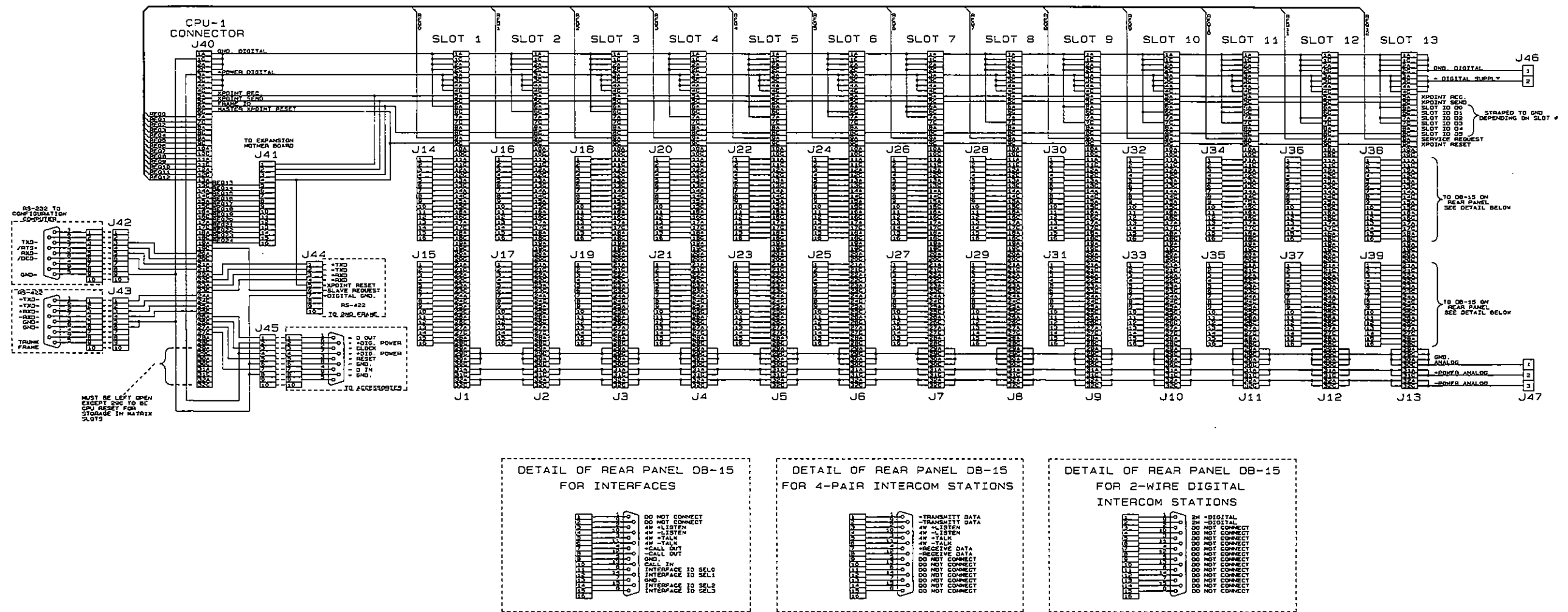


FIGURE F2-2 Schematic - MCF-100 Frame, 1st Digital Motherboard, Rev. A

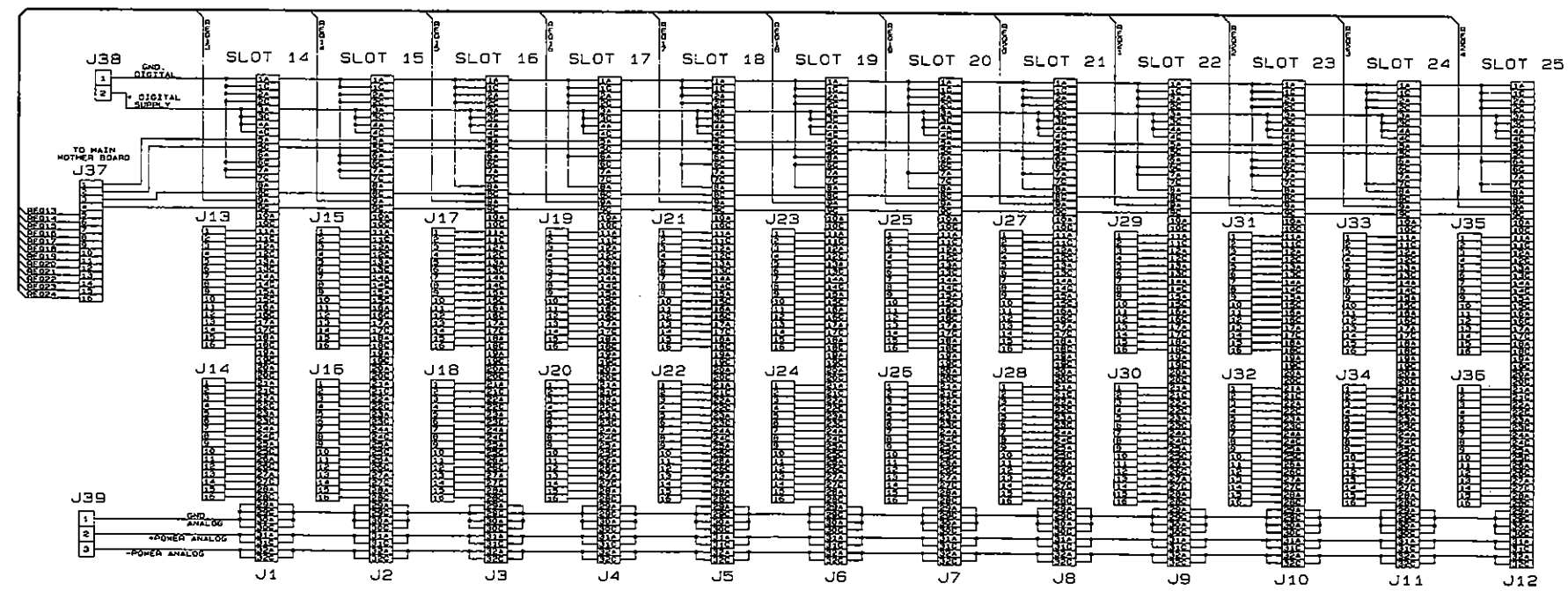


FIGURE F2-3 Schematic - MCF-100 Frame, 2nd Digital Motherboard, Rev. A

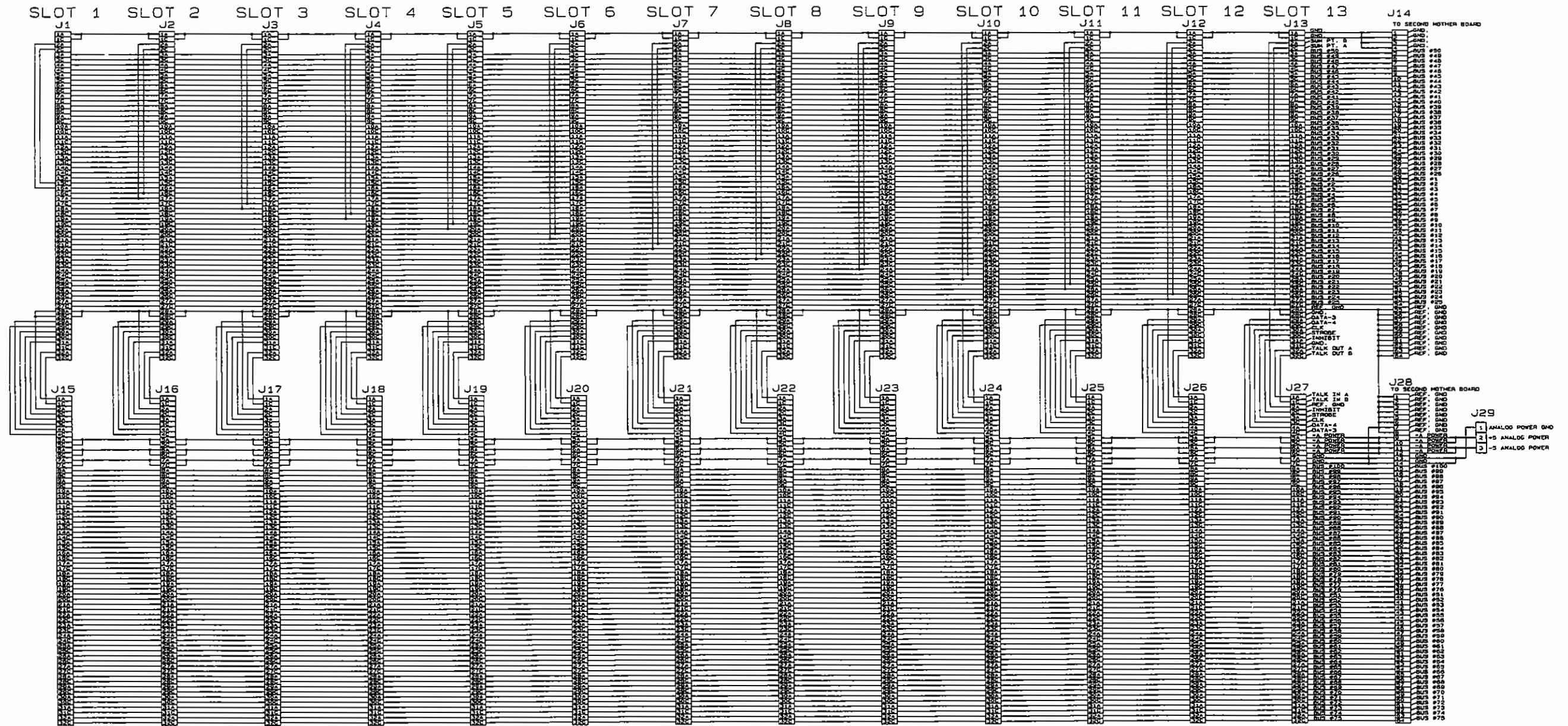


FIGURE F2-4 Schematic - MCF-100 Frame, 1st Audio Motherboard, Rev. A

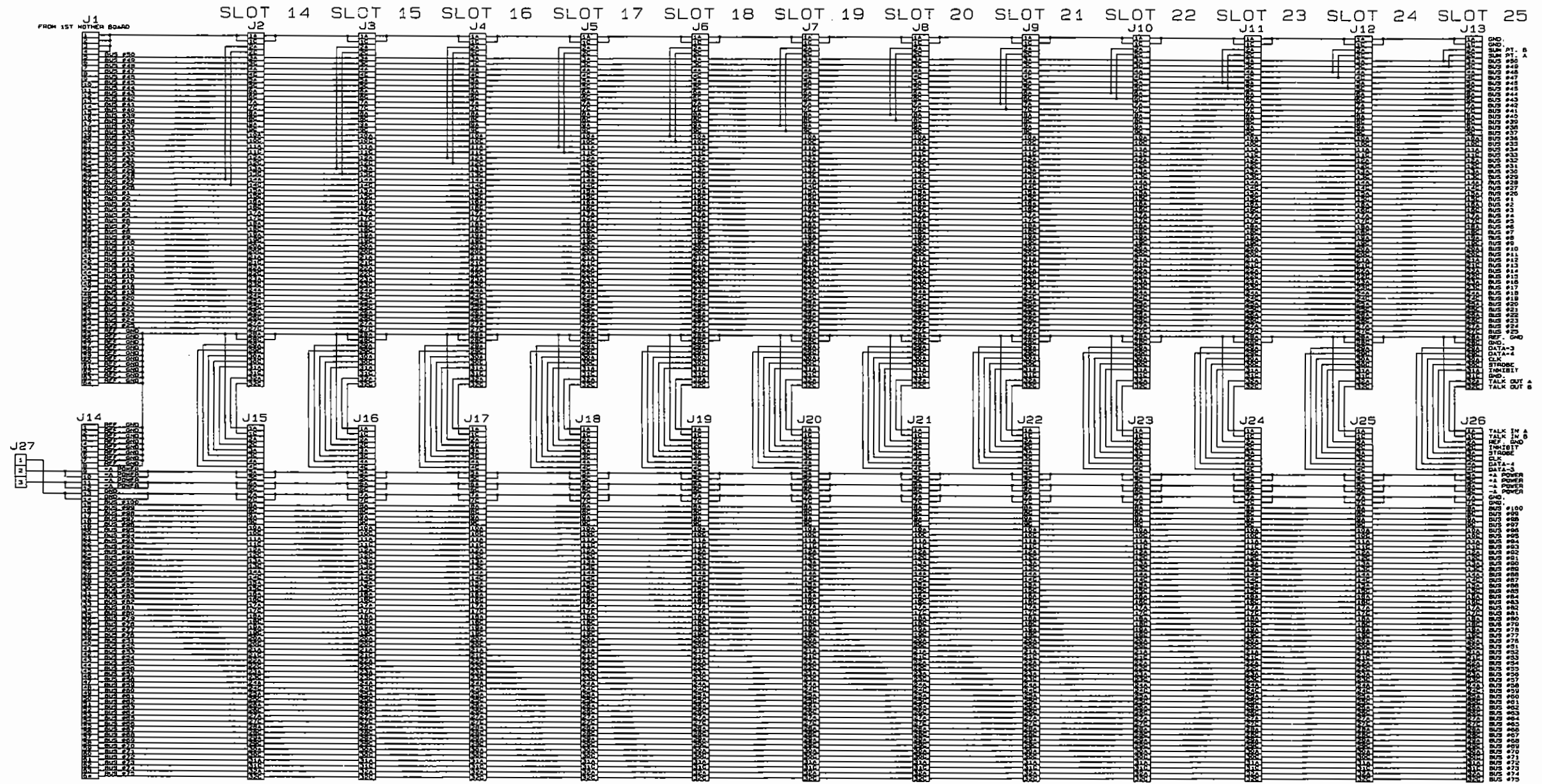
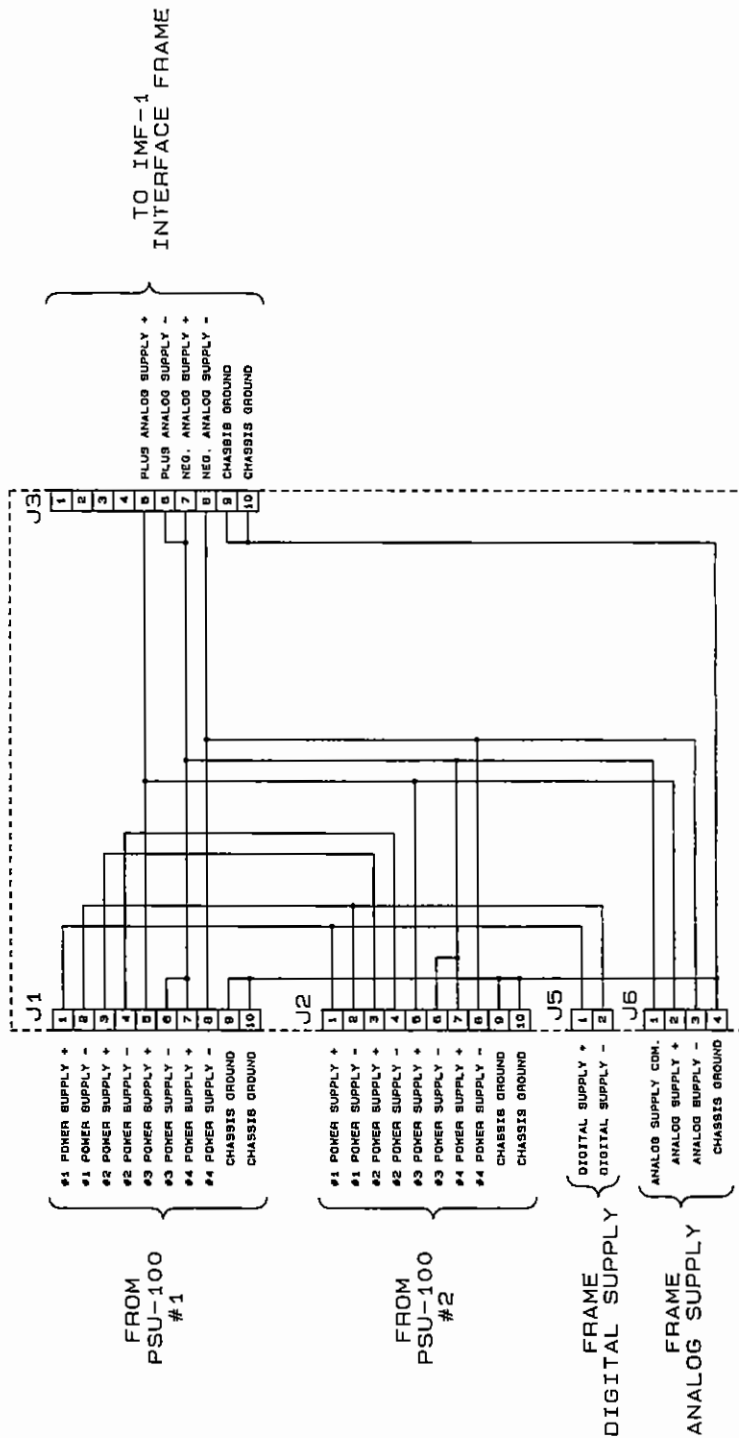


FIGURE F2-5 Schematic - MCF-100 Frame, 2nd Audio Motherboard, Rev. A



MCF-100

FIGURE F2-6 Schematic - MCF-100 Frame, Power Connector Board, Rev. B

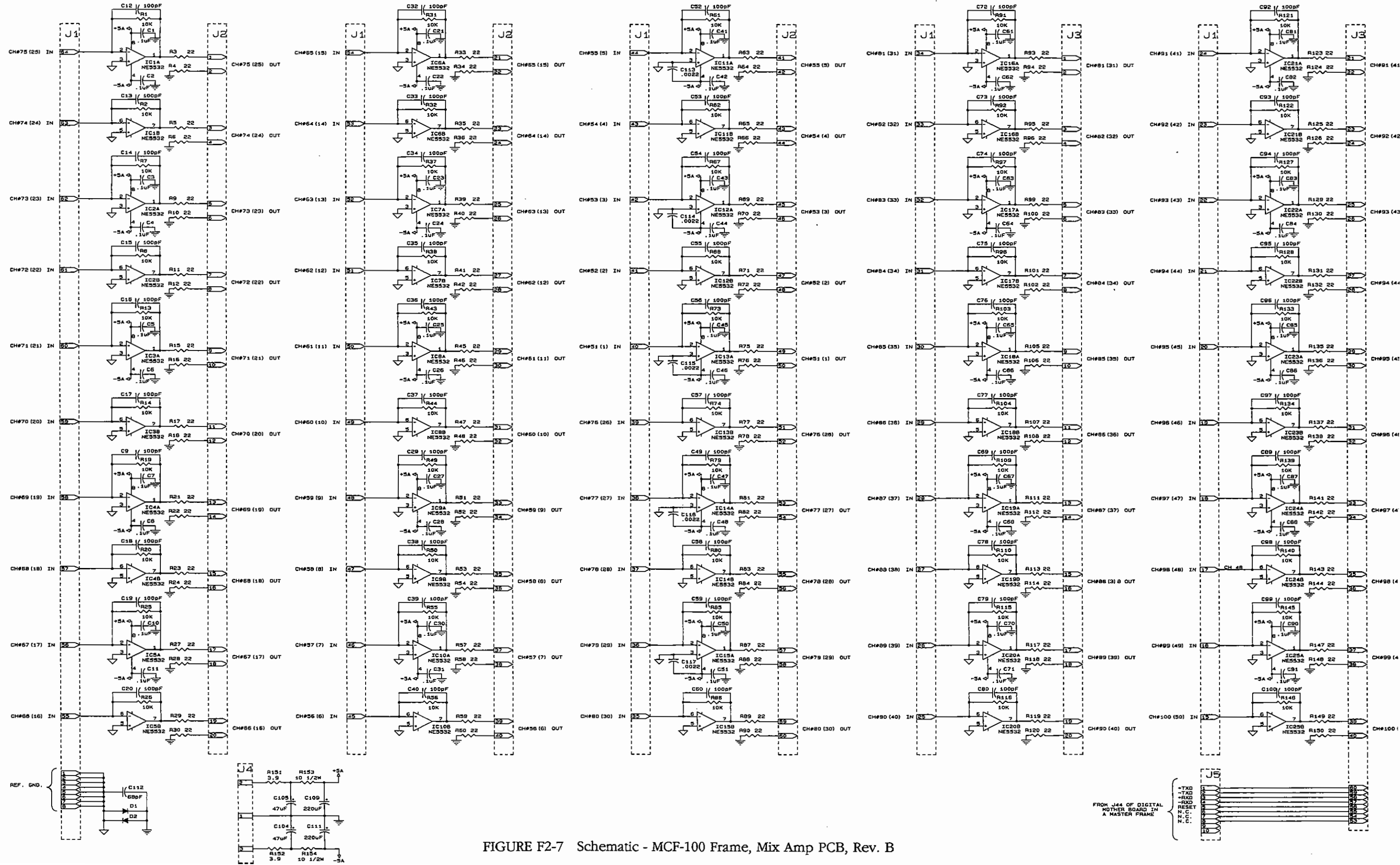


FIGURE F2-7 Schematic - MCF-100 Frame, Mix Amp PCB, Rev. B

MCF-100

MCF-100

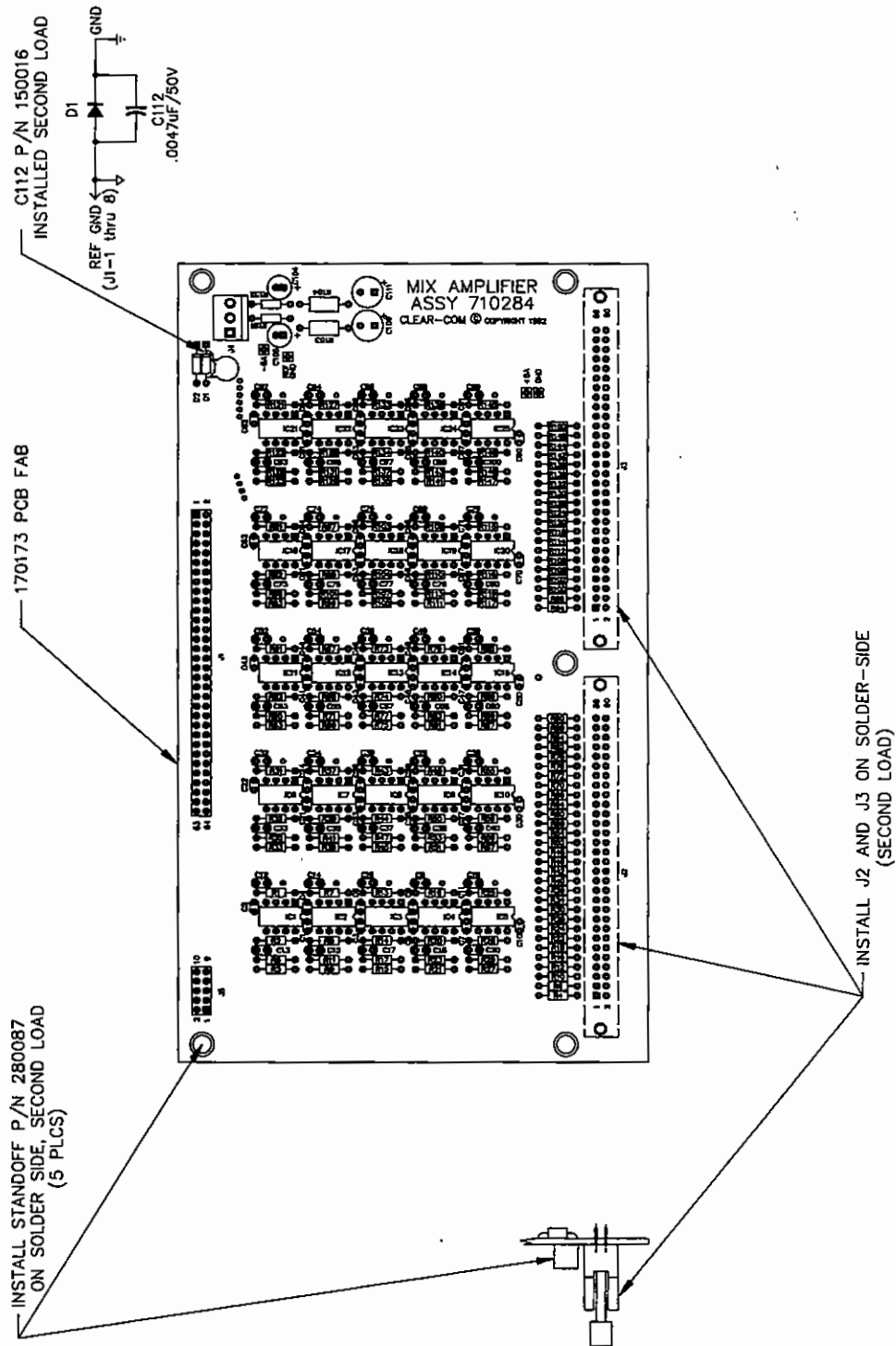


FIGURE F2-8 Assembly Drawing - Mix Amp PCB, Rev. B

Bill of Materials for The Mix Amp PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
100	pF	Ceramic Disc	50V	10%	150006	C9 C12 C13 C14 C15 C16 C17 C18 C19 C20 C29 C32 C33 C34 C35 C36 C37 C38 C39 C40 C49 C52 C53 C54 C55 C56 C57 C58 C59 C60 C69 C72 C73 C74 C75 C76 C77 C78 C79 C80 C89 C92 C93 C94 C95 C96 C97 C98 C99 C100
0.0047	uF	Ceramic Disc	50V	10%	150016	C112
0.1	uF	Monolithic	50V	10%	150035	C1 C2 C3 C4 C5 C6 C7 C8 C10 C11 C21 C22 C23 C24 C25 C26 C27 C28 C30 C31 C41 C42 C43 C44 C45 C46 C47 C48 C50 C51 C61 C62 C63 C64 C65 C66 C67 C68 C70 C71 C81 C82 C83 C84 C85 C86 C87 C88 C90 C91
47	uF	Aluminum	16V	20%	150143	C104 C105
220	uF	Aluminum	16V	20%	150146	C109 C111

Resistors & Resistor Packs

Value		Power	Type	Tol.	Part #	Designator
3.9	OHM	1/4	Carbon Film	5%	410001	R151 R152
10	OHM	1/2	Carbon Film	5%	410066	R153 R154
22	OHM	1/4	Carbon Film	5%	410004	R3 R4 R5 R6 R9 R10 R11 R12 R15 R16 R17 R18 R21 R22 R23 R24 R27 R28 R29 R30 R33 R34 R35 R36 R39 R40 R41 R42 R45 R46 R47 R48 R51 R52 R53 R54 R57 R58 R59 R60 R63 R64 R65 R66 R69 R70 R71 R72 R75 R76 R77 R78 R81 R82 R83 R84 R87 R88 R89 R90 R93 R94 R95 R96 R99 R100 R101 R102 R105 R106 R107 R108 R111 R112

Bill of Materials for The Mix Amp PCB ---- continued

MCF-100

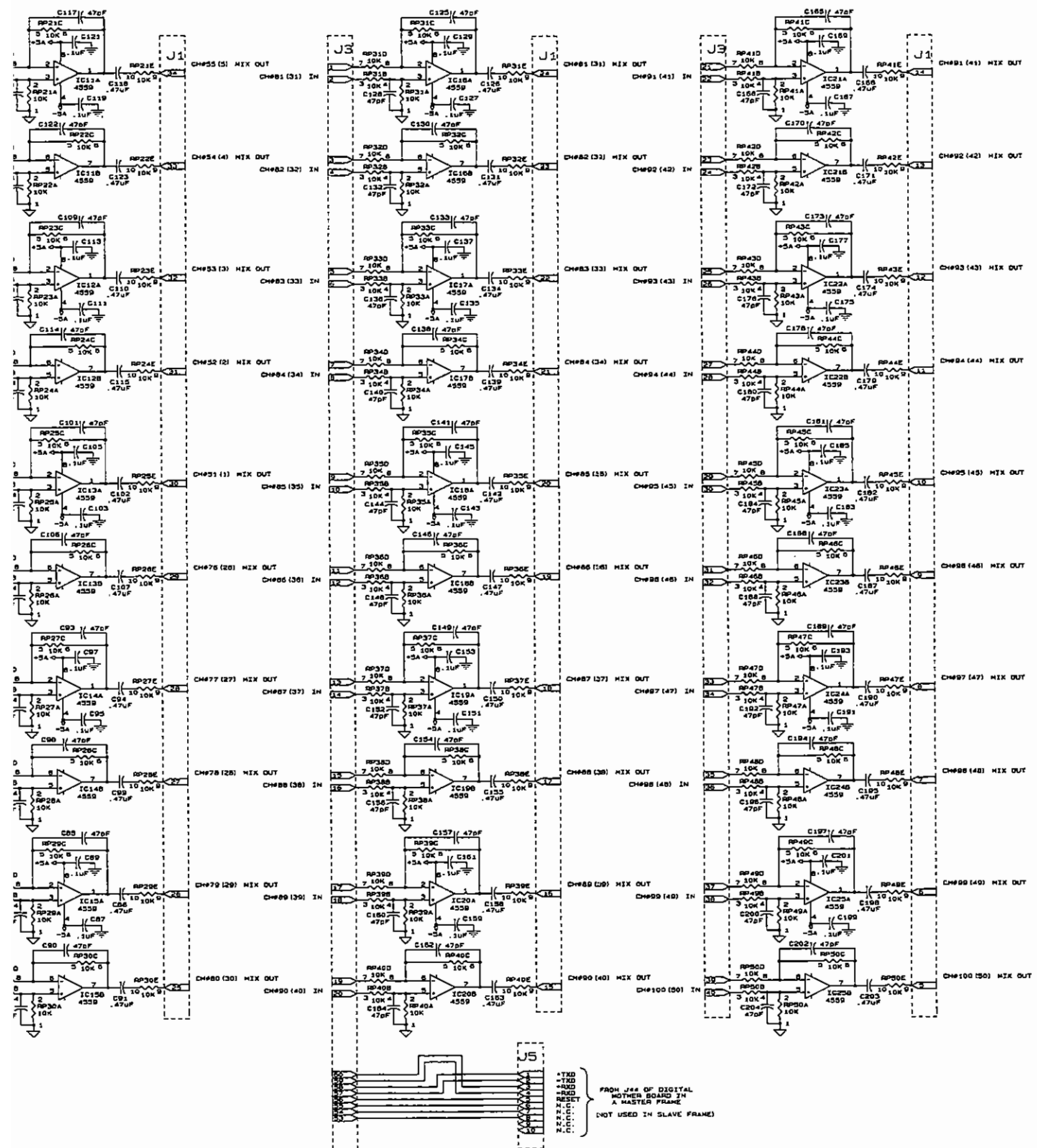
						R113 R114 R117 R118
						R119 R120 R123 R124
						R125 R126 R129 R130
						R131 R132 R135 R136
						R137 R138 R141 R142
						R143 R144 R147 R148
						R149 R150
10K	OHM	1/4	Carbon Film	5%	410016	R1 R2 R7 R8 R13 R14 R19
						R20 R25 R26 R31 R32 R37
						R38 R43 R44 R49 R50 R55
						R56 R61 R62 R67 R68 R73
						R74 R79 R80 R85 R86 R91
						R92 R97 R98 R103 R104
						R109 R110 R115 R116
						R121 R122 R127 R128
						R133 R134 R139 R140
						R145 R146

Diodes and Transistors

Device	Description	Part #	Designator
Diode 1N4148	SIGNAL 10MA 75PIV	480000	D1 D2

Integrated Circuits

Device	Description	Part #	Designator
Op Amp	NE5532 DUAL OP AMP	480070	IC1 IC2 IC3 IC4 IC5 IC6 IC7 IC8 IC9 IC10 IC11 IC12 IC13 IC14 IC15 IC16 IC17 IC18 IC19 IC20 IC21 IC22 IC23 IC24 IC25 IC25

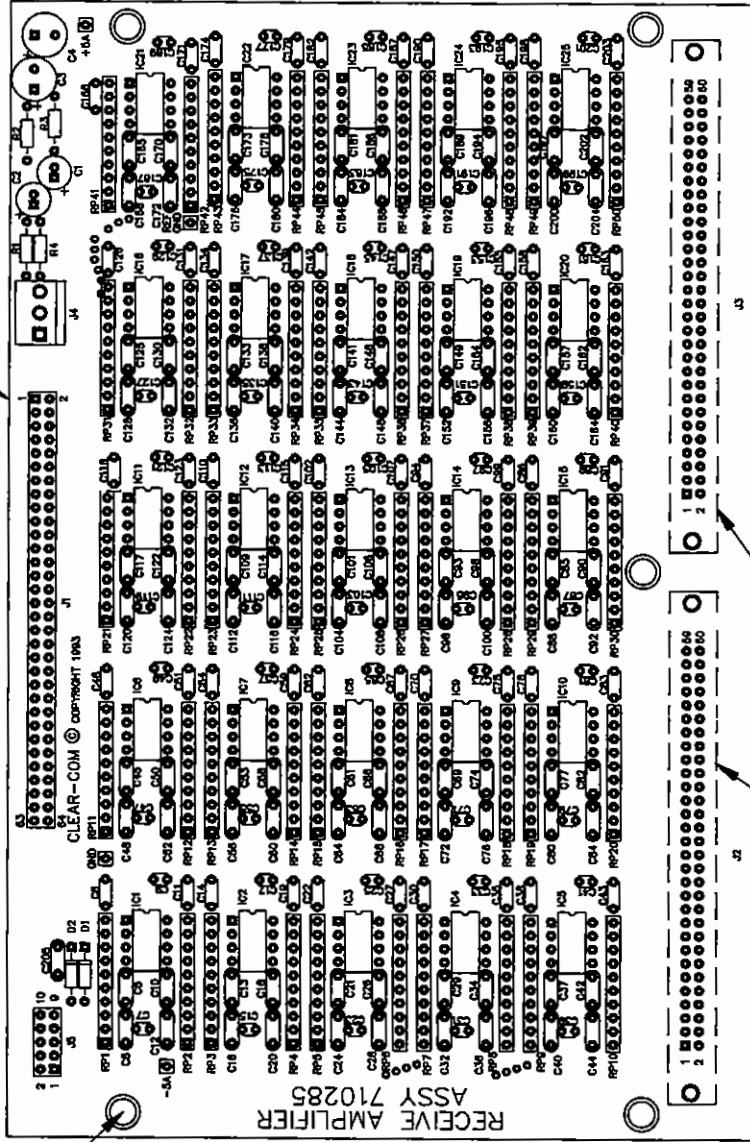




MCF-100

MCF-100

INSTALL STANDOFF P/N 280087
ON SOLDER SIDE, SECOND LOAD
(5 PLCS)



INSTALL J2 AND J3 ON SOLDER-SIDE
(SECOND LOAD)

FIGURE F2-10 Assembly Drawings - Receive Amp PCB, Rev. B

Bill of Materials for Receive Amp PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
47 pF	Ceramic Disc	50V	10%	150041	C5 C8 C10 C12 C13 C16 C18 C20 C21 C24 C26 C28 C29 C32 C34 C36 C37 C40 C42 C44 C45 C48 C50 C52 C53 C56 C58 C60 C61 C64 C66 C68 C69 C72 C74 C76 C77 C80 C82 C84 C85 C88 C90 C92 C93 C96 C98 C100 C101 C104 C106 C108 C109 C112 C114 C116 C117 C120 C122 C124 C125 C128 C130 C132 C133 C136 C138 C140 C141 C144 C146 C148 C149 C152 C154 C156 C157 C160 C162 C164 C165 C168 C170 C172 C173 C176 C178 C180 C181 C184 C186 C188 C189 C192 C194 C196 C197 C200 C202 C204
0.0047 uF	Ceramic Disc	50V	10%	150016	C205
0.1 uF	Monolithic	50V	10%	150035	C7 C9 C15 C17 C23 C25 C31 C33 C39 C41 C47 C49 C55 C57 C63 C65 C71 C73 C79 C81 C87 C89 C95 C97 C103 C105 C111 C113 C119 C121 C127 C129 C135 C137 C143 C145 C151 C153 C159 C161 C167 C169 C175 C177 C183 C185 C191 C193 C199 C201
0.47 uF	Monolithic	50V		150043	C6 C11 C14 C19 C22 C27 C30 C35 C38 C43 C46 C51 C54 C59 C62 C67 C70 C75 C78 C83 C86 C91 C94 C99 C102 C107 C110 C115

MCF-100

Bill of Materials for Receive Amp PCB ---- continued

						C118 C123 C126 C131
						C134 C139 C142 C147
						C150 C155 C158 C163
						C166 C171 C174 C179
						C182 C187 C190 C195
						C198 C203
47	uF	Aluminum	16V	20%	150143	C1 C2
220	uF	Aluminum	16V	20%	150146	C3 C4

Resistors & Resistor Packs

MCF-100

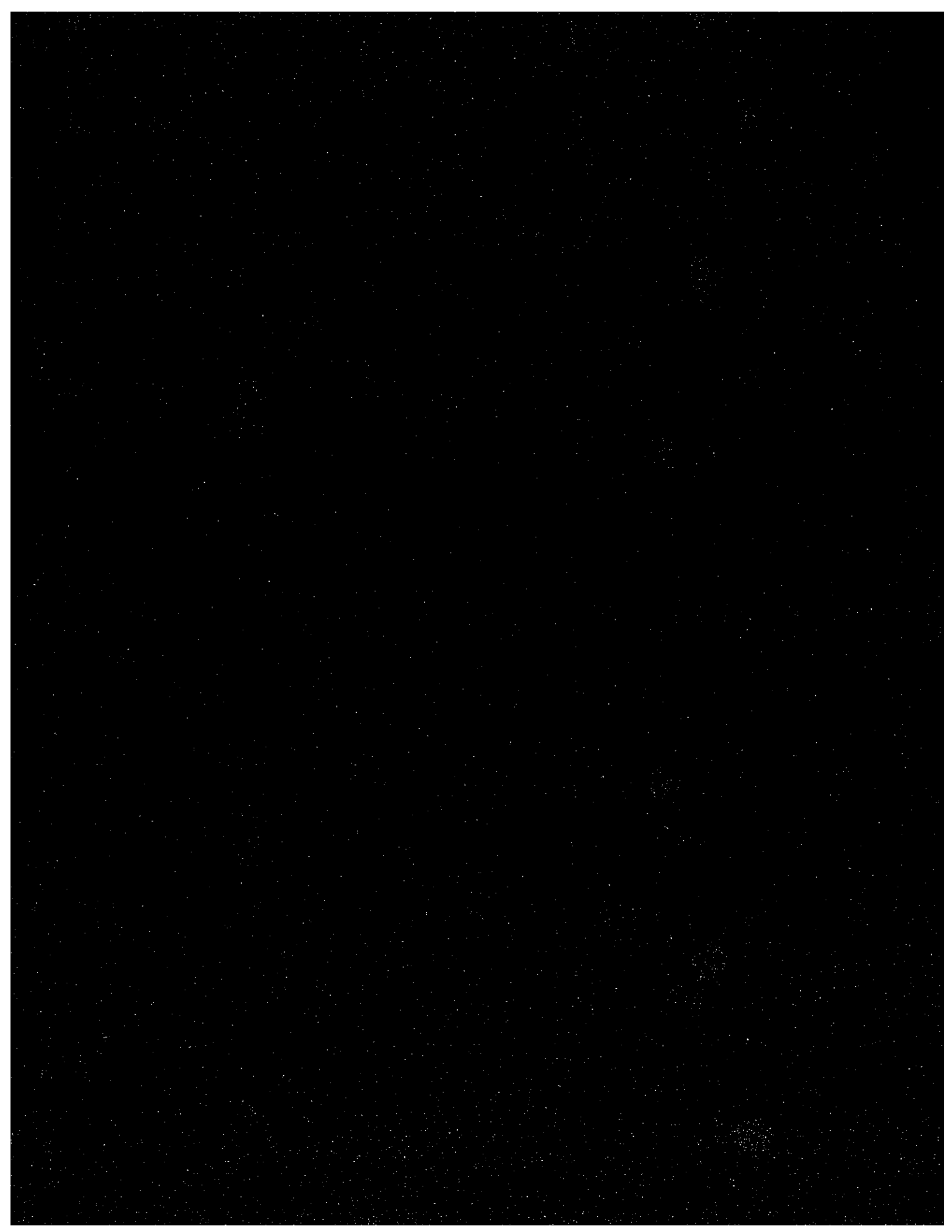
Value	Power	Type	Tol.	Part #	Designator
10 OHM	1/4	Carbon Film	5%	410002	R1 R2 R3 R4
10K OHM		R-Pack		415003	RP1 RP2 RP3 RP4 RP5 RP6 RP7 RP8 RP9 RP10 RP11 RP12 RP13 RP14 RP15 RP16 RP17 RP18 RP19 RP20 RP21 RP22 RP23 RP24 RP25 RP26 RP27 RP28 RP29 RP30 RP31 RP32 RP33 RP34 RP35 RP36 RP37 RP38 RP39 RP40 RP41 RP42 RP43 RP44 RP45 RP46 RP47 RP48 RP49 RP50

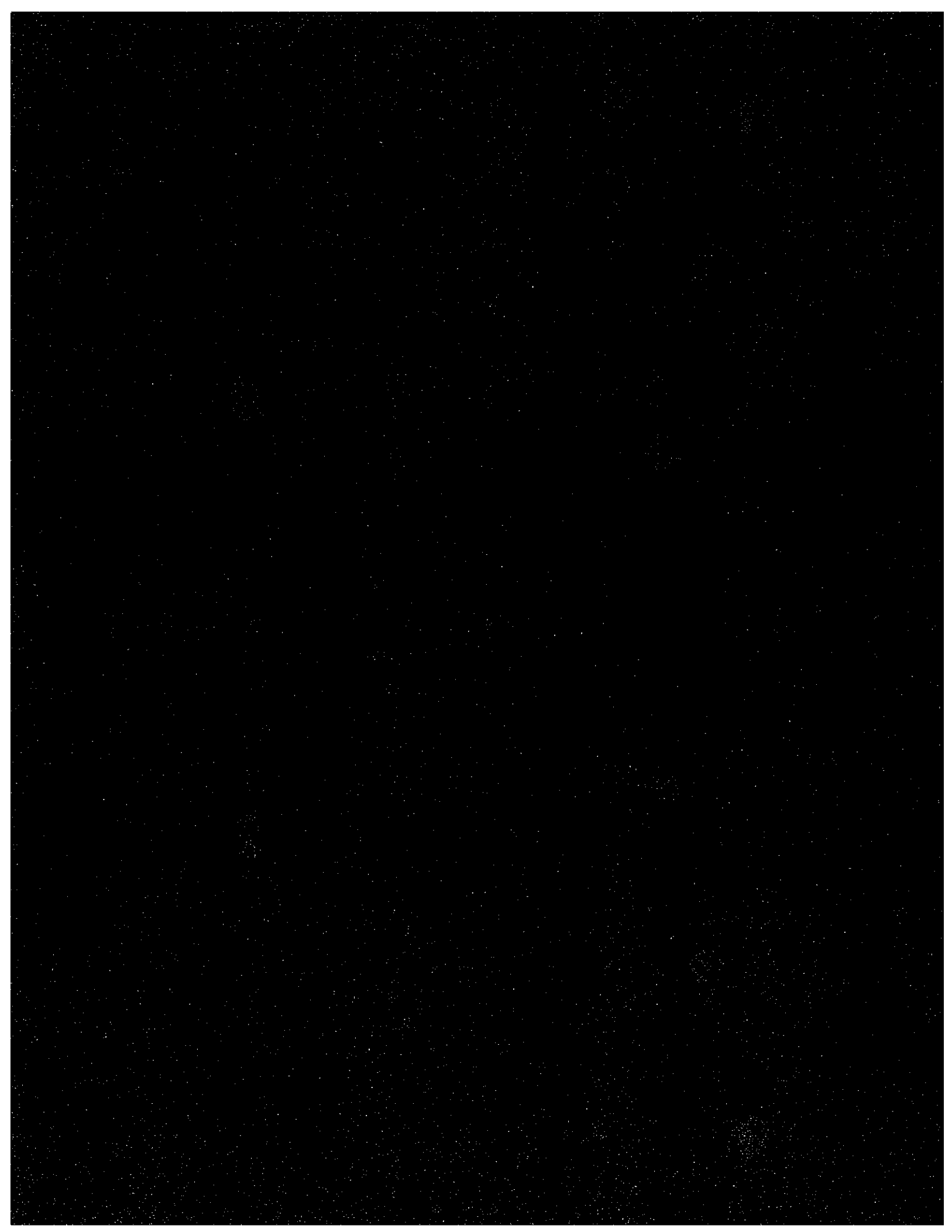
Diodes and Transistors

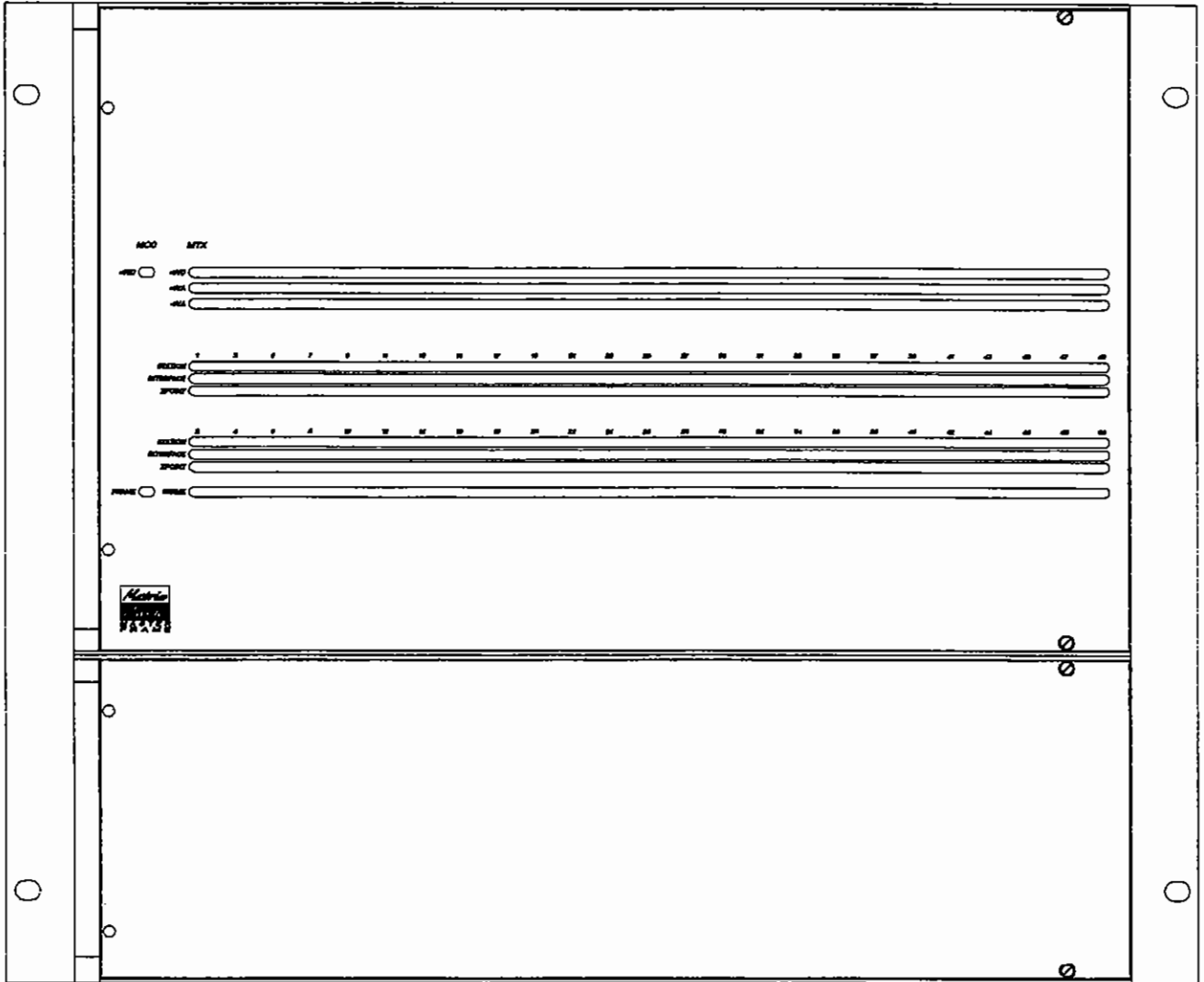
Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1 D2

Integrated Circuits

Device	Description	Part #	Designator
Op Amp	RC4559NB DUAL OP AMP	480056	IC1 IC2 IC3 IC4 IC5 IC6 IC7 IC8 IC9 IC10 IC11 IC12 IC13 IC14 IC15 IC16 IC17 IC18 IC19 IC20 IC21 IC22 IC23 IC24 IC25 IC25







Matrix Plus II System

SCF-101

EXPANSION CARD FRAME 50x100 - 25 SLOT

Introduction

This Section provides an overall schematic diagram of the SCF-101 Expansion Card Frame.

The SCF-101 Card Frame is the second of two frames needed to construct a 100 X 100 matrix system. The SCF-101 has enough card slots to house one CPU-150 System Controller Card, up to 25 MTX-100 or MTX-200 Matrix Cards, up to 25 STX-101 Crosspoint Expansion Cards. The rear panel contains all of the connectors needed to support the possible 50 ports.

The component parts of the SCF-101 are identical to the MCF-100 except that a few unnecessary rear panel connectors were eliminated and the positions that the MIX and RECEIVE amplifier PCBs occupy have been reversed to allow the external ribbon cables that interconnect the a MCF-100 and a SCF-101 to physically go straight across from frame to frame. The Overall Schematics of the two frames are also pictorially correct thus representing this swap. Refer to all of the schematics and other documentation of the MCF-100 except for the overall schematic.

The following pages contains the overall schematic the SCF-101 Frame.

SCF-101

SCF-101

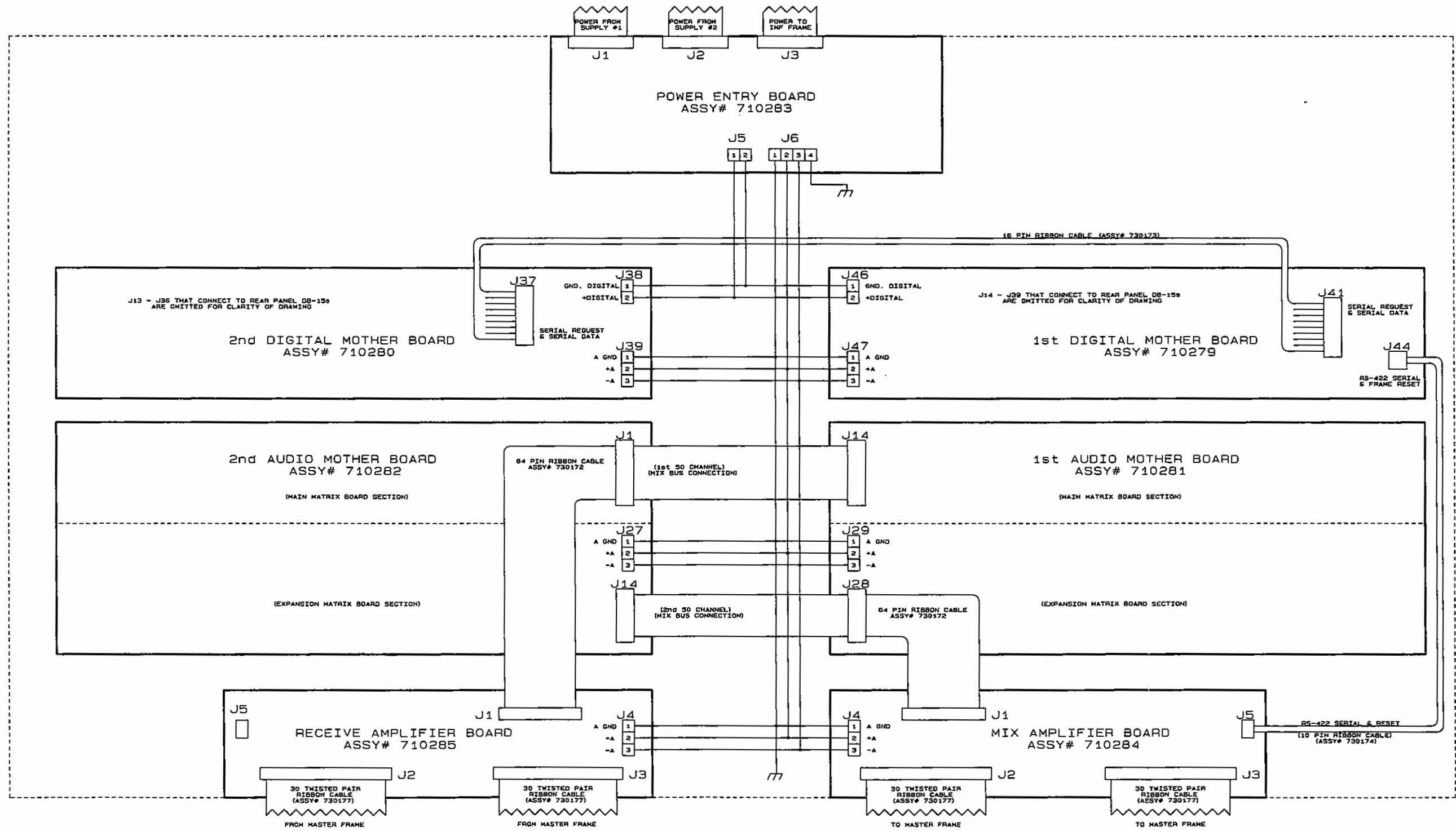
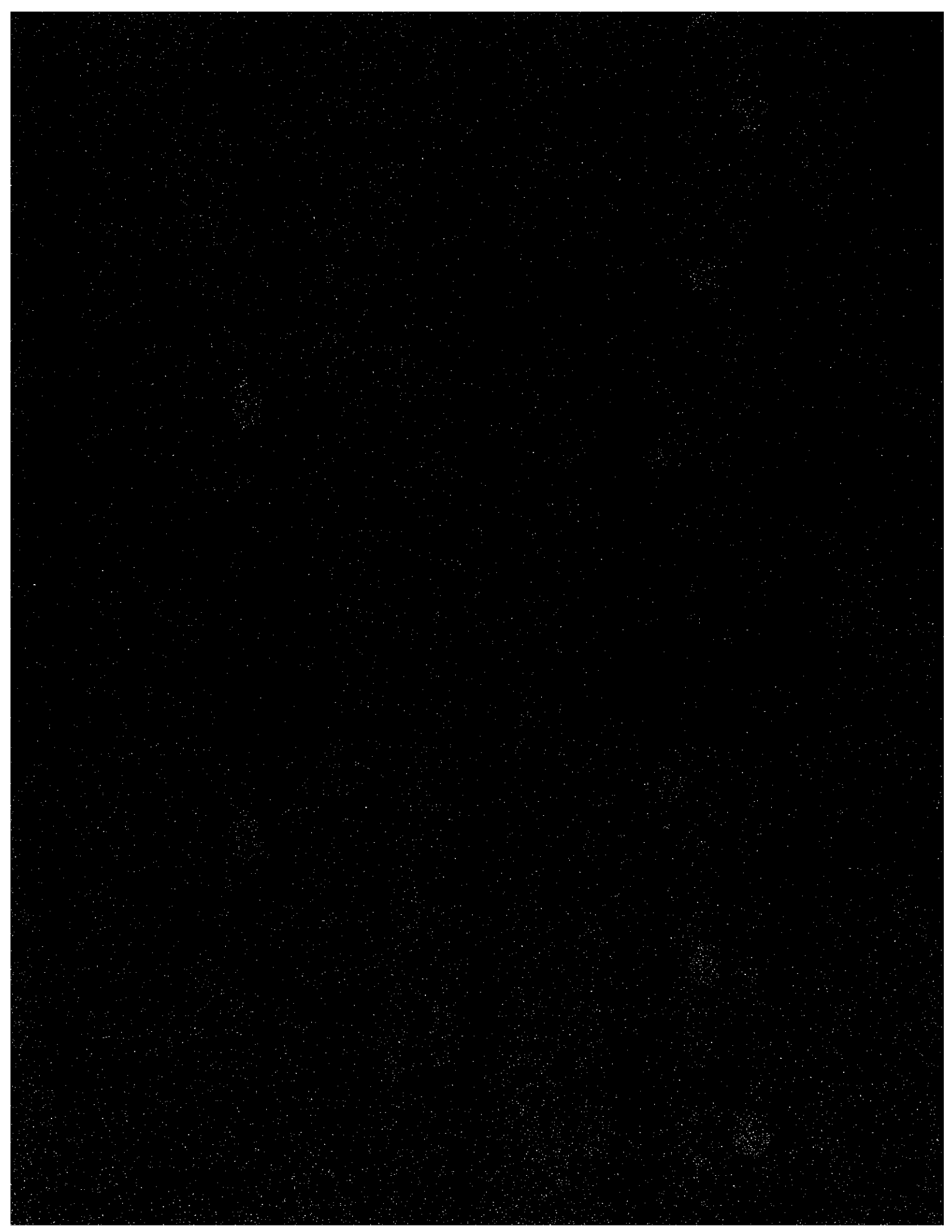
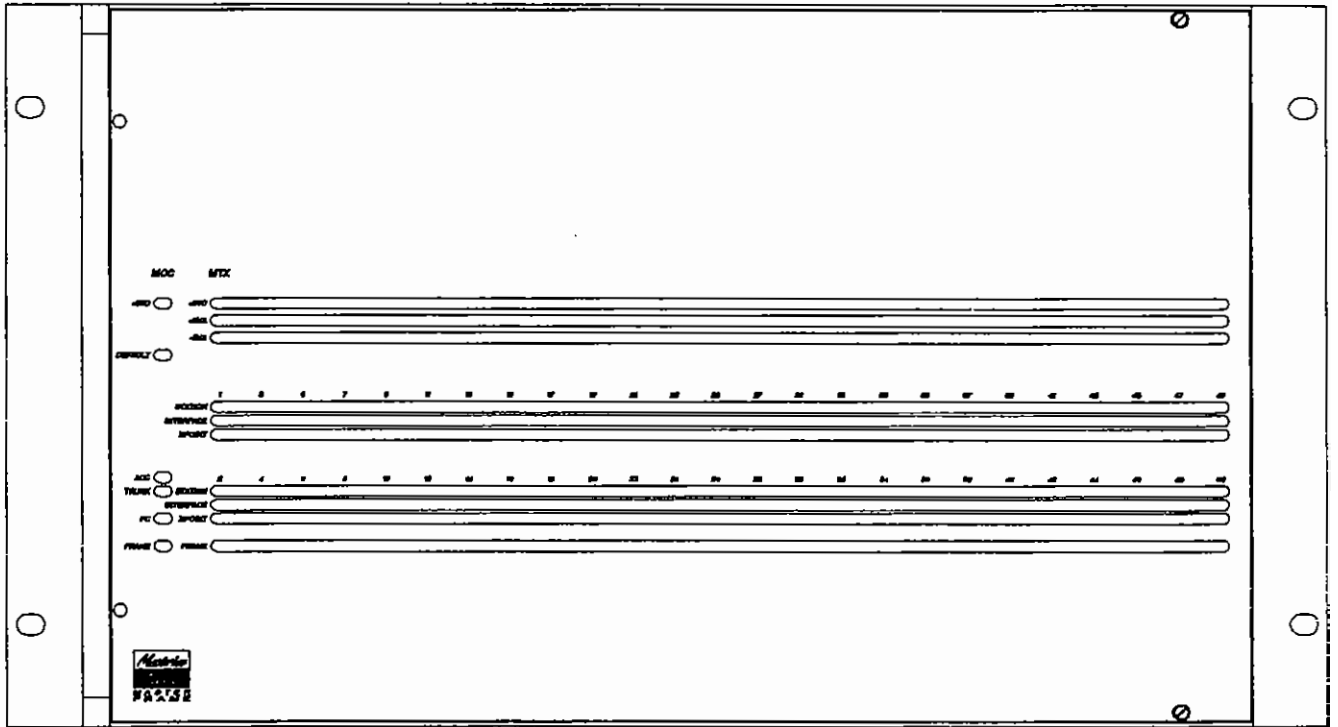


FIGURE F3-1 Schematic, Overall - SCF-101 Frame, Rev. B







Matrix Plus II System MCF-50
 MASTER CARD FRAME 50x50 - 25 SLOT

Introduction

This Section provides schematic drawings of the MCF-50 Master Card Frame.

The MCF-50 Card Frame is a 6RU high Matrix Plus II frame intended to provide up to 50 ports. The MCF-50 has enough card slots to house one CPU-100 System Controller Card, up to 25 MTX-100 or MTX-200 Matrix Cards. The rear panel contains all of the connectors needed to support the possible 50 ports and communication to the external PC, other matrix frames, and Accessory devices.

Internally, the mother boards that interconnect the various cards between each other and the rear panel are all passive devices. In the following documentation, only schematics are provided for the entire frame.

Mechanical frame parts and passive PCBs usually do not need much service work and therefore are not listed in detail. If more detail is needed, call Clear-Com service department

The following pages contain schematics.

MCF-50

MCF-50

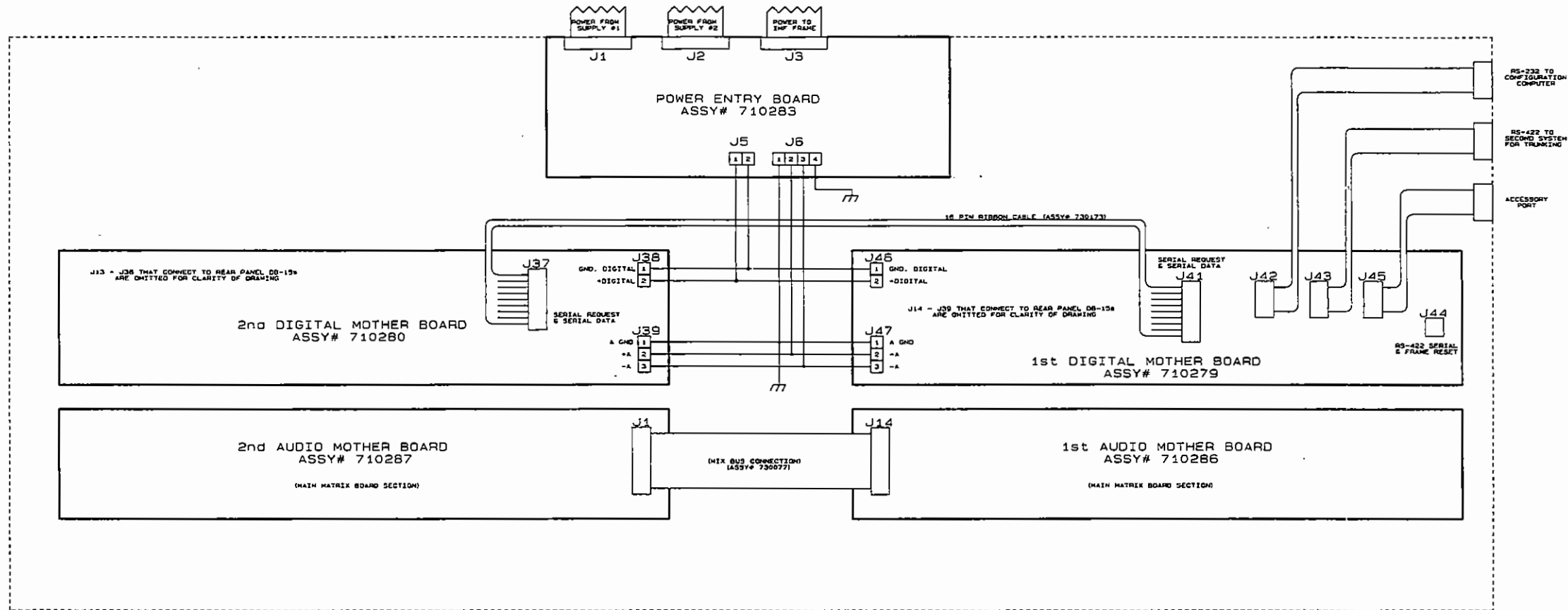


FIGURE F4-1 Schematic, Overall - MCF-50 Frame, Rev. A

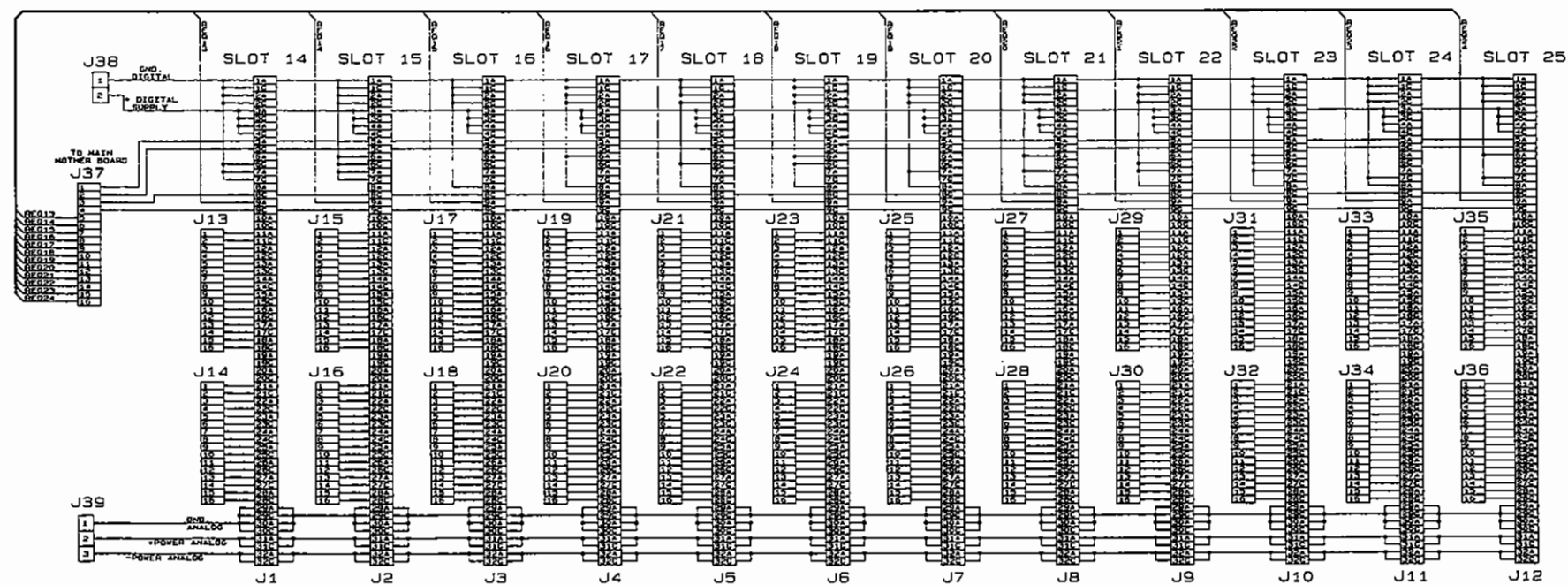


FIGURE F4-3 Schematic - MCF-50 Frame, 2nd Digital Motherboard, Rev. A

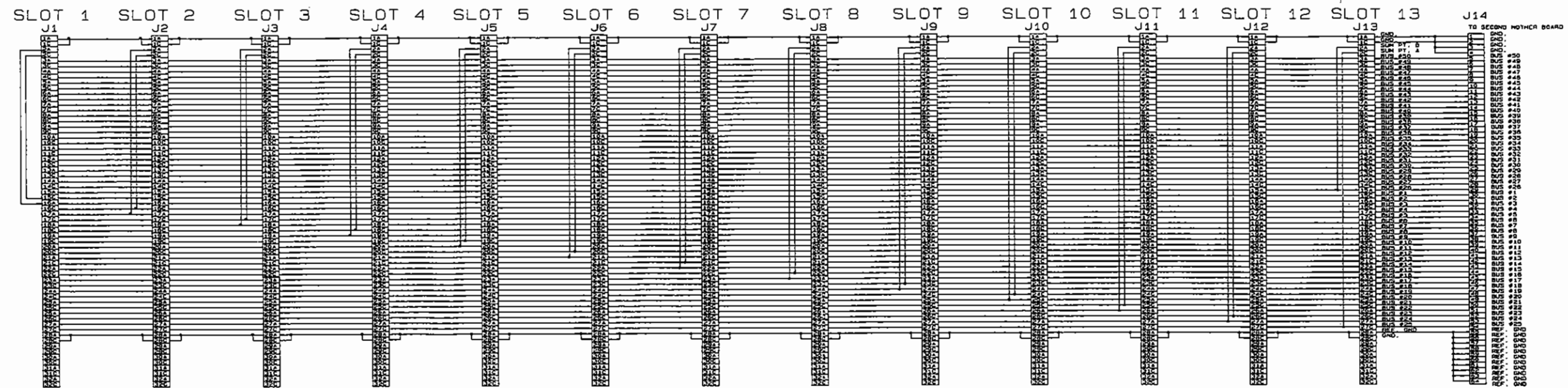


FIGURE F4-4 Schematic - MCF-50 Frame, 1st Audio Motherboard, Rev. A

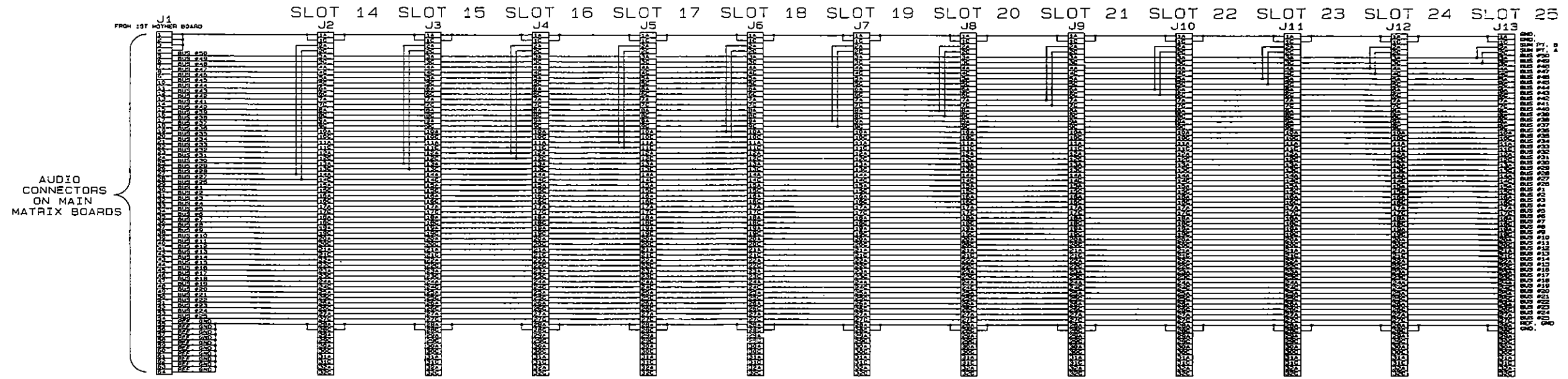
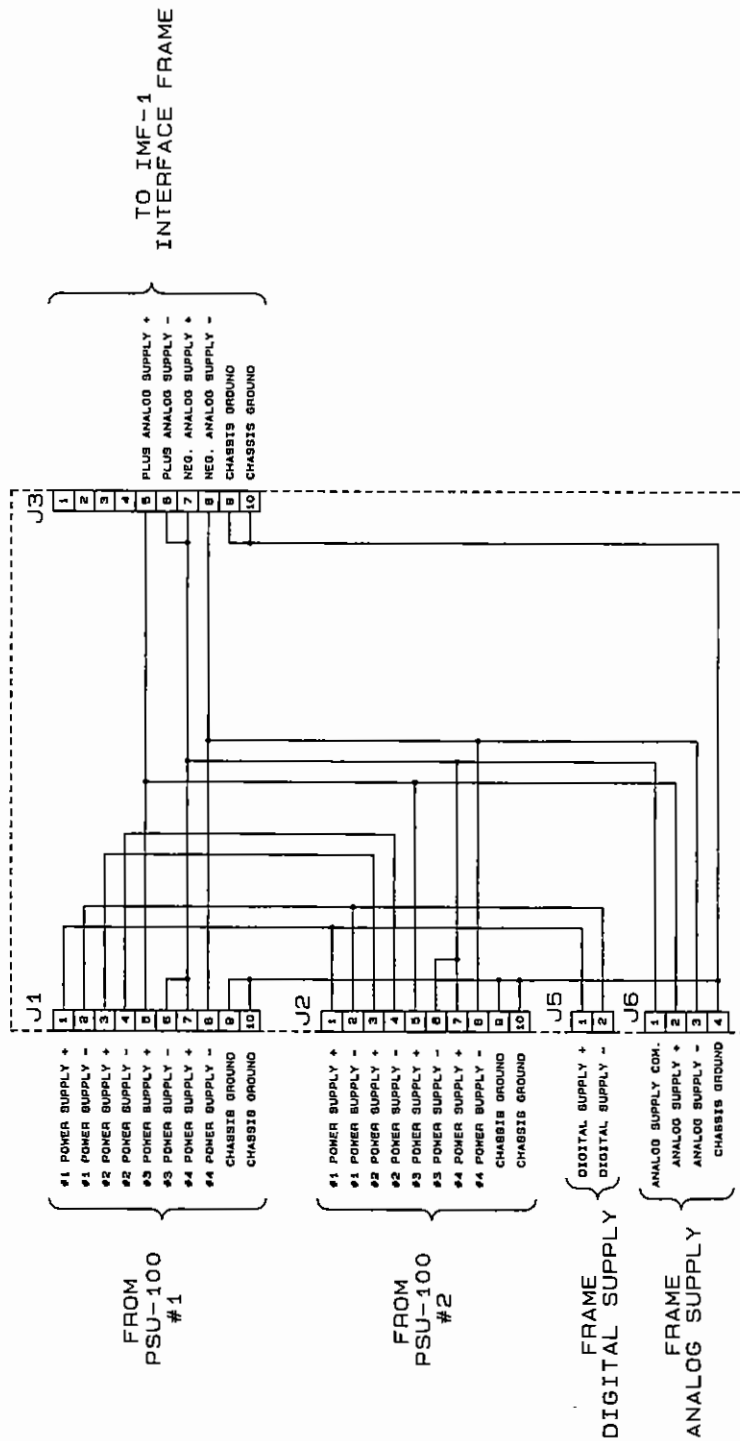
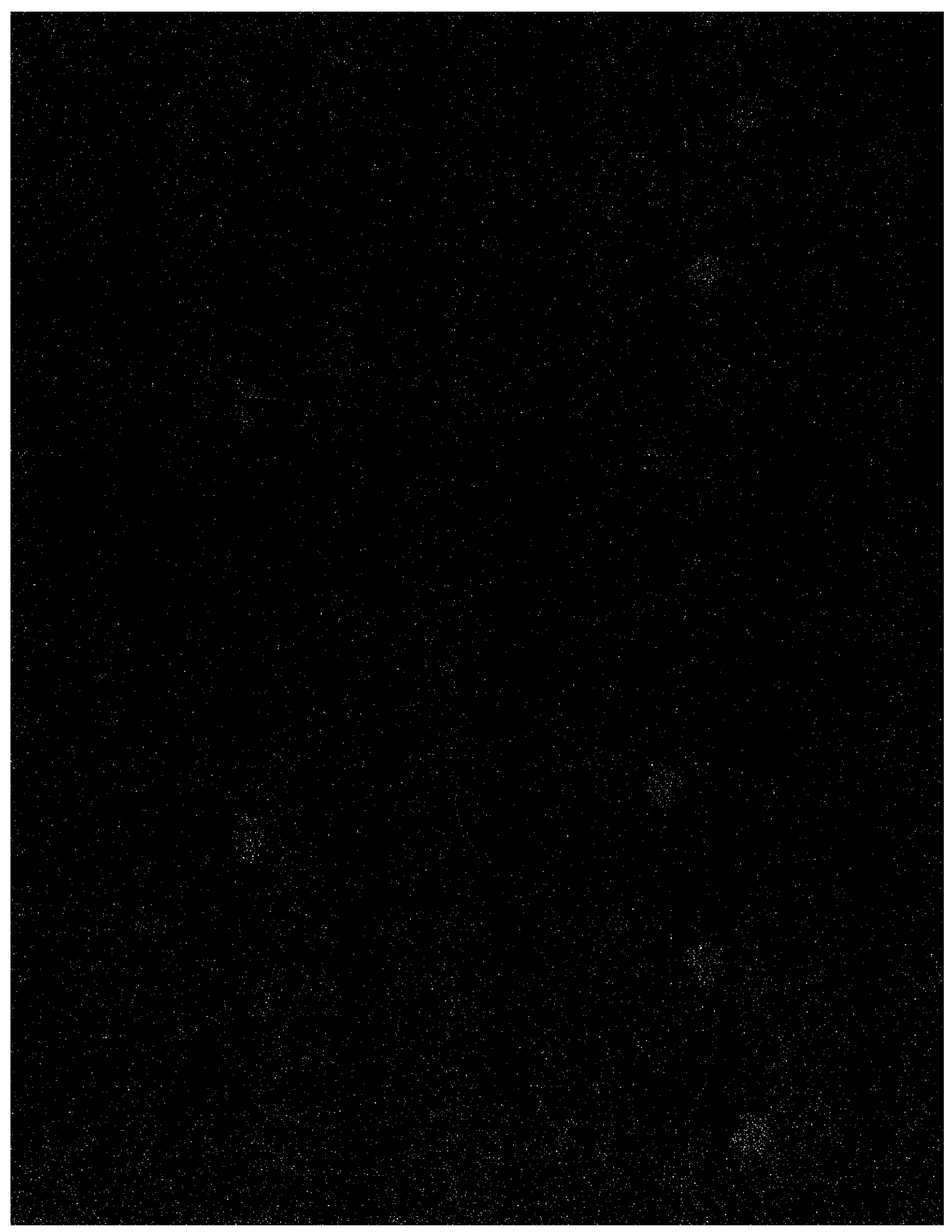


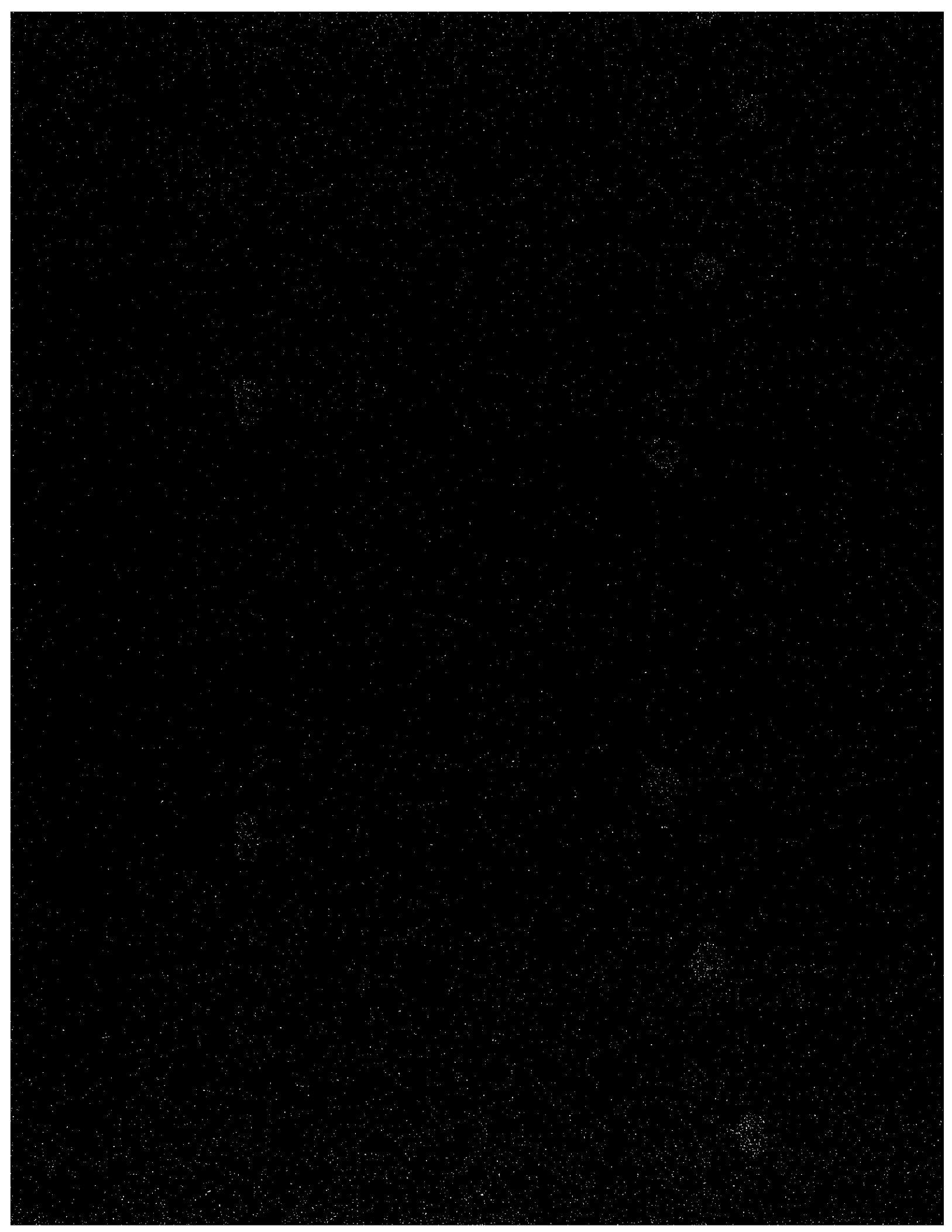
FIGURE F4-5 Schematic - MCF-50 Frame, 2nd Audio Motherboard, Rev. A



MCF-50

FIGURE F4-6 Schematic - MCF-50 Frame, Power Connector PCB, Rev. B





Introduction

The MCF-25 Card Frame is a 6RU high Matrix Plus II frame intended to provide up to 26 ports. The MCF-25 has enough card slots to house one CPU-100 System Controller Card, up to 13 MTX-100 or MTX-200 Matrix Cards. The rear panel contains all of the connectors needed to support the possible 26 ports and communication to the external PC, other matrix frames, and Accessory devices.

The MCF-25 is identical to the MCF-50 except that the Second Digital Mother Board, the Second Audio Mother Board, and a modular portion of the rear panel that contains the last 24 port connectors are omitted. This section of the manual only contains the overall schematic of the MCF-25. Refer to the MCF-50 section for schematics for the various passive PCBs in the MCF-25.

MCF-25

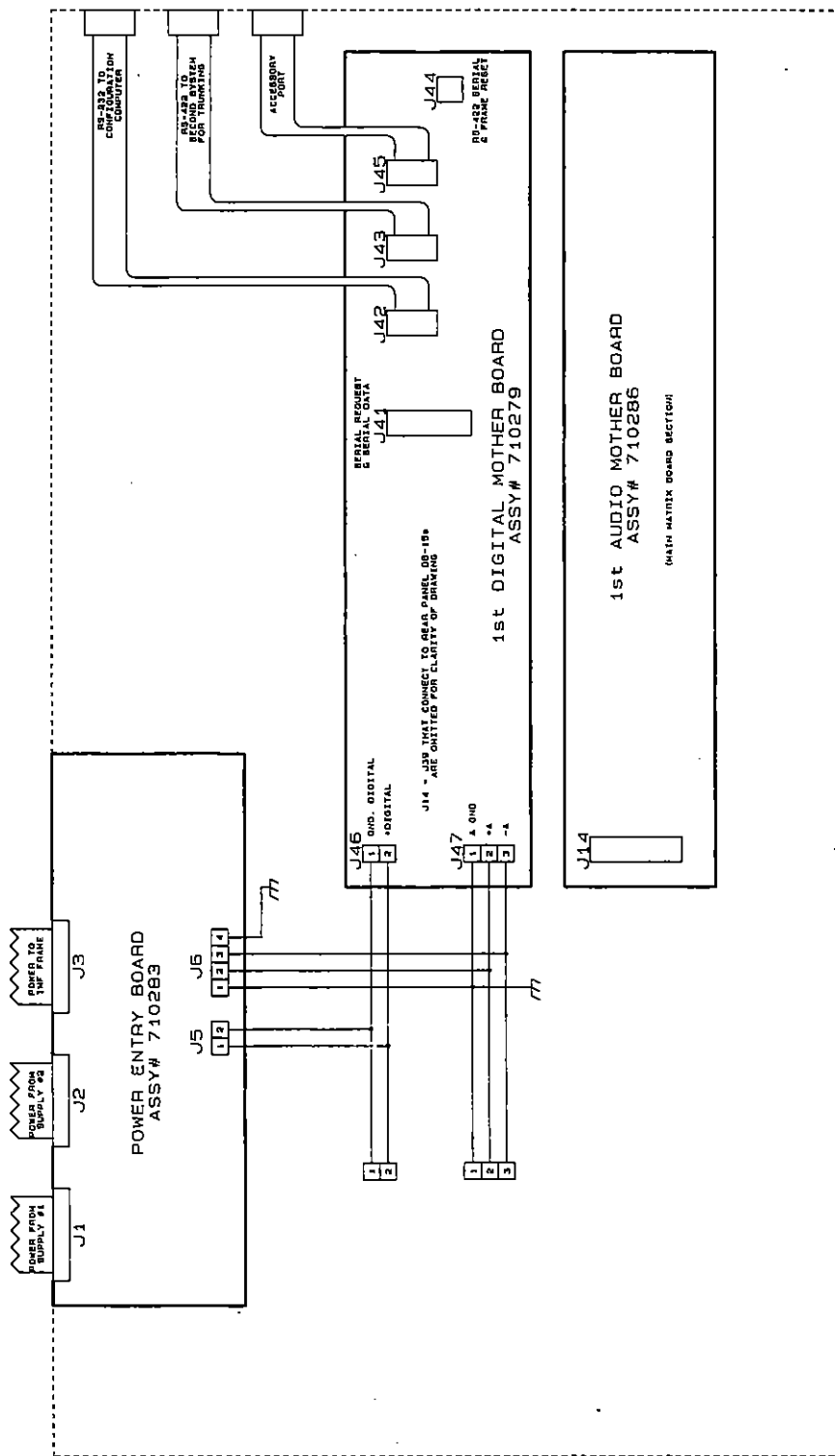
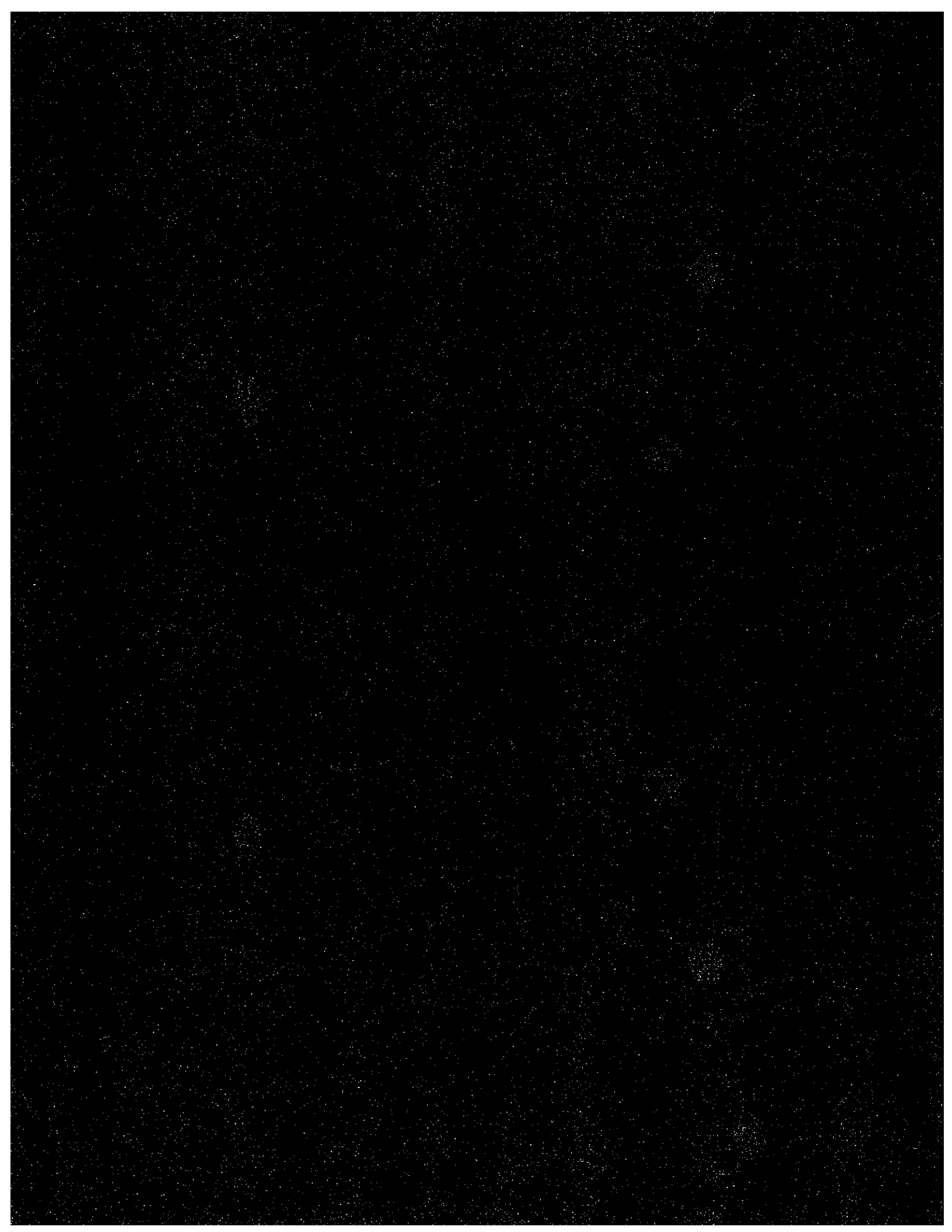
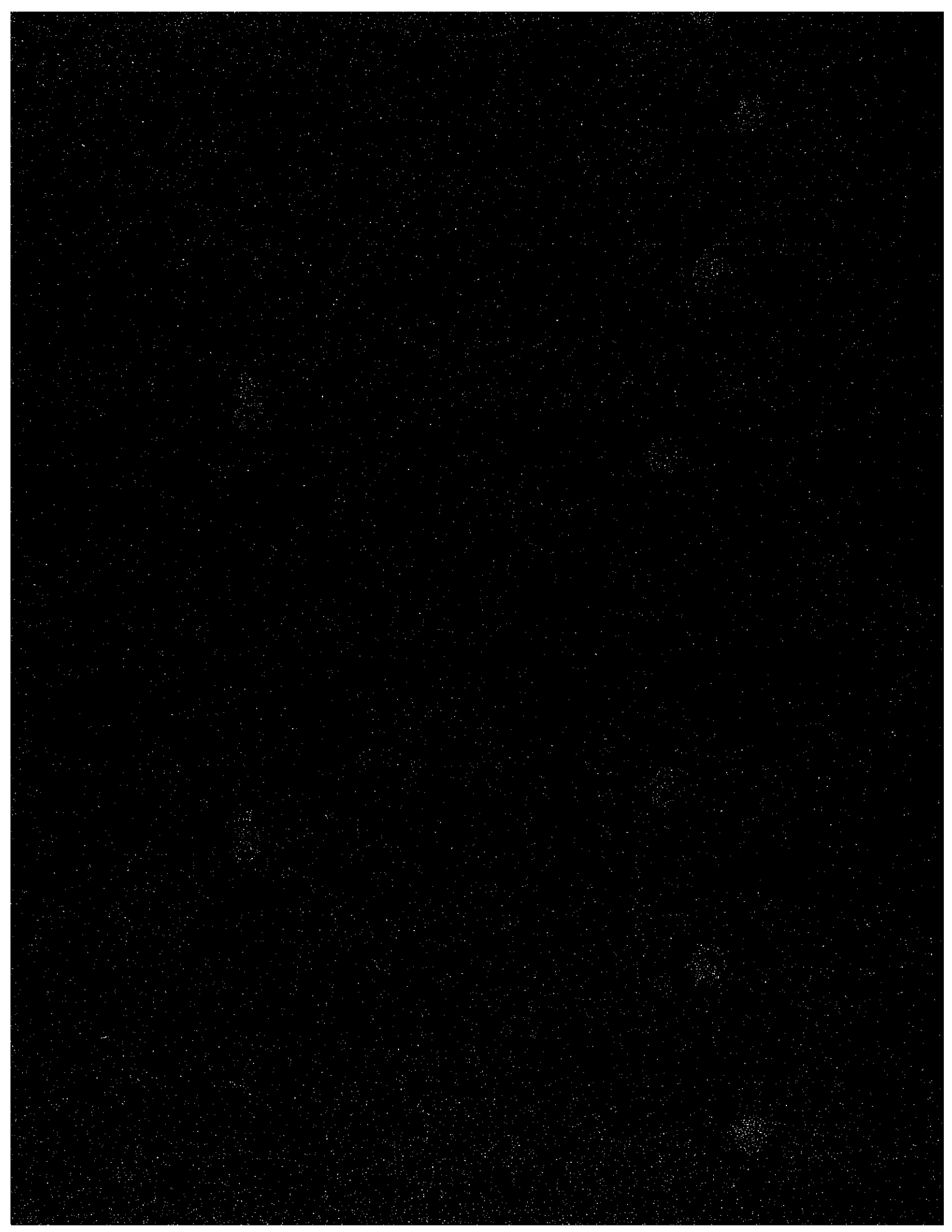
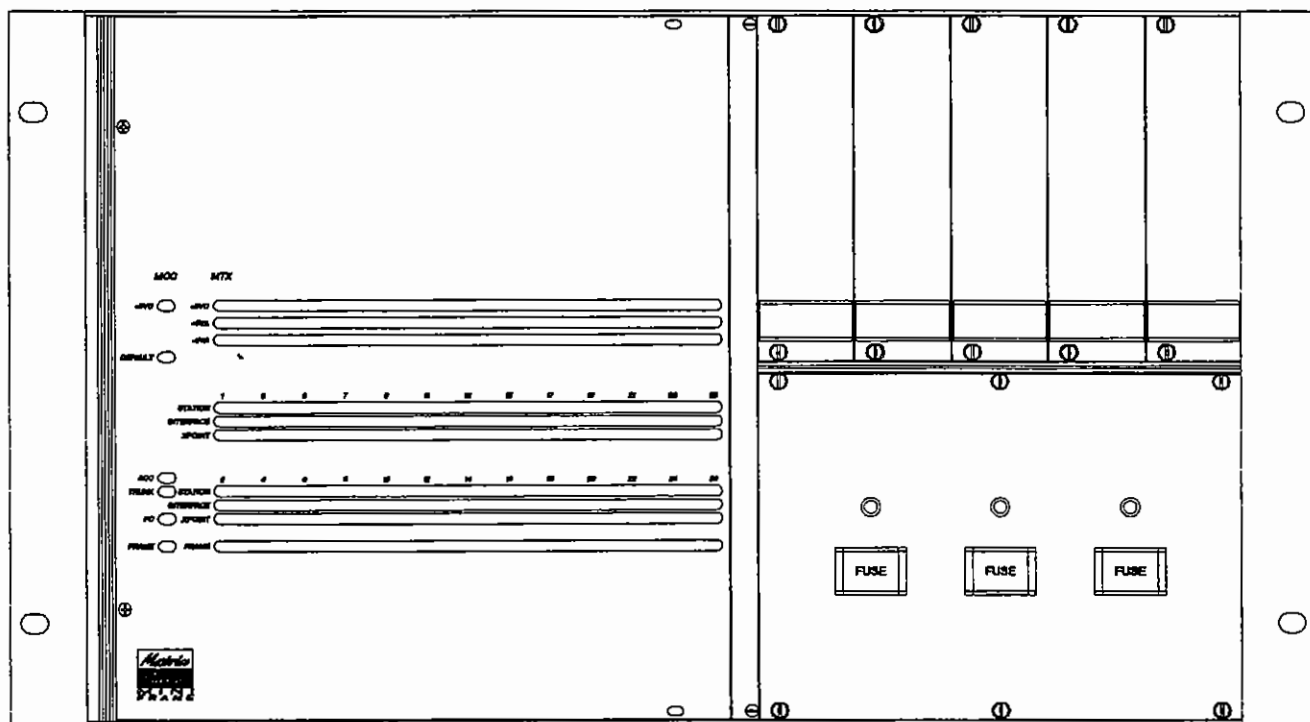


FIGURE F5-1 Schematic, Overall - MCF-25 Frame, Rev. A

MCF-25







Matrix Plus II System

MCF-10

MINI MATRIX 26 x 26

- 13 SLOT

Introduction

The MCF-10 Card Frame is a 6RU high Matrix Plus II frame intended to provide up to 26 ports, house up to 5 Matrix Plus II Interface Modules, and built in power supplies to power the frame. The MCF-10 has enough card slots to house one CPU-100 System Controller Card, up to 13 MTX-100 or MTX-200 Matrix Cards, up to 5 interface modules. The rear panel contains all of the connectors needed to support the possible 26 ports and communication to the external PC, other matrix frames, and Accessory devices.

This section contains a Bill of Materials for the overall frame and schematics of the entire frame.

MCF-10

MCF-10

Miscellaneous Bill of Materials for the MCF-10

Device	Description	Part #	Designator
FUSEHOLDER	20MM RECTANGULAR	520031	
FUSE	2A SLO-BLO 20MM X 5MM	520039	
FUSE	3A SLO-BLO 20MM X 5MM	520040	
POWER SUPPLY	40 WATT 9 VOLT SWITCHING	400010	
CABEL	DB-15 TO HEADER RIBBON	730074	
CABEL	DB-9F RIBBON CABLE	770002	
LED	GREEN PANEL MOUNT 12V	390046	

MCF-10

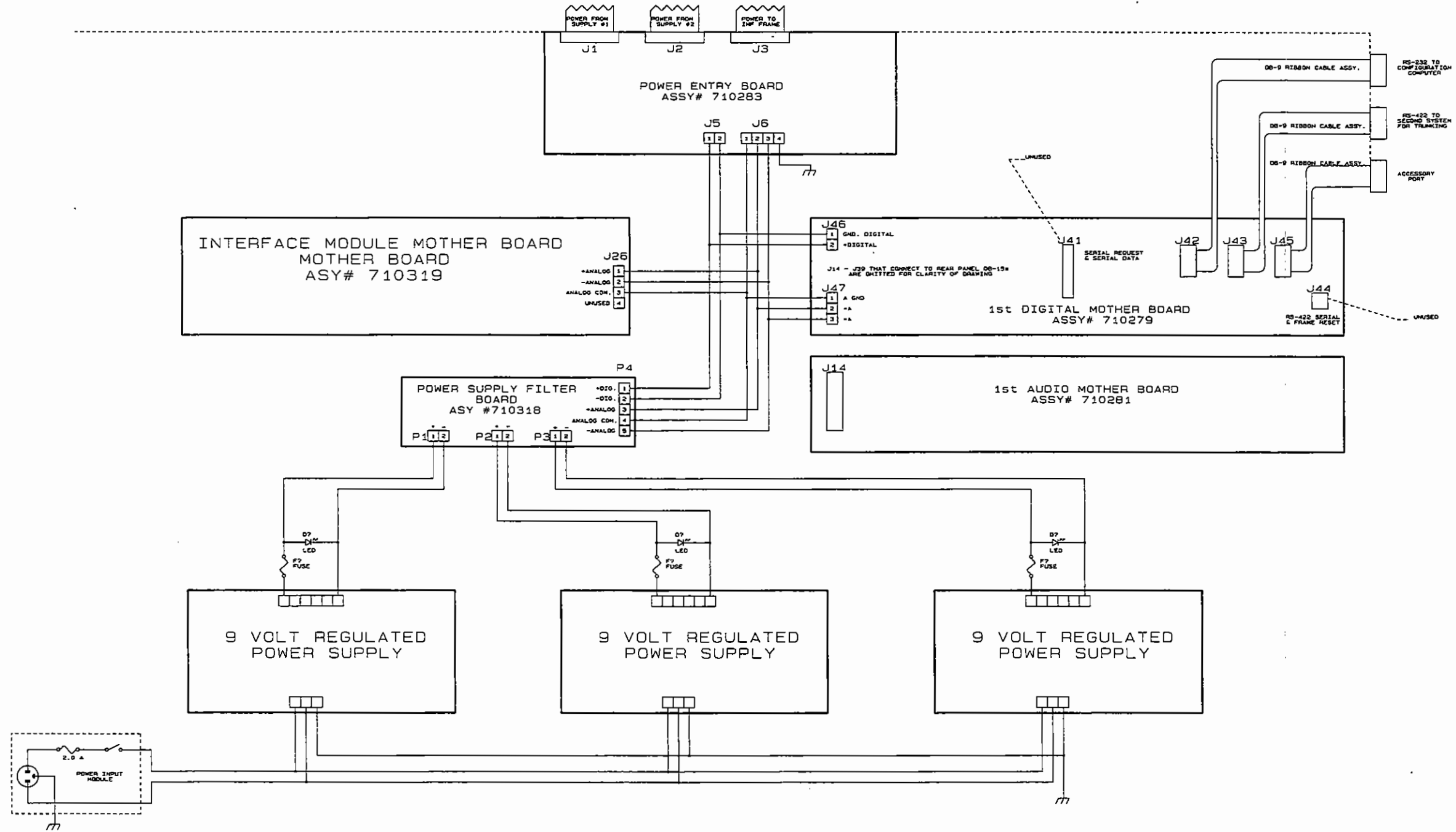


FIGURE F6-1 Schematic, Overall - MCF-10 Frame, Rev. A

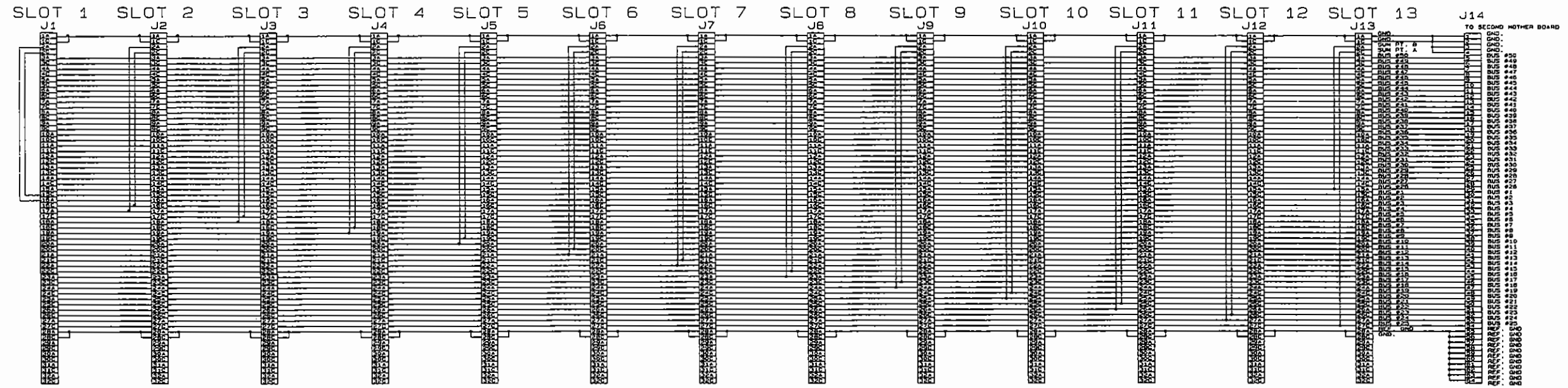


FIGURE F6-3 Schematic - MCF-10 Frame, 1st Audio Motherboard, Rev. A

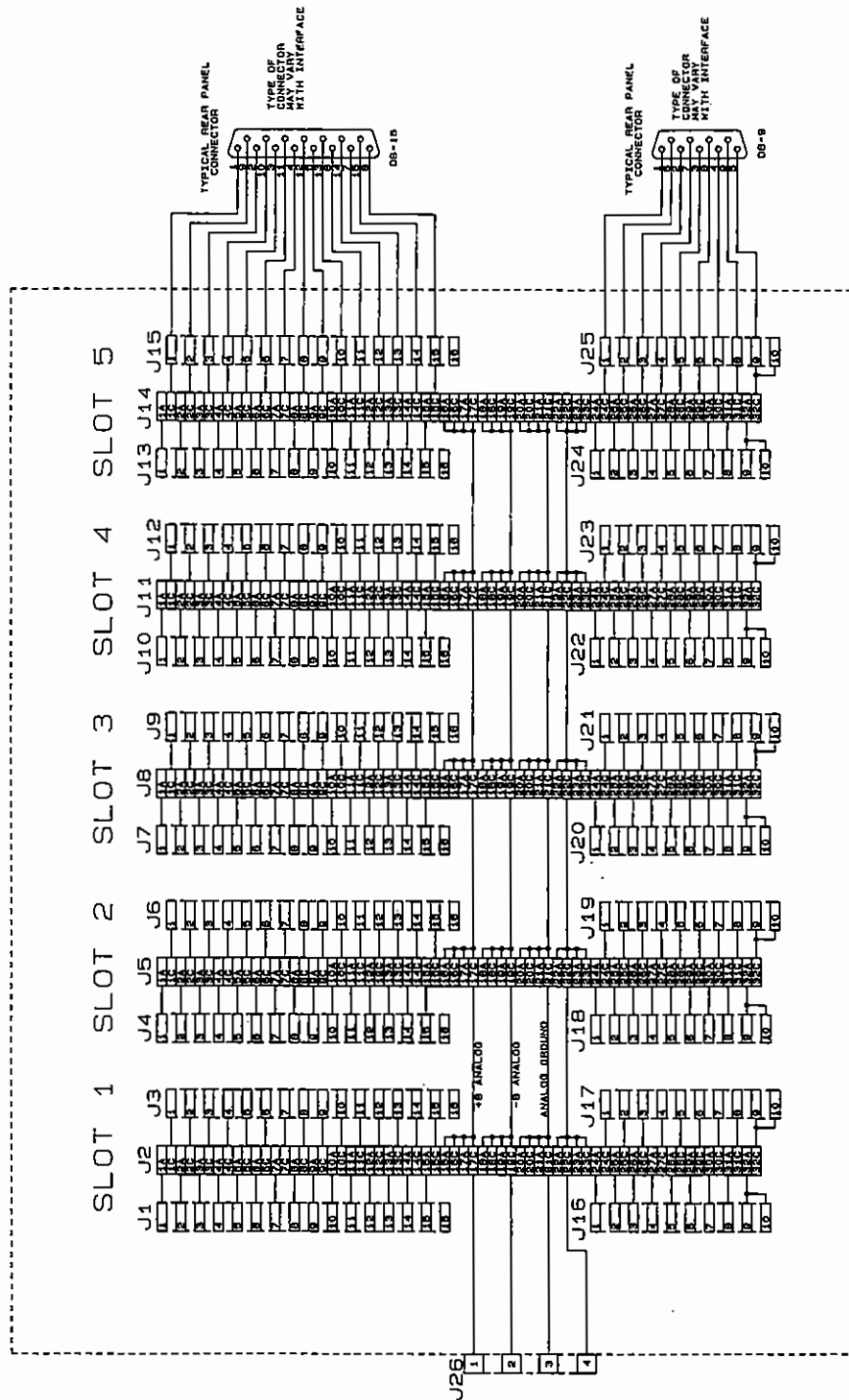


FIGURE F6-4 Schematic - MCF-10 Frame, Interface Motherboard, Rev. A

MCF-10

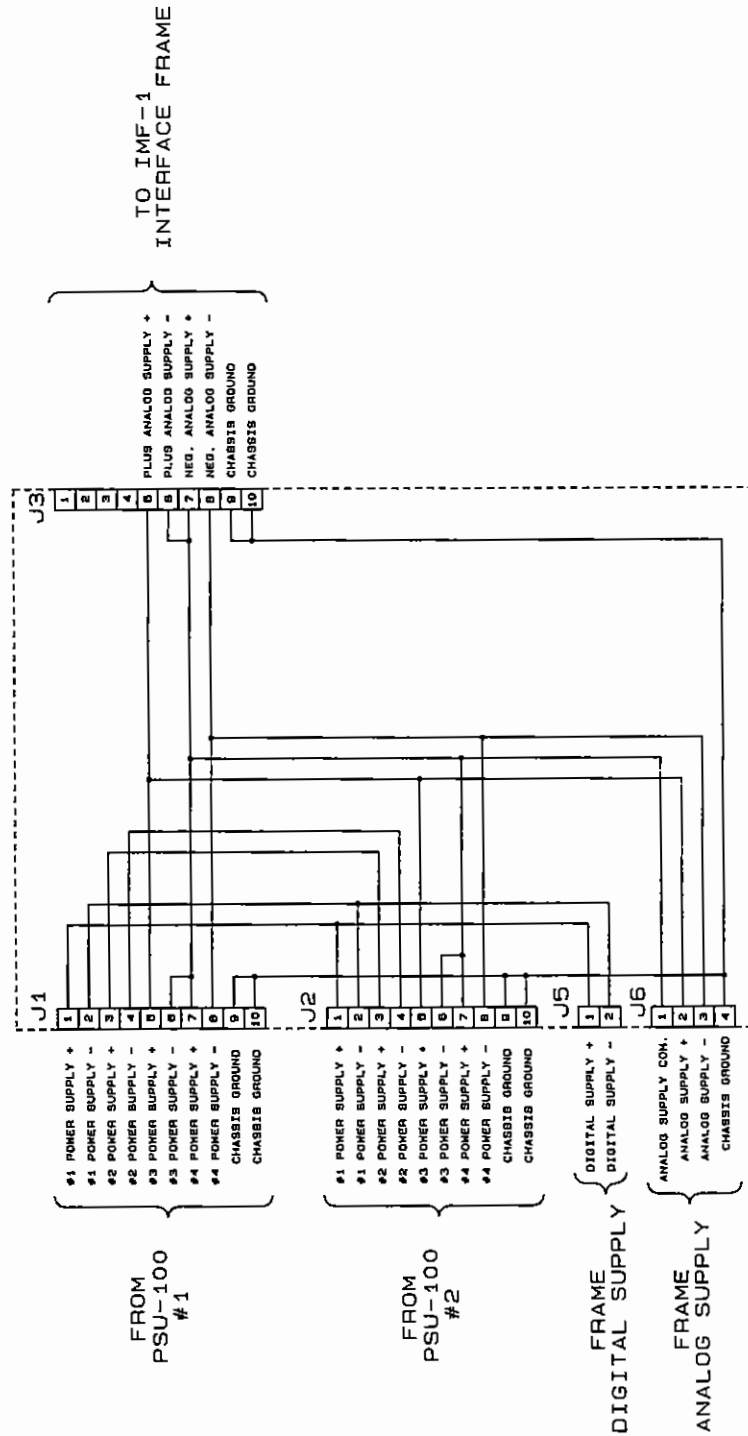
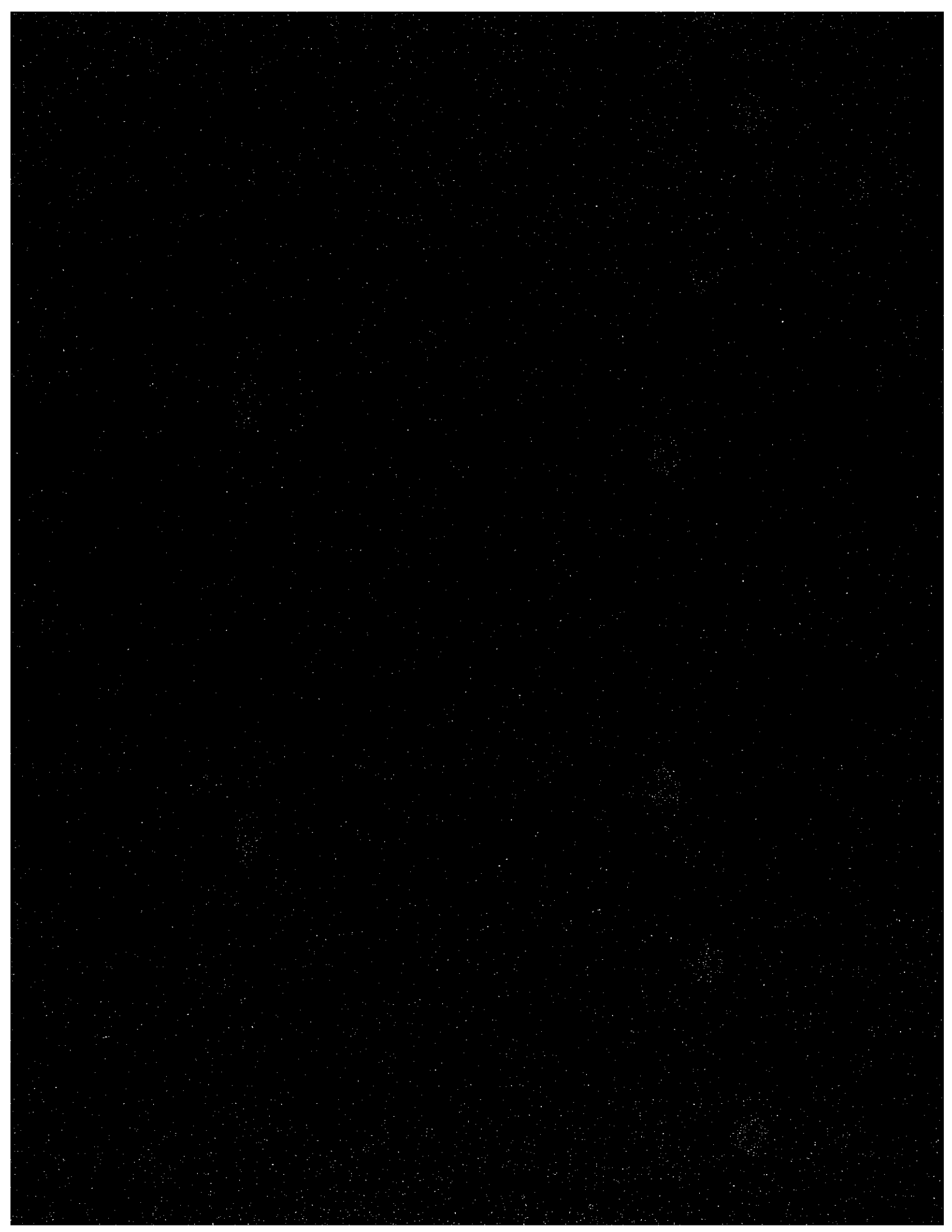
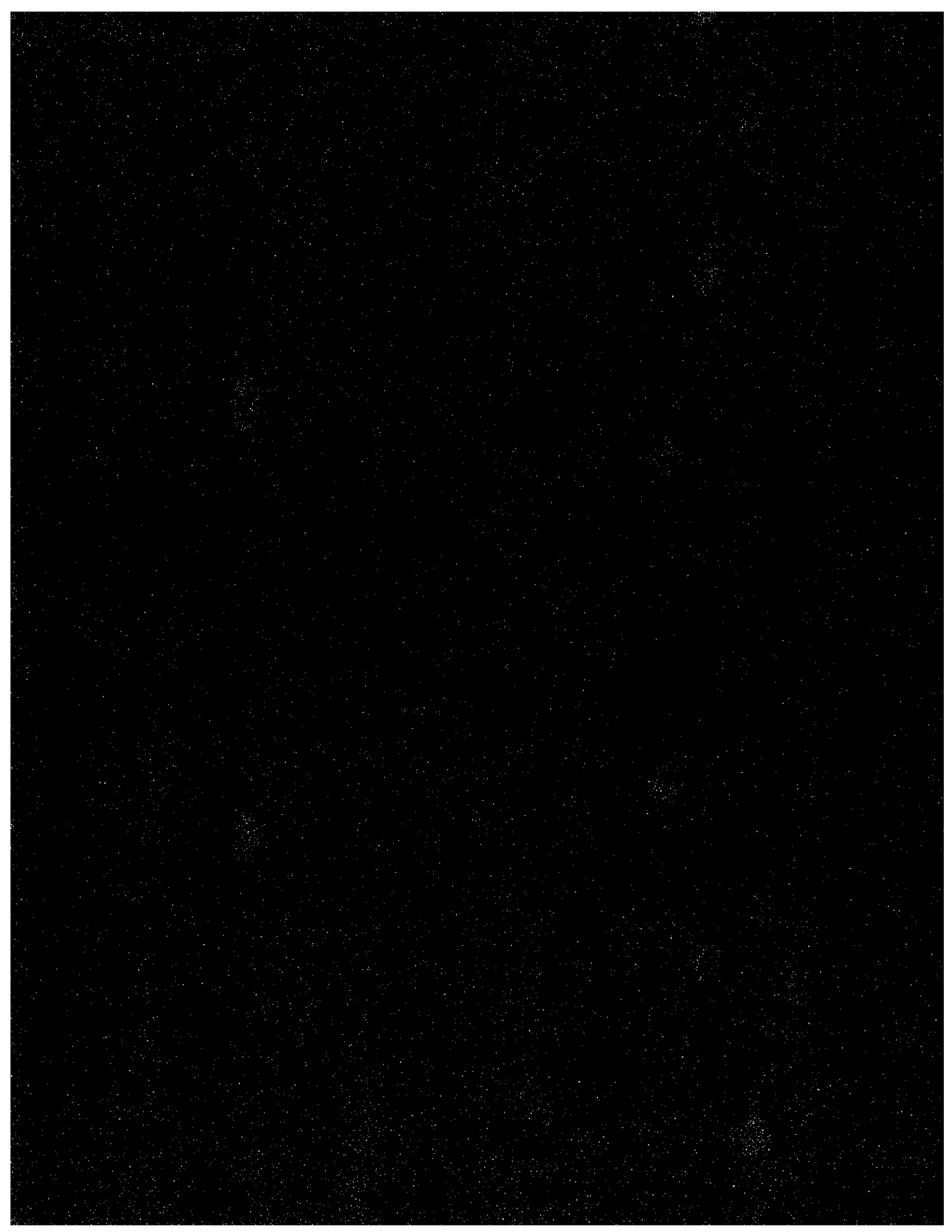
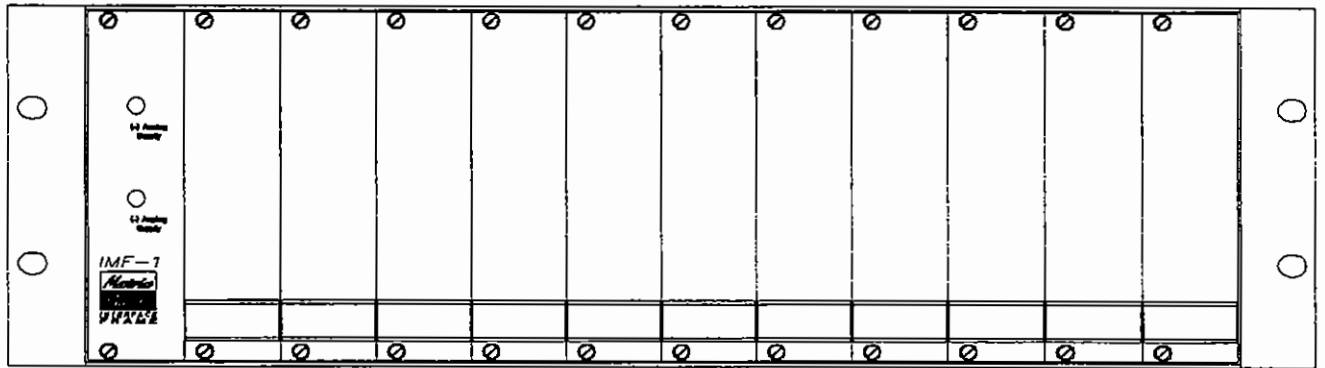


FIGURE F6-5 Schematic - MCF-10 Frame, Power Connector PCB, Rev. B







Matrix Plus II System

IMF-1

INTERFACE MODULE FRAME

Introduction

This Section provides a schematic of the IMF-1 Interface Card Frame.

The IMF-1 Interface Module Frame is a 3RU high frame intended to house up to 11 Matrix Plus II interfaces. Internally, the mother board that interconnect the various interface modules and the rear panel is all passive. In the following documentation, only schematics are provided for the entire frame.

Mechanical frame parts and passive PCBs usually do not need much service work and therefore are not listed in detail. If more detail is needed, call Clear-Com service department

IMF-1

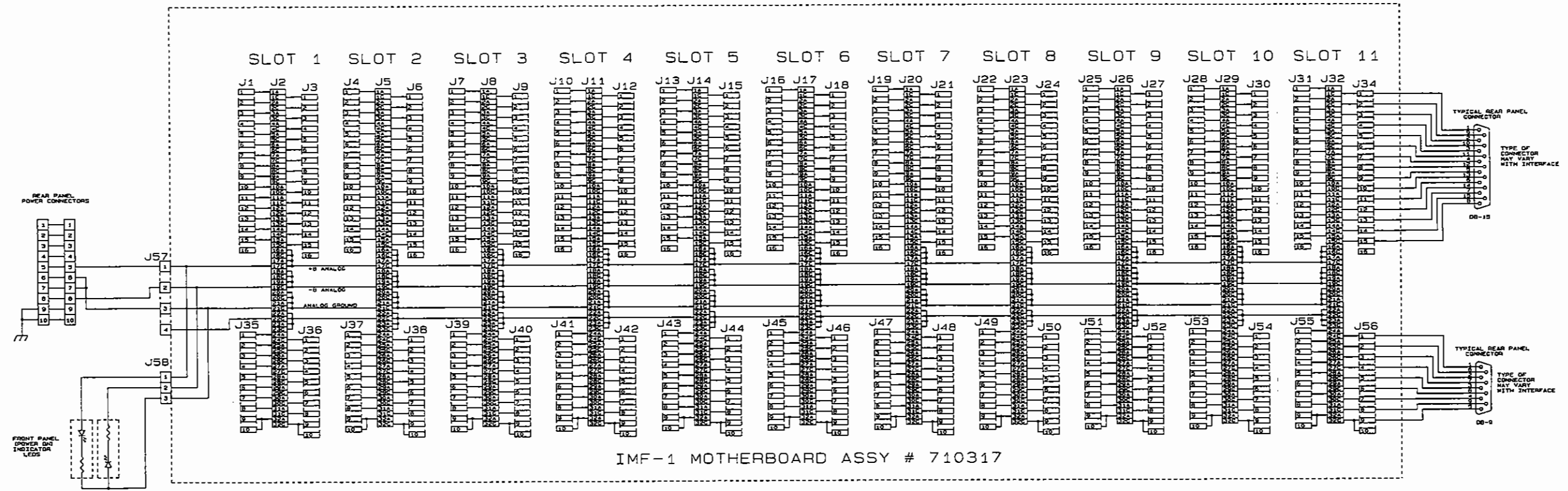
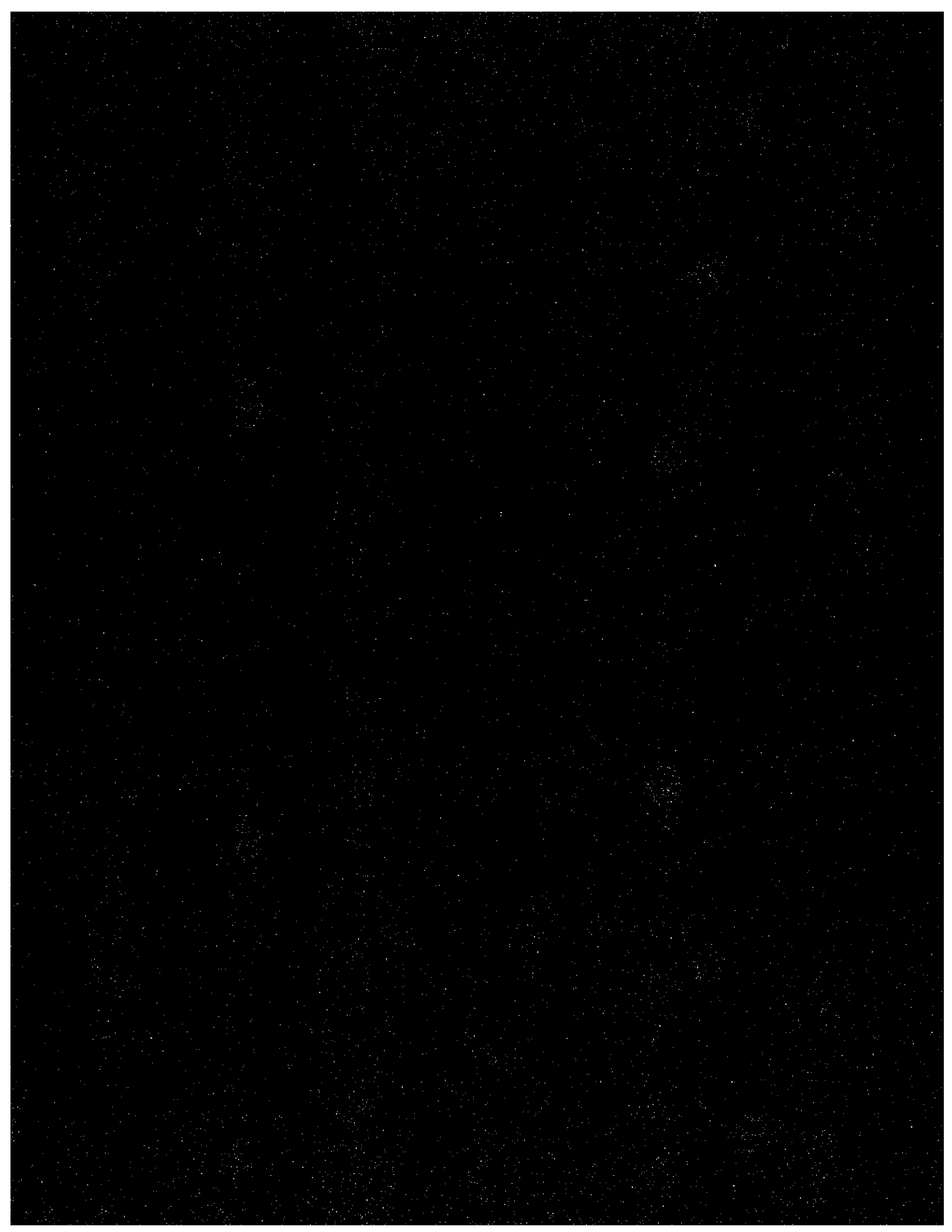
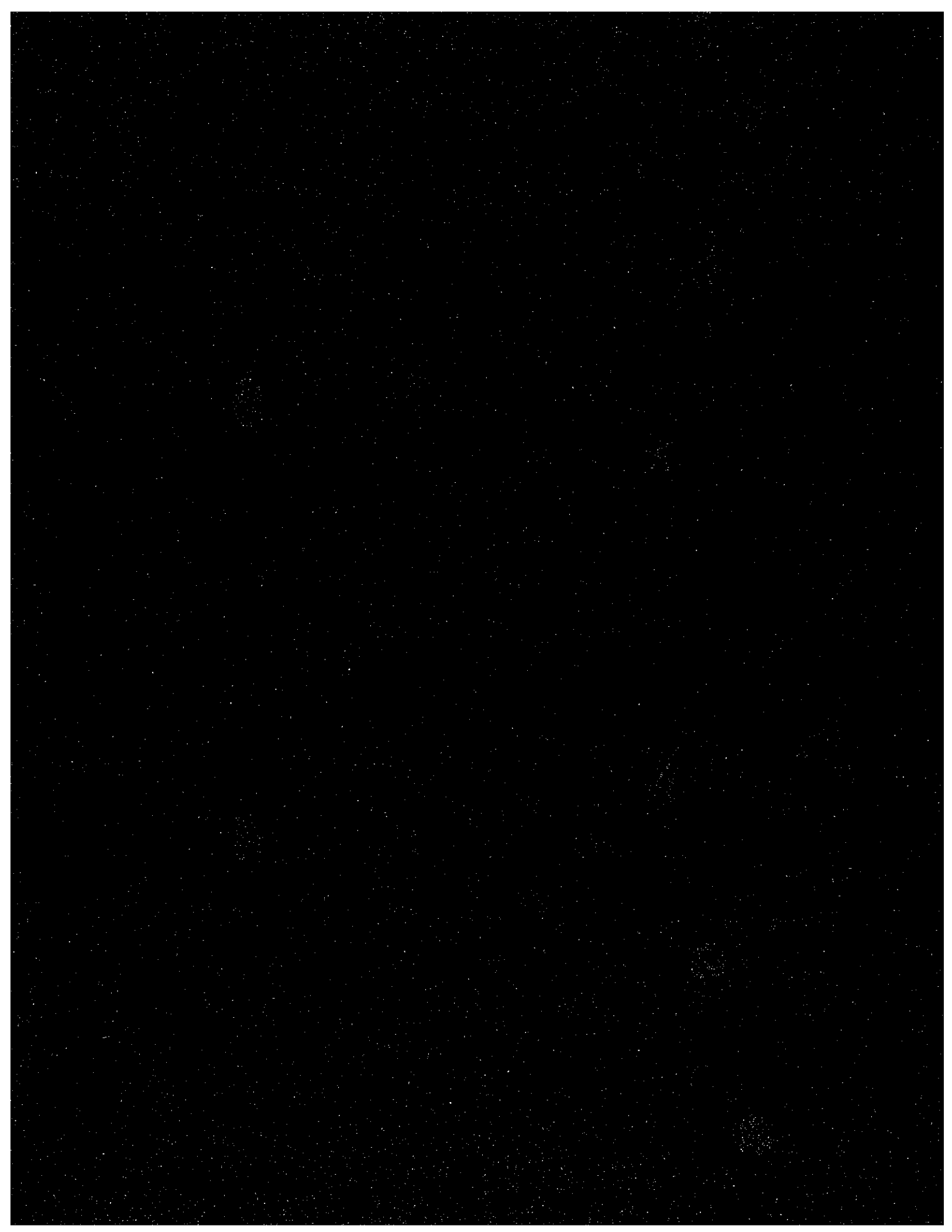


FIGURE F7-1 Schematic, Overall - IMF-1 Frame, Rev. A





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