Z E T R O N

MODEL 21
INSTANT RECALL RECORDER
INSTALLATION / OPERATION MANUAL

#025-9074L

This manual is for Model 21 Instant Recall Recorders equipped with version 2.00 or greater software.

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WARRANTY STATEMENT

Zetron, Inc. warrants that all equipment sold pursuant to any resultant agreement shall be free from defects in material or workmanship at the time of delivery. Such warranty shall extend from the time of delivery for one year. Buyer must provide written notice to Zetron within this prescribed warranty period of any defect; if the defect is not the result of improper usage, service, maintenance, or installation and equipment has not been otherwise damaged or modified after delivery, Zetron shall either replace or repair the defective part or parts of equipment or replace the equipment or refund the purchase price at Zetron's option after return of such equipment by buyer to Zetron. Shipment to Zetron's facility shall be borne on account of buyer.

1. Consequential Damages: Zetron shall not be liable for any incidental or consequential damages incurred as a result of any defect in any equipment sold hereunder, and Zetron's liability is specifically limited to the obligation described herein to repair or replace a defective part or parts covered by this warranty.

2. Exclusive Warranty: The warranty set forth herein is the only warranty, oral or written, made by Zetron and is in lieu of and replaces all other warranties, expressed or implied, including the warranty of merchantability and the warranty of fitness for particular purpose.

FEDERAL COMMUNICATIONS COMMISSION (FCC) REGULATIONS

The following criteria MUST BE MET to comply with FCC rules:

1. The FCC registration number of this device (EYBUSA-61090-RC-N) and ringer equivalence number (0.4B) MUST BE REPORTED to the telephone company.

2. This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

   a. This device may not cause harmful interference.

   b. This device must accept any interference received, including interference that may cause undesired operation.

3. This device MUST NOT be installed on coin-operated or multi-party telephone lines.

4. The sum of ringer equivalence numbers for all devices connected to a single telephone line should not exceed 5 for reliable operation.

5. Warranty repair work on this device MUST BE DONE BY Zetron, Inc. or a Zetron-authorized repair station.

1. INTRODUCTION

GENERAL DESCRIPTION

The Model 21 Instant Recall Recorder is a solid-state voice recorder designed for use in a variety of dispatching and other environments. The Model 21 has several advantages over magnetic tape based and other systems, including:

Simultaneous recording and playback
Up to 999 individually accessible messages
Individual messages may be protected from accidental erasure
Several powerful methods of retrieving recorded messages
Immediate movement within and between messages (no "rewind" time)
Compact tabletop or rack mountable enclosures
No degradation of audio quality after numerous repeats of message
No moving parts or preventative maintenance

The Instant Recall Recorder is typically used in dispatching environments to provide short term storage of activity on a telephone line or radio channel. All audio activity is recorded and is available for immediate recall at the press of a button. The dispatcher or call taker may replay all or part of a message as many times as desired to facilitate understanding of rapid or garbled speech. Replay of messages does not interfere with recording of new activity on the audio channel. Recording may be controlled in several ways and typically only occurs while there is audio present on the channel. The Model 21 is available with one of several memory options providing up to 32 minutes of audio storage.

2. SPECIFICATIONS

GENERAL SPECIFICATION

Features

Up to 32 minutes/999 messages of recorded audio
(memory expandable in 4-minute increments)
Simultaneous recording and playback
Solid state design requiring no preventative maintenance
Recording controlled by external contact closure, current sense, or internal VOX detector
Audio buffer in VOX detector prevents lost audio at start of message
Connector for remote control operation
5.25 x 19" rack mount enclosure houses complete unit
Built in 5-watt speaker with volume control
Headphone connector
Audio output connector for external recorder
Operates from 120-volt AC supply (optional 12-volt DC operation)
5-second reverse allows phrase replay
Display shows sequentially assigned message retrieval number
Messages retrieved via Reverse/Forward keys, or directly via keypad
Keypad may access messages based on time of recording or message number
Individual messages may be "saved" to prevent erasure
Specific points in messages may be marked for rapid playback access
200 to 3400 Hz frequency response provides high quality audio

Front Panel Controls and Indicators

RESTORE key
REVERSE key
PAUSE key
FORWARD key
Insert MARK key
Go to PREVIOUS MARK key
Go to NEXT MARK key
Message SAVE key

Keypad for message number entry
CLEAR key (part of keypad)
ENTER key (part of keypad)

Display for message numbers and keypad entries
Speaker volume control
Headphone jack
External recorder output jack
Built in speaker

Auxiliary Audio Input (J2 pins 1 and 2)

Input Impedance:
7700 +/- 10% ohms at 1 kHz.
Voltage:
Line-to-Line:
630 VDC Maximum sustained
Line-to-Ground:
1500 VAC Maximum sustained
Balance:
66 dB min at 1 kHz.
Minimum Signal (for knee of AGC Compression):
-27 dBm at 1 kHz (adjustable via R4).
Compression Range:
30 dB at 1 kHz.
Maximum Signal (without adding distortion):
+12 dBm (4.5 Vp) or end of compression range, whichever is less.

Telephone Line Input (J3 pins 3 and 4)

Connector:
RJ-12.
Input Impedance:
8000 +/- 10% ohms at 1 kHz.
Voltage:
Line-to-Line:
250 VDC Maximum sustained.
Line-to-Ground:
1500 VAC Maximum sustained.
Record Control Threshold:
Recording: less than 27 VDC (typ < 32 VDC).
Not Recording: greater than 35 VDC (typ > 33 VDC).
Current (Line-to-Line):
10 micro Amperes or less at 48 VDC.
Balance:
66 dB min at 1 kHz.
Minimum Signal (for knee of AGC Compression):
-15 dBm at 1 kHz (fixed).
Compression Range:
22 dB at 1 kHz.
Maximum Signal (without adding distortion):
+7 dBm.

Both Inputs

Freq. Response:
250 - 3400 Hz for +1 to -3 dB.
VOX Threshold:
14 dB below knee of compression.

Headset Output

Connector:
Standard 1/4" Monaural.
Impedance:
100 ohms.
Maximum Signal (playing back fully AGC'd recordings)
4.5 dBm (1.3 Vrms).

Recorder Output

Connector:
Standard 1/8" Monaural.
Impedance:
50,000 ohms.
Maximum Signal (playing back fully AGC'd recordings)
-20 dBm (0.08 Vrms).

Line Power Input

Connector:
Standard IEC.
Voltage:
85 to 264 VAC.
Frequency:
47 to 440 Hz.
Power:
60 Watts maximum, 20 Watts typical.
Hold-Up Time:
12 milliseconds (110 VAC).
Isolation Voltage:
1500 VAC Maximum sustained.
Fusing:
1.0 Ampere Slo-Blow in a shock-safe holder.

Dimensions and Weight

All-In-One Unit (901-9060):
19 x 5.25 x 12.5 inches, 9 lb.
Base Unit (901-9098):
19 x 5.25 x 12 inches, 9 lb.
Rack-Mount Control Unit (901-9097):
19 x 5.25 x 3 inches, 4 lb.
Dual Rack-Mount Control Unit (901-9116):
19 x 5.25 x 4 inches, 5 lb.
Table-Top Control Unit (901-9115):
8 x 9 x 4 inches, 3 lb.
Model 921 Rack-Mount Control Unit:
19 x 5.25 x 4 inches, 8 lb.

3. OPERATION

OVERVIEW

The Model 21 Instant Recall Recorder has been designed to be simple to operate without sacrificing power or versatility. The Model 21's front panel can be divided into the following sections:

Display
Control Keys
Keypad
Audio Output Jacks and Controls

The Display shows current recording and playback activity and displays entries made on the keypad.

The Control Keys allow the operator to start and stop playback of messages. The Forward and Reverse keys allow movement within and between messages. Messages may be saved to prevent subsequent erasure. Important points in messages may be marked to allow easy location when the message is replayed.

The Keypad allows the operator to directly enter the number of or time a message to be recalled or saved.

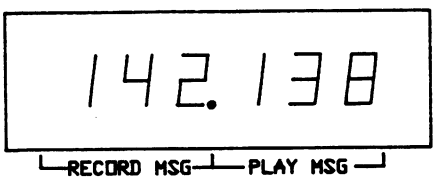
Front panel jacks are provided for headphones and an external recorder. The volume control adjusts the output level of the Model 21's internal speaker and headphone jack.

DISPLAY

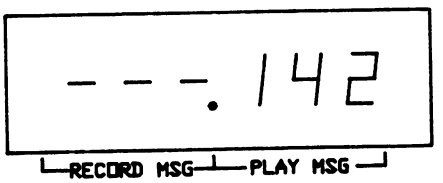
The Model 21 features a six-digit LED display which displays information about recording and playback activity and displays keypad entries while they are being made. Switches on the rear panel of the Model 21 Control Unit select the operating mode of the display:

Switch 1	Switch 2	Display Mode
ON	ON	Message Number always
OFF	ON	Time always
ON	OFF	Time during playback (recommended)

"Message Number always" Display Mode - This mode shows message numbers in the two 3-digit sections regardless of the unit being idle, recording or playing. If the Model 21 is recording a message, the left half of the display shows the number of the message being recorded. When recording is not taking place, these three digits display "---". While playing, the right half of the display shows the number of the message being played. When no message is being played, these three digits show the number of the most recently recorded message. This is also the number of the message that will be played if the Pause/Play key is pressed. Two possible displays in this mode are shown below:



RECORDING MSG #142
MESSAGE #138 PLAYING OR JUST PLAYED



NOT RECORDING
MESSAGE #142 PLAYING OR JUST PLAYED

Figure 3-1, Model 21 Display

"Time always" Display Mode - This mode shows 24-hour time (hours, minutes, seconds) in the 6-digit display. While the unit is not playing, the time shown is the actual time. While the unit is playing, the time shown is the time at which the voice being replayed was recorded. In this display mode, there is no "recording" indication.

"Time during playback" Display Mode - This mode shows message numbers while the unit is not playing (see previous page). While the unit is playing, the display shows the time at which the voice being replayed was recorded. In this display mode, there is no "recording" indication while playing back. This is the recommended mode.

The display is also used to show keypad entries, during which time the normal display operation is superseded.

CONTROL KEYS

A Model 21 Instant Recall Recorder can be equipped with one of several operator control units. The control keys are laid out differently on the various control units but operate identically. The following control key layouts are available.

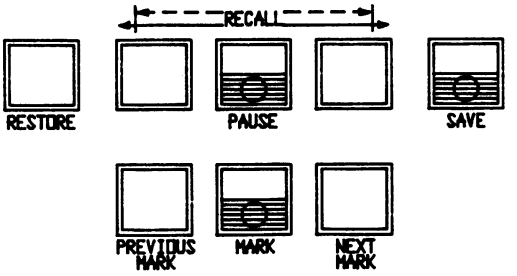


Figure 3-2A, Model 21 Control Keys
Single Rack Mount Unit (901-9096)
Rack Mount Control Unit (901-9097)

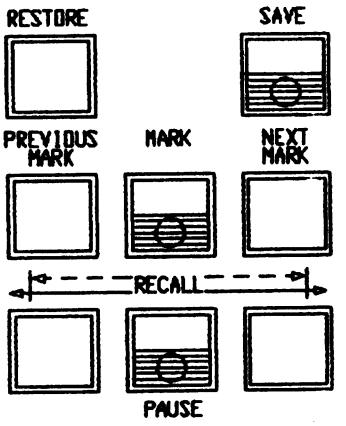


Figure 3-2B, Model 21 Control Keys
Desktop Control Unit (901-9115)
Dual Rack Mount Control Unit (901-9116)

These keys perform the functions described below:

"RESTORE" - Pressing the RESTORE key stops playback (if a message is being played). Pressing the PAUSE/PLAY key after RESTORE has been pressed will start playback at the beginning of the most recently recorded message.

"PAUSE/PLAY" - Pressing the PAUSE/PLAY key during playback pauses playback. Pressing PAUSE/PLAY again causes the Model 21 to resume playback at the point at which it paused. If the Model 21 is neither playing or paused, pressing PAUSE/PLAY will start playback of the most recently recorded message. The PAUSE/PLAY key has an integral LED which is illuminated while a message is being played and flashes while playback is paused.

"REVERSE" - Momentarily pressing the REVERSE key during playback restarts playback five seconds earlier in the message being played (but always within the same message). Holding the key down for more than one second causes the Model 21 to beep and display the number of the preceding message. If the key is held down for one second after the beep, the Model 21 will beep again and move back by one more message. This process can continue until the oldest available message is reached. When the oldest message is reached, the Model 21 will output a continuous tone until the key is released. When the key is released, playback will begin at the start of the message whose number is displayed. Playback then continues through all recorded messages, in the order they were recorded, until the most recent message is played. The Model 21 will beep between each message during playback.

Pressing the REVERSE key when playback is not in progress will start playback at the beginning of the next to most recent message.

"FORWARD" - Momentarily pressing the FORWARD key during playback restarts playback five seconds later in the message being played (but not within five seconds of the end of the message). Holding the key down for more than one second causes the Model 21 to beep and display the number of the following message. If the key is held down for one second after the beep, the Model 21 will beep again and advance to the next message. This process can continue until the most recently recorded message has been reached. When the most recent message is reached, the Model 21 will sound a continuous tone until the key is released. While the FORWARD key is depressed, the "Play Msg" portion of the Model 21's display shows the number of the message which will be played when the FORWARD key is released. When the key is released, playback will begin at the start of the message whose number is displayed. Playback then continues through all recorded messages, in the order they were recorded, until the most recent message is played. The Model 21 will beep between each message during playback.

If playback is not in progress, pressing the FORWARD key has no effect.

"SAVE" - During normal operation, the oldest messages are automatically deleted when memory is required to record new messages. The Model 21's Message Save feature allows individual messages to be protected from this automatic erasure. This feature may be controlled in several ways:

Saving Messages During Playback:

Pressing the SAVE key while a message is being played will cause that message to be saved. When the SAVE key is pressed the Model 21's display will briefly display "SAVED" and then return to its normal operating mode. The message will then be protected from erasure until it is "Released" using the "Save Edit" mode, described below.

"Save Edit" Mode:

The Model 21 provides a simple method for locating and playing saved messages and for releasing saved messages when they are no longer required. This feature is activated by pressing the SAVE key while no message is

being played. When the SAVE key is pressed, the SAVE LED will begin to flash and the number of the oldest saved message will be displayed on the "Play Msg" portion of the Model 21's display. Pressing the SAVE key again will cause the Model 21 to display the next newest saved message. Repeatedly pressing the SAVE key will advance the display through all of the saved messages and then begin again at the oldest saved message.

At any time while "Save Edit" mode is active, pressing the PAUSE/PLAY key to start playback of the displayed message. Playback will then continue normally until the most recent message is played or the RESTORE key is pressed. The Model 21 will then return to normal operation.

Pressing the RESTORE key will immediately terminate the "Save Edit" function and return the Model 21 to normal operation.

While "Save Edit" mode is active, as indicated by the flashing of the SAVE LED, a message may be saved by entering its number on the keypad and pressing the keypad's Enter (#) key or the SAVE key. The Model 21 will briefly display "SAVED" and remain in "Save Edit" mode, displaying the number of the message that was just saved.

Pressing the Clear (*) key on the keypad during "Save Edit" operation will cause the Model 21 to release the message whose number is displayed, allowing that message to be deleted when new messages are recorded. The Model 21 will briefly display "RELEAS" and then remain in "Save Edit" mode, displaying the number of the next saved message. This may be repeated until the all saved messages have been released. When the last saved message is released, the Model 21 will automatically leave "Save Edit" mode and return to normal operation.

The SAVE key's integral LED flashes while "Save Edit" mode is active. When "Save Edit" mode is not active, the SAVE LED will be on if any messages are saved. There is no limit to the number of messages which may be saved at any given time. A message can remain saved indefinitely.

"MARK" - Pressing the MARK key while a message is being recorded causes a mark to be written into that message which points to the current location in the message. This feature is used to simplify location of important parts of a message. If no message is being recorded, pressing the MARK key has no effect. The LED in the MARK key will be on if any marks have been placed in the message being recorded. The MARK LED will flash if there are marks in the message being played.

If "Automatic Mark" is enabled (via Control Unit switches), then a mark will be inserted automatically one minute after the recording begins, and every minute thereafter. This feature makes it convenient to move playback within long messages. Also, by observing the MARK LED during playback, the operator can easily identify messages that are longer than one minute.

"PREVIOUS MARK" - Pressing the PREVIOUS MARK key starts playback at the location of the previous mark in the message being played. If there are no marks in the message being played, or if playback has not yet reached the first mark in the message, playback will restart at the beginning of the message. The PREVIOUS MARK key has no effect if no message is being played. If "Search All" is enabled (via control unit switches), previous messages will be searched for a mark, and if found, playback will start at that mark. The Model 21 will beep if the mark found is in a previous message.

"NEXT MARK" - Pressing the NEXT MARK key restarts playback at the location of the next mark in the message being played. If there are no marks in the message being played, or if playback has passed the last mark in the message, pressing the NEXT MARK key will have no effect. The NEXT MARK key has no effect if no message is being played. If "Search All" is enabled (via control unit switches), later messages will be searched for a mark, and if found, playback will start at that mark. The Model 21 will beep if the mark found is in a later message.

KEYPAD

When each message is recorded it is assigned a unique number between 000 and 999. In addition to message number, the time of recording is also stored with the message. The 12-key keypad may be used to directly access messages for playback using either message numbers or time-of-recording entry.

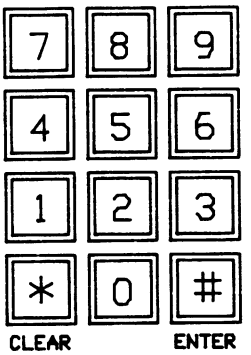


Figure 3-3, Model 21 Keypad

"Message Number Entry" - Any message stored in the Model 21 may be recalled by entering its message number and pressing the Enter (#) key on the keypad. As soon as the Enter key is pressed, playback will begin. An example is shown below:

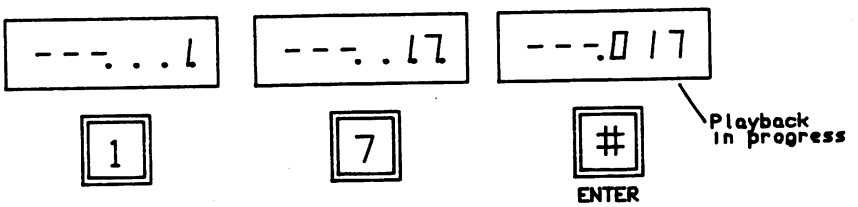


Figure 3-4, Example of Recall by Message Number

A message number may be entered as one, two or three digits. If the example above, message 17 is recalled by entering "17" rather then "017", which would also work. Message 5 could be recalled by entering "5", "05", or "005". If an error is made during message number entry, pressing the Clear (*) key on the keypad will clear the entry.

"Time-of-Recording Entry" - A time entry may be entered as four digits (hours and minutes) or six digits (hours, minutes, seconds). The time must be entered in a 24-hour format. If the desired time is less than 10:00, a leading zero must be entered so that four or six digits are entered. For example, if 9:00 is desired, then either "0900" or "090000" must be entered. When the desired time has been entered, pressing the Enter (#) key on the keypad will cause the unit to start replaying the message that was recorded closest to the time entered. The message replay will always start at the beginning of the message, even if the time entered was in the middle of the message. If an error is made during time entry, pressing the Clear (*) key on the keypad will clear the entry.

AUDIO OUTPUT JACKS AND CONTROLS

The Model 21 features an internal speaker which is used to listen to recalled messages. The volume control on the front panel sets the audio level of this speaker and the headphone jack.

The headphone jack on the Model 21's front panel allows the operator to listen to recalled messages through headphones instead of the internal speaker. This jack is a standard 1/4", monaural phone jack. When the headphone plug is inserted into this jack, the Model 21's internal speaker is disconnected.

The Recorder Output jack allows connection of an external recorder to the Model 21's audio output. This feature is typically used to allow recording a "backup copy" of an important message without interrupting the operation of a logging recorder. The recorder output jack is a standard 1/8", monaural connector. The signal level at this connector is nominally -20 dBm (0.22 volts peak-to-peak) and is not affected by the front panel volume control.

Single Rack Mount Control Units (P/N 901-9096 AND 901-9097)
The speaker, volume control, headphone, and recorder output jacks are all located on the front panel of the unit.

Desktop Control Unit (P/N 901-9115)
The speaker and volume control are on the front panel of the control unit. The headphone and recorder output jacks are located on the right side of the unit. The larger of the two jacks is the headphone jack.

Dual Rack Mount Control Unit (P/N 901-9116)
The Dual Rack Mount Control Unit allows a single control panel to control the operation of two separate recall recorders. The two recorders have completely separate controls but share a single speaker. Separate volume controls and headphone and recorder output jacks are provided for each recorder. If both recall recorders are replaying messages, both messages will be heard from the speaker. If headphones are plugged into the headphone jack for one of the recorders, the audio from that recorder will only be heard in the headphones. Audio from the other recorder will still be sent to the speaker.

IMPORTANT NOTE: If power is only applied to one of recorders attached to a Dual Rack Mount Control Unit (or the control unit cable is not attached), the speaker will not operate properly. However, headphones may be used to listen to audio from the one operational recorder.

SETTING THE TIME CLOCK

When the unit is first plugged in, or when daylight saving time change occurs, it will be necessary to set the time of the unit. This may be done by entering the sequence "995959" on the keypad and pressing the Enter (#) key of the keypad. The display will then show "__.__.__" at which point a 6-digit 24-hour time should be entered. The entered time should be a few seconds ahead of the actual time. When the actual time matches the entered time, the Enter (#) key should be pressed which will start the clock at the entered time. The display will then resume normal operation. After setting, the time normally remains accurate, even if power interruptions have occurred.

RESETTING THE CALL COUNTER

The message number display can often be used as a call counter to indicate the number of calls received since the unit has been last reset. The call count may be reset by entering "994325" on the keypad and pressing the Enter (#) key of the keypad. NOTE: THIS WILL RESET THE ENTIRE UNIT, AND ALL RECORDED MESSAGES, INCLUDING SAVED MESSAGES, WILL BE LOST.

4. INSTALLATION

POWER SUPPLY

The Model 21 is typically powered from a standard 120-volt AC outlet. If desired, an Uninterruptable Power Supply (UPS) may be used to provide power during extended power outages or to prevent loss of recorded messages while a generator system is being activated. The line cord extending from the rear of the Model 21 is plugged into the wall outlet or the output of the UPS.

In configurations featuring a remote Control Unit, 12-volt DC power for the Control Unit is supplied through the cable from the main unit. No additional power connection needs to be made.

Operating the Model 21 from a 220-volt AC Supply

Model 21's may be operated from either a 110- or 220-volt AC source. The power supply used in the Model 21 will operate properly when supplied with 85 to 264 volts AC.

BASE UNIT AUDIO AND CONTROL CONNECTIONS

Control Unit Connector

This connector is used to connect to a remotely located Control Unit. The connector is always present, even if the operator control panel is built into the Model 21. If the Model 21 has a built-in control panel, the Control Unit connector on the rear panel is not used. If a Control Unit is to be remotely located, the cable between the Control Unit and the Voice Storage Unit should be plugged into this connector.

Main Interface Connector

Most of the connections to the Model 21 may be made at this connector. The available inputs and outputs are shown below:

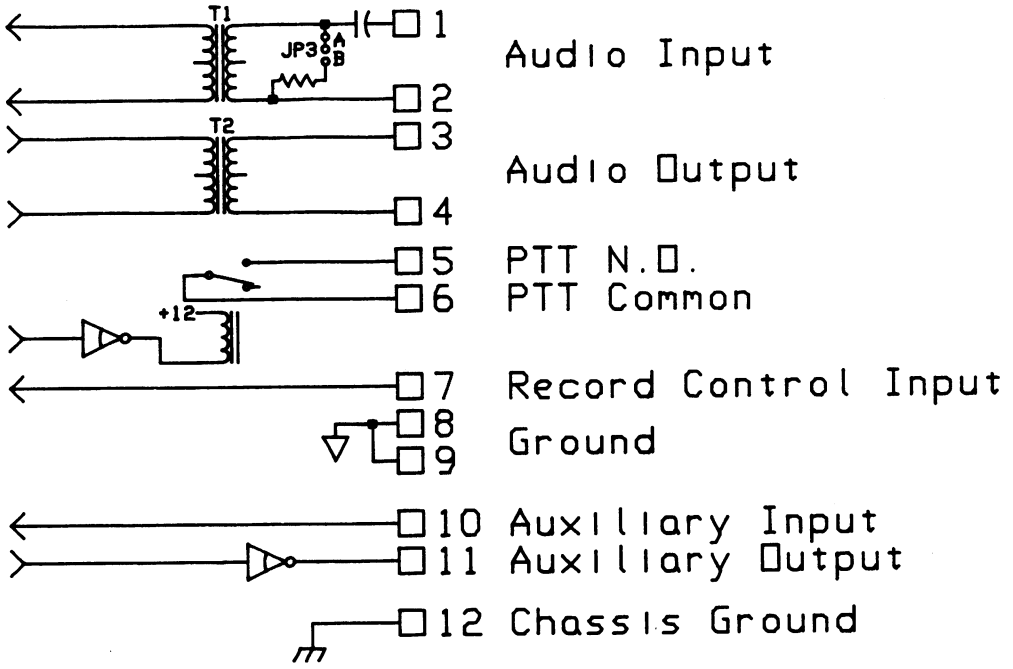


Figure 4-2, Model 21 Main Interface Connector

These signals operate in the following manner:

Audio Input Circuit (connector pins 1 and 2, jumper JP3, level control R4)
The audio input circuitry of the Model 21 is capable of accepting a wide range of signal levels (between -20 and +10 dBm). The Model 21 contains an AGC (automatic gain control) circuit which prevents driving the recording circuitry into distortion. Since the AGC circuit has a dynamic range of at least 20dB, high quality recording can be performed over a wide variety of signal levels without adjusting the input signal level.

Adjustment of the audio input signal level should be performed by monitoring the signal at test point TP1 (labeled "AGC") on the Model 21's main circuit board. The audio input level control (R4, accessible from the real panel of the unit, should be adjusted so that a typical input signal will produce a -6dBm (1.1 volts peak-to-peak) signal level at TP1. The input level should be set so that any expected input signal level will be amplified to -6dBm by the AGC circuit.

Record Control Input (pin 7)
The Record Control Input is one of the methods which may be used to control message recording. A contact closure between ground and the Record Control Input will cause the Model 21 to start recording. Recording will continue as long as the contact closure is present. Activating the Record Control Input will always cause recording, even if the Model 21's VOX circuit is also enabled to control recording.

Chassis Ground (pin 12)
A good connection should always be made between the Model 21's chassis ground terminal and a grounded part of the metal console enclosure or other earth ground.

Audio Output Circuit (pins 3 and 4)
The audio output terminals are generally not used. This signal is a 600 ohm balanced audio pair which is also sent to the Control Unit. The signal level is set to 0dBm at the factory and should not be adjusted.

PTT Relay Output (pins 5 and 6)
The PTT relay output is a normally open contact set which is closed while the Model 21 is playing a message. The relay remains closed if playback is paused.

Auxiliary Input and Output (pins 10 and 11)
These signals are not used at this time.

Phone Line Input Connector
Audio may also be supplied to the Model 21 directly from a telephone line. The Phone Line connector on the rear panel of the Model 21 is a 6-wire modular jack. The center pair of wires (pins 3 and 4) on this connector may be connected to a telephone line or other balanced audio pair.

If the Model 21 is connected to a telephone line, it can be configured to monitor DC voltage across the telephone line and record when absence of voltage indicates an "offhook" condition. See "Methods of Controlling Recording" for detailed information about this feature.

If this connector is to be used with an audio source other than a telephone line, jumpers JP1 and JP2 on the circuit board may be used to connect the Model 21's Record Control Input circuit to the second pair of wires (pins 2 and 5) of this connector. Installation of JP1 grounds pin 2 of the Phone Line connector, providing a ground reference level for the Record Control Input. Installation of JP2 connects the Record Control Input signal to pin 5 of the Phone Line connector. If these jumpers are both installed, a contact closure between pins 2 and 5 will activate the Record Control Input, causing the Model 21 to begin recording.

METHODS OF CONTROLLING RECORDING

The Model 21 can monitor any of several different conditions to determine when incoming audio should be recorded. These options are described below:

Record Control Input

The most precise control over recording is obtained by connecting the Model 21's Record Control Input to a signal which supplies a contact closure when audio is to be recorded. Typical sources of this contact closure would be a spare hookswitch contact on a telephone answering position or a Call/Busy indicator on a communications console. The Model 21 will always record while there is a contact closure across the Record Control Input. Recording begins immediately when the contact closure begins and continues for a user-selected interval after the closure ends. One of four intervals can be selected using two of the switches accessible from the right side of the Model 21 recorder unit:

Switch 8	Switch 7	
OFF	OFF	record for 2 seconds after Record Control Input activity ends
OFF	ON	record for 1 second after Record Control Input activity ends
ON	OFF	record for 500mS after Record Control Input activity ends
ON	ON	record for 100mS after Record Control Input activity ends

Phone Line Voltage Detector

If the Model 21 is to record audio from a telephone line, it can determine when to record by monitoring the DC voltage across the telephone line pair. There is typically about 48 volts DC across an idle, "onhook" telephone pair. When the line is taken "offhook" to answer or place a call, the DC voltage drops to 6 volts or less. The Model 21 can detect this DC voltage and begin recording when the line is taken "offhook". This feature provides a simple, two wire interface between the recall recorder and the telephone system. Recording begins as soon as line voltage drops and continues until line voltage has returned (at the end of the call) and been present for 2 seconds.

The Phone Line Voltage Detector is enabled by placing DIP switch #2 (accessible from the right hand side of the Model 21 Base Unit) in the ON position. If this switch is OFF, DC line voltage will have no effect on recording. This switch MUST be in the OFF position if the Model 21 is not connected to a telephone circuit, since low DC voltage will be interpreted as an offhook telephone and recording will begin.

VOX Detector

If no other method of controlling recording is available, the Model 21 features a VOX detector circuit which, when enabled, causes the Model 21 to record while there is audio present at its audio input. The VOX detector circuit's output is activated soon after an audio signal appears at the Model 21's audio input. The Model 21 maintains an "audio buffer" to prevent loss of audio during this startup period. Recording continues as long as audio is present and for a user-selected period after audio activity ends. One of four intervals can be selected using two of the switches accessible from the right side of the Model 21 recorder unit:

Switch 6	Switch 5	
OFF	OFF	record for 10 seconds after VOX activity ends
OFF	ON	record for 5 seconds after VOX activity ends
ON	OFF	record for 2 seconds after VOX activity ends
ON	ON	record for 1 second after VOX activity ends

The VOX detector is enabled by placing DIP switch #1 (accessible from the right hand side of the Model 21 Base Unit) in the ON position. If this switch is OFF, presence of an audio signal will not cause recording to begin.

AUTOMATIC MARK

Automatic Mark insertion places a "Mark" in the message being recorded one minute after the message starts and every minute thereafter. Automatic Mark is enabled by placing DIP Switch #3 (accessible from the back of the Model 21 Control Unit) in the OFF position. If this switch is ON, Automatic Mark is disabled.

SWITCH SUMMARY

Base Unit Switches:

Switch 1 OFF	Voice Operated (VOX) Recording Disabled
Switch 1 ON	Voice Operated (VOX) Recording Enabled
Switch 2 OFF	Telephone Line Voltage Operated Recording Disabled
Switch 2 ON	Telephone Line Voltage Operated Recording Enabled
Switch 3 OFF	Must be in this position
Switch 4 OFF	"Search All" messages for next/previous mark Disabled
Switch 4 ON	"Search All" messages for next/previous mark Enabled

Switch 5	6	
OFF	OFF	Record for 10 seconds after VOX activity ends
ON	OFF	Record for 5 seconds after VOX activity ends
OFF	ON	Record for 2 seconds after VOX activity ends
ON	ON	Record for 1 second after VOX activity ends

Switch 7	8	
OFF	OFF	Record for 2 seconds after Record Control Input ends
ON	OFF	Record for 1 second after Record Control Input ends
OFF	ON	Record for 500 msecs after Record Control Input ends
ON	ON	Record for 100 msecs after Record Control Input ends

Control Unit Switches:

Switch 1	2	
OFF	ON	"Time-Always" Display Mode
ON	OFF	"Time-During-Playback" Display Mode
ON	ON	"Message-Number-Always" Display Mode

Switch 3 OFF	"Automatic Mark" Enabled
Switch 3 ON	"Automatic Mark" Disabled
Switch 7 OFF	MUST BE IN THIS POSITION

INSTALLING THE CONTROL UNIT

In almost all cases, the Model 21 Instant Recall Recorder is supplied as a Base Unit (P/N 901-9098) with a separate Control Unit. The only exception is the single rack mount unit (P/N 901-9096) which includes the Base Unit and Control Unit in a single enclosure. All units featuring remote Control Units are supplied with a 12-foot shielded cable assembly to connect the Control Unit to the Base Unit. If required, cables up to 300 feet in length can be made. The Control Unit cable has male 9-pin "D" type connectors on each end which mate with connectors on the rear of the Base and Control Units. The procedure for installing each type of Control Unit is given below:

Rack Mount Control Unit
The rack mount Control Unit provides controls for a single Model 21 in a 5.25" by 19" enclosure approximately 3 inches deep. This shallow case can be installed in almost any rack mounting application. There is connector on the rear panel of the Control Unit labeled "Voice Storage Unit Interface" to which the cable should be attached.

Dual Rack Mount Control Unit
Installation of the dual rack mount Control Unit is basically the same as the single Control Unit. This Control Unit features two separate sets of control electronics, allowing a single rack mounted unit to control two Model 21 Base Units. There are two connectors labeled "To Base Unit" on the rear panel of the Control Unit. One control cable is run from each Base Unit to one of the Control Unit connectors.

Desktop Control Unit
The desktop Control Unit provides the same control features as the rack mount Control Units in an attractive desktop enclosure. A cable extends approximately two feet from the rear of the Control Unit, ending in a connector which mates with the control cable from the Base Unit.

Grounding the Control Unit
When installing any Model 21 Instant Recall Recorder, regardless of the type of Control Unit to be used, it is important to ensure that the chassis of the Base Unit is connected to a good earth ground. If the Base Unit and a rack mounted Control Unit are being installed in a metal console enclosure, make sure that the console chassis is well grounded. This, in addition to the ground connections in the control cable, should be the only grounding required. If the console furniture is non-conductive, a ground wire may need to be run from the case of the Control Unit to a good earth ground, preferably directly to the chassis of the Base Unit.

The desktop Control Unit may require additional grounding if the environment in which it is installed is conducive to static discharge. If static problems are known to be common (such as in areas of dry climate or on large carpeted floors) a ground wire should be connected from the Control Unit to the Base Unit. This wire may be connected from pin 12 of the orange connector on the rear panel of the Base Unit to the pin labeled "-" on connector J3 on the main board of the Control Unit.

These special grounding precautions are not usually necessary unless static discharge problems occur, usually indicated by erratic operation of the Control Unit. Contact a Zetron applications engineer for more information on handling grounding and static discharge problems.

5. ALI INTERFACE OPTION

OPERATION OF ALI INTERFACE OPTION

The Model 21 Instant Recall Recorder can optionally be equipped to interface to the Automatic Location Information (ALI) display system at an E-911 call takers position. This option allows the Model 21 to store the ALI data which is received for each call and store it with the audio portion of the call. Then, if the call is subsequently replayed, the ALI screen for that call will also be recalled to the call taker's display.

The display system can be configured to use a single ALI display for both "live" and recalled ALI screens or to use two separate displays, one for display of the active call and a second for recalled ALI data.

The ALI Interface option for the Model 21 consists of a circuit board and several cables which give the Model 21 access to the necessary data flowing between the ALI controller and display. The ALI Interface circuit board is installed, either at the factory or as a field installable option, in the Model 21 Base Unit. This board features two RS-232 serial data ports which may be configured for use with virtually any ALI display system. One of the ports is connected to the ALI controller, which is the source of new ALI data. The other port connects to the ALI display which will be used for display of recalled ALI screens. The ALI Interface board routes data between these ports according to one of two sets of rules, based on the number of ALI displays at each operator position. Two switches on the ALI Interface board (accessible from the rear of the Model 21 Base Unit) select the mode in which the ALI system will operate:

Switch 2	Switch 1	
ON	OFF	One ALI Display at each Operator Position
OFF	OFF	Two ALI Displays at each Operator Position

Switch 3	
OFF	Used only with Model 921 (see Model 921 Manual Supplement, "Recalled ALI" indicator)
ON	Always on for Model 21

These operating modes are described in detail below:

One ALI Display at each Operator Position
If a single ALI display is to be used for both "live" and recalled ALI screens, the Model 21 ALI Interface must be connected between the ALI controller and the display so that it can select whether to output new ALI data received from the controller or recalled ALI data from its own memory. An overview of this type of installation is shown below:

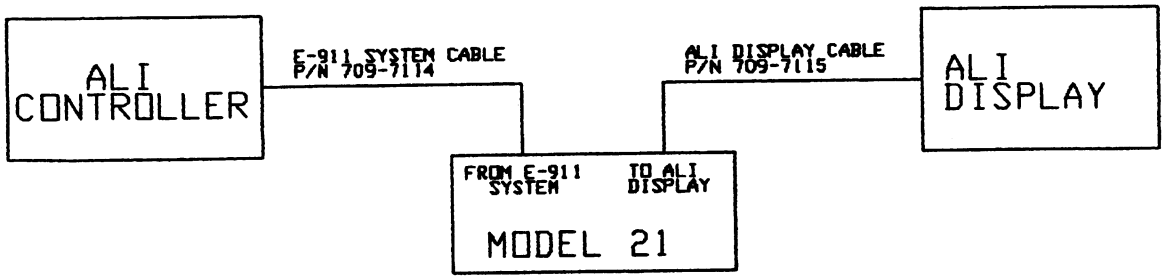


Figure 5-1, Model 21 Interfaced to a Single ALI Display

One cable is installed between the ALI controller (or an existing cable extending from the ALI controller to the operator position) and the Model 21 ALI input port. This connector is labeled "FROM E-911 SYSTEM" on the rear panel of the Model 21 Base Unit. A cable for this purpose (Zetron P/N 709-7114) is supplied with the ALI interface option.

A second cable is connected between the Model 21's ALI output port and the ALI display. This cable is attached to the connector labeled "TO ALI DISPLAY" on the rear panel of the Model 21 Base Unit. This cable (Zetron P/N 709-7115) is also supplied with the ALI Interface option.

When the switches on the ALI Interface board are set to specify that a single display is in use, the Model 21 will always send data received from the ALI controller to the ALI display port immediately. If a previously recorded message is replayed while a new call is being recorded, the ALI screen for the recalled message will not be displayed. This ensures that the ALI screen for a call in progress will always be shown on the display for the duration of the call.

Two ALI Displays at each Operator Position
The Model 21 can be configured to operate in systems where one display shows new ALI screens as they are received and a second display is used only for recalled ALI screens. In this configuration, the Model 21 ALI Interface must be connected so that it can receive the data sent from the ALI controller to the primary ("live") display without interrupting that data path. The Model 21 is also connected to the secondary (recall) display to allow it to send recalled ALI screens to that display. A diagram of this type of installation is shown below:

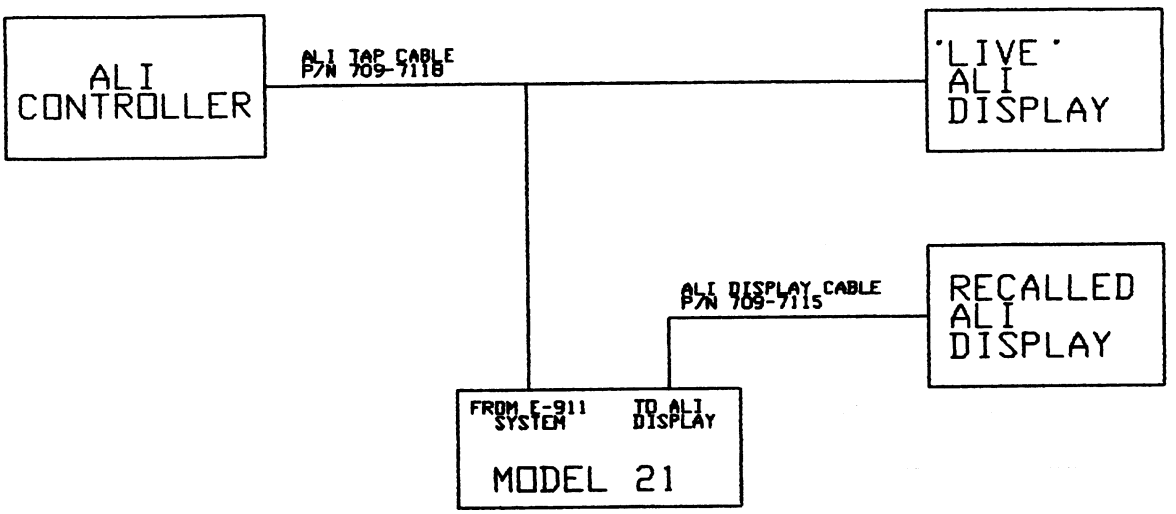


Figure 5-2, Model 21 Interfaced to Two ALI Displays

One cable is installed between the ALI controller (or an existing cable extending from the ALI controller to the operator position), the "live" ALI display and the connector labeled "FROM E-911 SYSTEM" on the rear panel of the Model 21 Base Unit. A cable for this purpose (Zetron P/N 709-7118) is supplied with the ALI interface option.

Another cable is used to connect the Model 21's ALI output port to the secondary (recalled) ALI display. This cable is attached to the connector labeled "TO ALI DISPLAY" on the rear panel of the Model 21 Base Unit. This cable (Zetron P/N 709-7115) is also supplied with the ALI Interface option.

When the switches on the ALI Interface board are set to specify that two ALI displays are in use, the Model 21 never sends data received from the ALI controller to the ALI display port. When a previously recorded message is replayed, the ALI screen for that message is immediately output to the secondary ALI display. In this configuration, the source of each ALI screen is clear because one display always shows the ALI screen for the call in progress (or the last call) and the other display shows the ALI screen for the last recalled message.

CONFIGURING THE ALI DISPLAY PORTS

The ALI Interface board is equipped with two RS-232 compatible serial communication ports which, as described above, are used to connect the Model 21 to the ALI controller and one or two ALI displays.

Baud Rate Jumpers

Each of the serial ports on the ALI Interface board feature a plug-in jumper which allows the installer to select the baud rate at which the port will operate. A baud rate of 300, 600, 1200, 2400, 4800, or 9600 may be selected. The circuit board is clearly marked to indicate the proper jumper position for each baud rate. Both ports on the ALI Interface board are configured at the factory for operation at 1200 baud, the most common data rate for ALI display systems.

The jumper labeled "Port A" sets the baud rate for the port which communicates with the ALI controller. The jumper labeled "Port B" sets the baud rate for the display output port.

If the Model 21 is being installed in an operator position which will include only one ALI display device, the two serial ports on the ALI interface should be configured for operation at the same baud rate. This allows the ALI interface's failsafe feature (see "ALI Bypass Switching" below) to operate properly in the event of serious communication errors.

If two ALI displays are to be used at each operator position, a failure on the Model 21's ALI interface will only affect the display used for recalled ALI screens. Display of new ALI screens will be unaffected. In this situation, the ports may be configured to operate at different baud rates. The "Port A" jumper must be positioned to select the proper baud rate for data being received from the ALI controller. However, the display output port may be configured, using the "Port B" jumper, for operation at the highest baud rate which the ALI display device will reliably accept. This will provide the fastest possible display updating during message recall. Note that the display used for recalled ALIs must also be configured to operate at the same baud rate as the ALI interface's display output port.

ALI Bypass Switching

The Model 21 ALI Interface provides a "failsafe" feature which allows it to effectively remove itself from the communication path between the ALI controller and the display device. This is done to ensure that the ALI display will continue to show ALI screens as they are received, even if a failure occurs on the Model 21. This switching system disconnects the ALI ports from the Model 21's internal electronics and connects them directly to one another if any of the following conditions occurs:

No power applied to Model 21 or ALI Interface board
Microprocessor failure on ALI Interface board
Multiple serial data errors on either ALI port

If power is restored to the Model 21 or the unit begins operating properly, the ALI interface ports will be reactivated after several seconds of proper operation. Note that, as described above, both of the ALI Interface's serial ports must be operating at the same baud rate for this feature to be used.

INSTALLATION OF ALI INTERFACE OPTION

This section describes the procedure for field installation of an ALI Interface board in a Model 21 Instant Recall Recorder:

1. Remove power from the recorder Base Unit. Remove the unit from the rack or other enclosure in which it is installed.

2. Remove the top cover from the Base Unit. The ALI Interface board will be installed in the empty space between the power supply and two boards currently installed in the unit.

3. Remove the cover from the power supply in the Base Unit. This is required to allow installation of the ALI Interface board. No changes are to be made to the power supply. The power supply cover must be replaced after the ALI interface board has been installed.

3. Locate connector J6 on the Audio Digitizer board (the bottom board) in the Base Unit. This connector is located on the edge of the circuit board, near the front of the unit. Locate connector J5 on the ALI interface board. This connector has 7 pins which extend from the edge of the board.

4. Orient the ALI interface board so that J5 aligns with connector J6 on the Audio Digitizer board and the two serial port connectors (J3 and J4) are toward the rear of the unit. Slide the ALI interface board into place so that the connectors mate properly and the serial port connectors extend through the opening in the rear of the case.

5. Secure the ALI Interface board with the four screws supplied in the option kit.

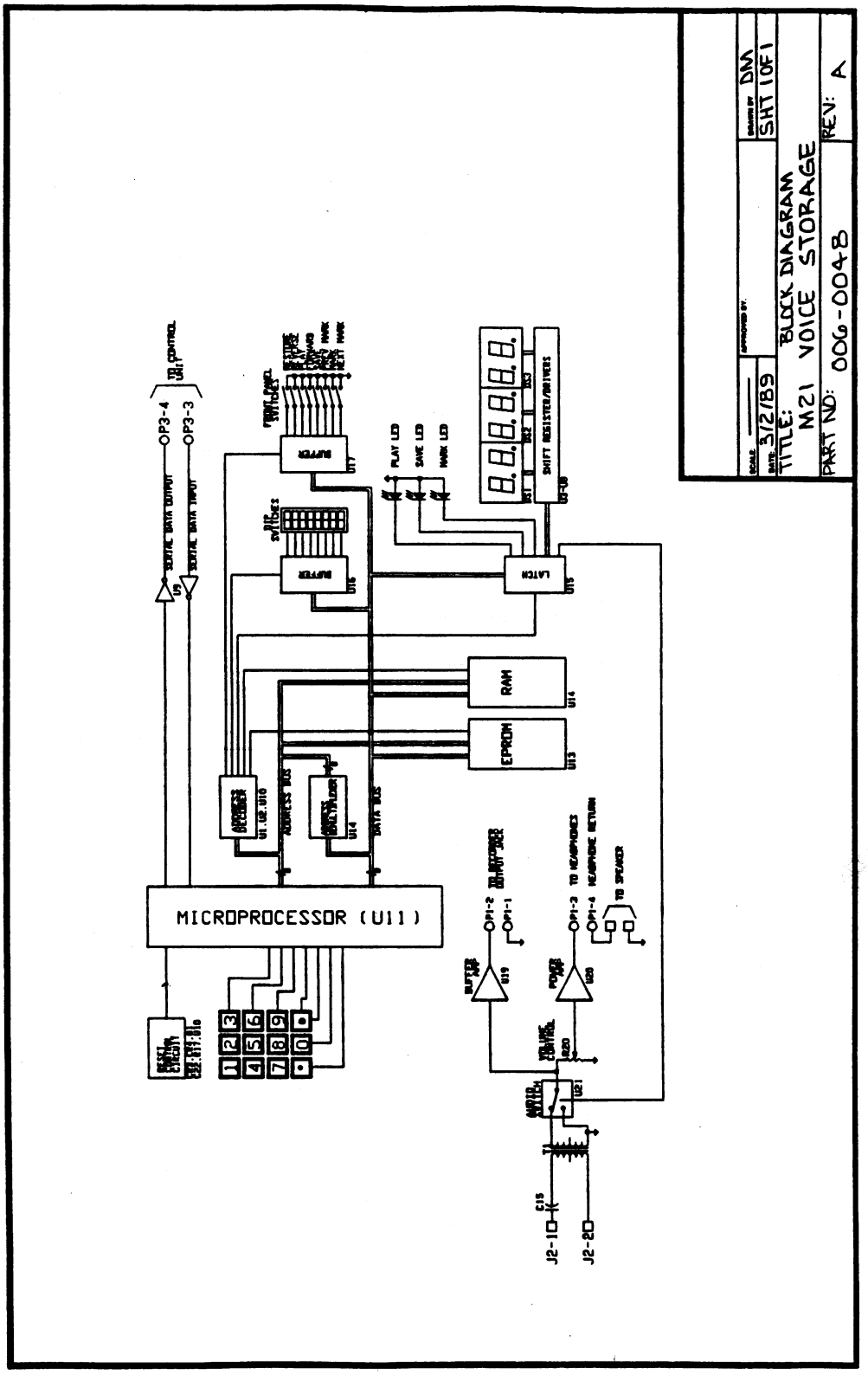
6. Replace the power supply cover which was removed in step 2 above.

7. Replace the top cover of the unit.

8. Reinstall the unit and apply power.

6. THEORY OF OPERATION

MODEL 21 VOICE STORAGE UNIT BLOCK DIAGRAM (006-0048A)



VOICE STORAGE UNIT

Power Supply

The Model 21 Voice Storage Unit is powered by a three output switching power supply. This supply provides +12VDC, +5VDC and -12VDC outputs which power the Voice Storage Unit and Control Unit. The Control Unit is powered only from the 12VDC output and has on-board regulation for its +5VDC and other required voltages. The supply is protected by a 1 amp slow-blow fuse mounted on the rear panel of the unit. This supply should be replaced as a module rather than repaired to component level. Do not attempt to adjust the supply in any way.

Microprocessor and Local Memory

The Voice Storage Unit features a 68HC11 microprocessor which controls all audio digitization and playback functions. The microprocessor is clocked by a crystal oscillator circuit composed of 8MHz crystal Y1, C17, C18, R7, R8, and parts of U1. When power is applied to the unit, the circuit containing R28, C25, and parts of U11 and U6 delay startup of the microprocessor to allow the power supply outputs to stabilize.

Five of the microprocessor's address lines are used as inputs to bipolar PROM U10 which decodes these signals to enable the microprocessor's various memory and peripheral devices. Control signals are generated for the EPROM (U22) which stores the processor's operating software, static RAM (U21), the external memory board used for storage of digitized audio, the playback audio output latch (U16), and the serial I/O port (U23) used to communicate with the optional ALI system interface.

Voice Storage Memory

The Model 21 Voice Storage Unit is equipped with one of several memory options which allows storage of up to 32 minutes of recorded audio. In its maximum (32-minute) configuration, the unit is equipped with 8 megabytes of dynamic RAM for voice storage. This large quantity of memory is accessed as 32 kbyte banks using circuitry on the memory board. Control signals and power are supplied to the memory board through connector J5. Circuitry on the memory board generates the timing signals required to control the memories.

Audio Input Circuitry
The Model 21 is equipped with two audio inputs which may be used to interface with the audio source to be recorded. Audio at pins 1 and 2 of connector J2 is DC-blocked by C13 and presented to the primary of transformer T1. JP3 and R3 set the circuit's input impedance at either 10K ohms (with JP3 in the "A" position) or 600 ohms (with JP3 in the "B" position. CR1 and CR2 protect subsequent circuitry from extremely large signals at the audio input. R4, accessible from the rear panel of the unit, adjusts the level of the audio signal.

Audio can also be input to the Model 21 at connector J3. This 6 conductor RJ11 jack accepts an audio signal on pins 3 and 4. Capacitor C14 removes any DC voltage from the signal before it is presented to the primary of T3. CR3 and CR4 protect subsequent circuitry from extremely large signals at the audio input.

The signals from the two audio inputs are then summed together and presented to the input of the AGC circuit formed by U13, Q1, Q2, CR12, CR13 and other components. This circuit maintains the signal level at TP1 at 1.1 volts peak-to-peak over a 20dB input signal level range. This signal provides the input to the Model 21's audio digitization circuitry, described below.

The AGC audio is monitored by the VOX circuit formed by U13 and other components. This circuit generates an output when an audio signal is present. CR14 and U18 convert this signal to a digital logic level which is monitored by the microprocessor and used to control recording.

Audio Digitizer
The circuit formed by U4, U3, and part of U1 generates several timing signals which are used to control audio digitization and playback.

The output of the AGC circuit described above is bandpass filtered by part of U12 before digitization. The filter passes audio between 200 and 3400Hz. The filter's output is DC-blocked by C32 and presented to the input of CVSD encoder U20. The audio signal is digitized by U20 and output as a serial digital bitstream at a rate of 31.25 kbits/second. This bitstream is clocked into shift register U5, from which it is read by the microprocessor.

When audio is being replayed, the microprocessor writes the digitized audio, one byte at a time, to latch U14. The data from this latch is strobed into shift register U17. The data is then shifted out as a serial bitstream into CVSD decoder U19. The output of U19 is a reconstructed audio signal which is then lowpass filtered by part of U12. This filter passes the audio signal below 3400Hz. This signal is then passed through output level control R25 to a driver amplifier, also contained in U12. The output of the driver is passed through transformer T2 to the Model 21's output. This signal is present at pins 3 and 4 of J2 and is also output to the Control Unit interface connectors, J1 and J7.

Control Inputs and Outputs
The Model 21's Record Control Input at pin 7 of connector J2 is used to cause the Model 21 to begin recording the signal at its audio input. A contact closure between the Record Control Input and ground (J2-8) is buffered by C10 and U2 and presented to one of the microprocessor's inputs where it is monitored. This signal and a ground reference can be connected to RJ11 jack J3. If JP1 is installed, the Record Control Input is connected to pin 2 of J3. Installation of JP2 grounds pin 5 of J3.

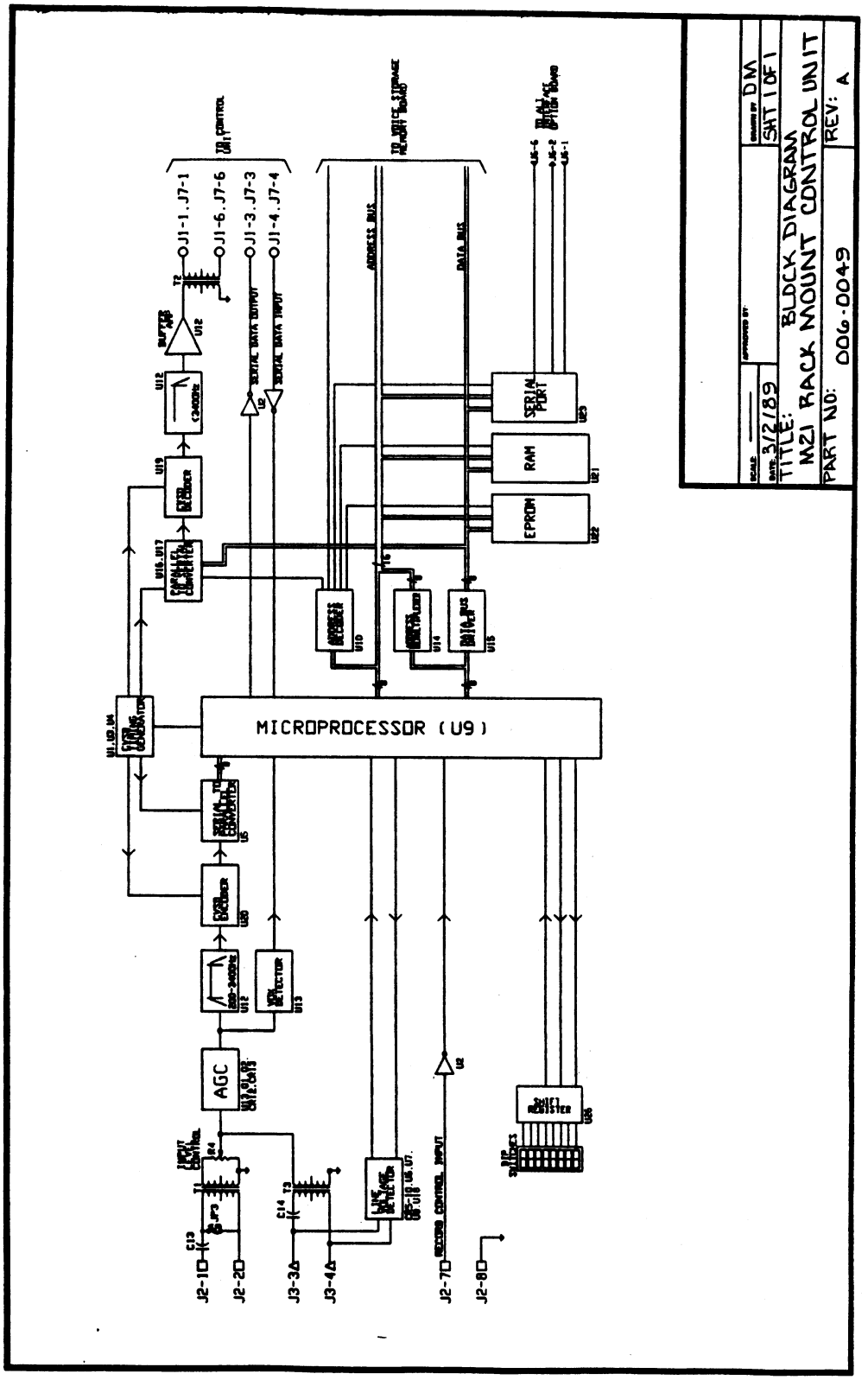
Relay K1 is driven by the microprocessor via U6. The relay is activated during playback. A normally open contact set is connected to pins 5 and 6 of J2.

The Auxiliary Input and Auxiliary Output signals present J2 are not used at this time.

Interface to Control Unit
Connector J1 or J7 is used to connect the Model 21 Voice Storage Unit to its operator Control Unit. These connectors contain the Model 21's balanced audio output and a +12VDC supply voltage from which the Control Unit operates. Also present on these connectors is a pair of serial data signals which allow the Voice Storage Unit to communicate with the Control Unit.

ALI System Interface
Connector J6 passes signals from the Voice Storage Unit to the optional ALI Interface board. This option allows the Model 21 to store and recall information displayed on the ALI screen of an E-911 answering position. The signals present at this connector include +5VDC, +12VDC and -12VDC supply voltages and the input and output of a serial communication port formed by U23. This port allows ALI data and control information to be sent between the ALI display system and the Voice Storage Unit.

MODEL 21 RACK MOUNT CONTROL UNIT BLOCK DIAGRAM (006-0049A)



RACK MOUNT CONTROL UNIT

Power Supply Circuit

The Control Unit is powered from the +12VDC output of the Voice Storage Unit's power supply. The Control Unit's circuitry is protected by 1 amp slow blow fuse F1 and by varistor RV1. The supply voltage is then regulated to +5VDC by R1 and VR1 to power the microprocessor and other digital circuitry. U18 and part of U19 are used to generate a -8VDC supply for the Control Unit's serial communication line driver.

Audio Amplifier

The balanced audio output from the Voice Storage Unit is DC blocked by C15 and presented to the primary of transformer T1. Analog switch U21 is then used to enable or disable amplification of the input signal. This switch is controlled by the microprocessor to enable the Control Unit's speaker amplifier only during playback of recorded audio. The audio amplifier's input is switched to ground by U21 when playback is not active to prevent undesired amplification of line noise when the Model 21 is idle.

The switched audio signal is then amplified by a circuit formed by U20, C12 and other components. The front panel volume control, R20, adjusts the output level of the speaker. The output of the speaker amplifier is connected to pin 3 of connector P1. The headphone output jack loops this signal back to the speaker via pin 4 of P1 unless headphones are plugged into the jack. If headphones are in use, no audio is returned to the speaker. Since this signal is from the output of the speaker amplifier, the front panel volume control affects the level at the headphone jack.

Connector P1 also contains the playback audio signal buffered by U19. This signal is connected to the Recorder Output jack on the Control Unit's front panel. This output is not affected by the speaker volume control.

Microprocessor and Memory

The Control Unit features a 6803 microprocessor which is clocked by an oscillator circuit made of C1, C2 and 2.4576MHz crystal Y1. Control and address signals from the microprocessor are decoded by U1 to allow access to EPROM U13 which contains the Control Unit's operating software, RAM U14 and other I/O devices.

Communication with the Voice Storage Unit is performed by the microprocessor's internal serial communication port via RS-232 driver U9.

The keypad, arranged as a 3 X 4 switch matrix, is directly scanned by the microprocessor's I/O lines. Control signals are generated by U2 and U10 to allow the microprocessor to read the eight front panel keys (via U17) and the configuration DIP switches (via U16). Latch U15 stores eight output bits which directly drive the LEDs in the "Mark", "Play" and "Save" keys. These LEDs are flashed by the microprocessor under software control without additional hardware. Three of U15's outputs drive a shift register chain consisting of U3 through U8 which holds the data for the Control Unit's six-digit LED display.

ALI INTERFACE BOARD

Power Supply

The ALI Interface board is powered from the outputs of the Model 21 Base Unit's power supply. Regulated supply voltages of +5, +12 and -12 volts DC are supplied to the ALI Interface via connector J5. Filtering is present near the power connector but no additional regulation is performed.

Microprocessor and Memory

A 6803 microprocessor controls the operation of the ALI Interface board. The microprocessor's clock signal is generated from 2.4576MHz crystal Y1. U8 demultiplexes the microprocessor's address bus, preparing the address and data busses for use by the memory and peripheral devices. The read and write control lines are decoded by U9 to create separate "Read" and "Write" signals to control the memories and peripherals. The ALI Interface's operating software is stored in EPROM U12. Static RAM U13 contains buffers for serial port data and other data storage.

Reset and Watchdog Timer Circuit

The circuit containing diodes CR1 and CR2, capacitor C6 and parts of U6 and U7 provides a properly conditioned Reset signal to the microprocessor to ensure that the microprocessor will begin operating properly when the correct power supply voltages are present. When power is applied to the unit, C6 charges through R7 (since the output of U6B is near +5 VDC) until it reaches the positive threshold voltage of U6B (about 3 volts). When the output of U6B then goes "low", a logic "1" level is presented to the microprocessor's Reset input, allowing it to begin executing its software. The software then begins toggling output bit P10 at a rate of several hundred cycles per second. This should continue as long as the microprocessor is operating properly. Part of U6 and diodes CR3 and CR4 use this signal to form a "watchdog timer" circuit which will reset the microprocessor if ceases to properly execute its software. During normal operation, the square wave present at U6A causes current to flow through CR3, holding the input of U6B at a logic "1" level. This level is inverted twice by U6B and U7G and presented to the microprocessor's Reset input where it allows the processor to continue operating. If P10 remains at the same state for several hundred milliseconds, the current flow through CR3 ceases, and C6 begins to discharge through R7 (since the output of U6B is near ground). When the input of U6B reaches its negative threshold level (about 1.5 volts) its output goes to a logic "1", resetting the microprocessor. C6 then begins charging again, just as it does at power-up. This cycle will repeat indefinitely if the microprocessor never properly executes software and toggles its P10 output.

Communication with Audio Digitizer Board
The 6803 microprocessor includes a serial data port which may be used to communicate with other serial devices. The ALI Interface board uses this port to communicate with the microprocessor on the Audio Digitizer Board. This communication allows the two microprocessors to exchange information about when recording and playback are occurring and when ALI data is received. The data signals between the boards are TTL level serial data at 4800 baud. The signals travel through connector J5 on the ALI Interface board to J6 on the Audio Digitizer Board. Binary counter U10 generates a 307.2kHz square wave from the microprocessor's clock output. This signal is also sent through J5 to the Audio Digitizer Board where it clocks the 6850 ACIA with which the ALI Interface board communicates.

ALI Interface Ports
Two 6850 ACIAs are used to communicate with the ALI display system. Each 6850 is a complete serial data port which, when used with a line driver/receiver IC, provides a bidirectional RS-232 data port. Binary counter U10 divides the microprocessor's clock output to provide data clock signals for both ACIAs. Baud rate clocks are provided to allow the ACIAs to operate at one of several commonly used data rates. The port consisting of U15, U17 and J4 is used to communicate with the ALI controller. Jumper JP2 selects this port's baud rate from one of six options. The port consisting of U14, U11 and J3 is used to communicate with the ALI display. Jumper JP1 selects this port's baud rate.

Port Bypass Circuitry
Relays K1, K2, K3, and K4 are used to allow the ALI Interface to electrically remove itself from the ALI display data path. These relays disconnect the data and control signals from the ALI Interface's internal drivers and receivers and connect the two ports together. This feature is used by the Model 21 to ensure that ALI screens will be displayed as they are received, even if a failure occurs on the Model 21 or ALI Interface board. These relays are driven by several sources, all of which must be in the proper state to allow the ALI Interface to interrupt the data path between the two connectors.

First, the microprocessor must be properly executing its software. The relay control line includes an RC circuit formed by C2 and R1. When the microprocessor's reset signal becomes a logic "1", allowing the processor to operate, C2 begins charging through R1. When the voltage across C2 reaches the positive input threshold of U1C (about 3 volts), the microprocessor's relay control output will be enabled. However, the time constant of this circuit is longer than that of the microprocessor's reset circuit, ensuring that the port switching relays will not be activated unless the microprocessor is operating properly. If the ALI Interface's watchdog timer circuit (described above) is tripping continuously, the relay control output will never be enabled.

In addition, the microprocessor must activate the relays using its output bit P11. This output must be at a logic "1" to activate the relays. The microprocessor will not activate this bit until it has successfully completed initialization of both serial ports and their support software. While the ALI Interface is operating, it will deactivate the relays if multiple serial data errors are detected on either port. After reinitializing the ports and waiting several seconds, the ALI interface will attempt to reactivate the relays and resume communication with the ALI controller and display.

As an additional precaution, an external input is provided which allows the operator to disconnect the ALI Interface's serial ports without interrupting the operation of the Model 21. If pin 8 of either of the ALI Interface's serial port connectors (J3 and J4) is grounded, the serial port switching relays will immediately open, removing the Model 21 from the ALI data paths. (Pin 5 of each connector is a suitable ground reference for this purpose.) These pins can be wired to a switch inside the console for service purposes or to an operator accessible switch to allow immediate bypassing of the ALI ports. While the switch is closed, the Model 21 can neither send or receive ALI data.

7. REPAIR

TROUBLESHOOTING

The Model 21 constantly performs various diagnostics on itself while idle, playing and recording. In addition, a detailed memory test can be invoked at any time.

Power-On Diagnostics

Whenever the power cord is plugged in, the unit begins a series of power-on tests and displays some results on the front panel display. A normally operating unit will scroll the message "mEmOrY = nn mInUtES" (nn is the number of minutes that are properly operating). Note that an "m" shows as an "n" in the display.

Diagnostics Messages

If the unit discovers a problem while performing diagnostics, an error message will scroll through the display of the front panel. The following is a list of possible diagnostic messages:

wAtCHdOG ErrOr	("w" looks like "u") The unit's watchdog is not operating. However the unit will otherwise work properly except for resetting the call counter.
dISCOn	The Control Unit is not communicating with the Base Unit. Most likely the interconnecting cable needs attention.
FAIL	A general failure message. The following number can be used by the factory to identify the problem.
FP-Err	Forward Pointer Error, indicates a memory problem.
rP-Err	Reverse Pointer Error, indicates a memory problem.
nS-Err	Next Sector Error, indicates a memory problem.
PS-Err	Previous Sector Error, indicates a memory problem.
XErr	("x" looks unfamiliar) Interrupt Error. The following number can be used by the factory to identify the problem.
ErrOr	A general error message. The following numbers can be used by the factory to identify the problem.

Testing the Recorder's Memory
Occasionally it may be desirable to verify that the recorder's memory is functioning properly. To initiate the memory test, enter the sequence "995195" then press the Enter (#) key on the keypad. While the test is running, the current memory bank number will scroll through the display. If a failure is found, the word "Error" will show in the display. In the event that a failure is found, contact the Zetron factory. The memory test is halted by unplugging the power to the unit. NOTE: THIS WILL ERASE ALL RECORDED MESSAGES, INCLUDING SAVED MESSAGES.

MAINTENANCE

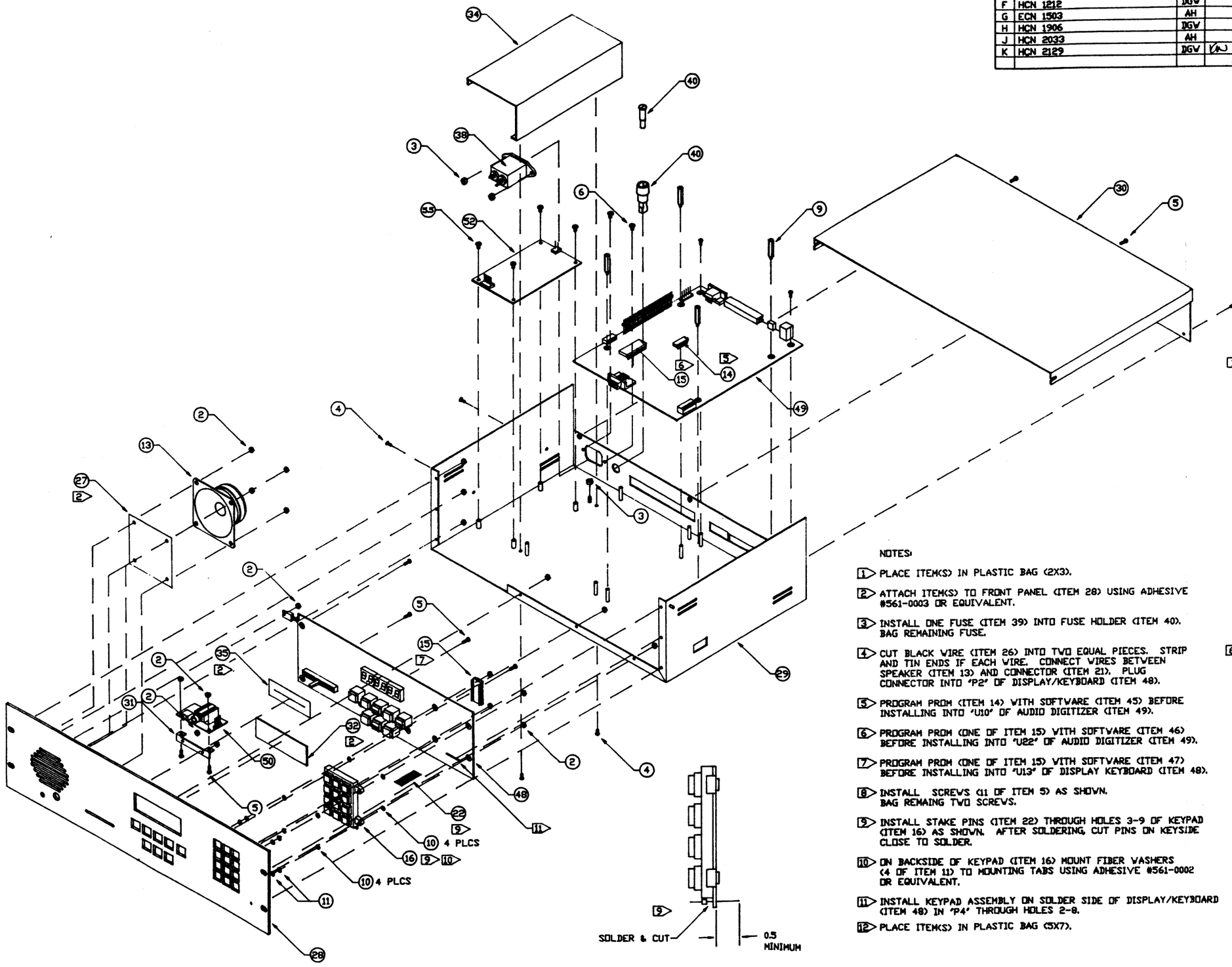
Since the Model 21 does not contain moving parts, there is no need for regularly scheduled maintenance or service. In the event that coffee or soda is spilled on the keypad, the keypad can be removed (unit disassembly required) and either cleaned or replaced (contact Zetron factory). If spilled on the other keys, the clear key top, plunger and elastormer button may be removed from the key body without disassembling the enclosure. A moist cotton swab may be used to clean the key parts before reassembly.

8. SCHEMATICS / PARTS LISTS

Continued ....

8. SCHEMATICS / PARTS LISTS (cont'd)

REVISIONS					REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE	REV	DESCRIPTION	DRAWN	APPRVD	DATE
F	HCN 1212	DGV			A	RELEASE	DM		
G	ECN 1503	AH			B	ECN 665	GH		
H	HCN 1906	DGV			C	ECN 722	NK		
J	HCN 2033	AH			C	ECN 799	AH		
K	HCN 2129	DGV	KN	4-21-93	D	ECN 969	KM		
					E	ECN 1055	KN	KN	



	QTY.	PART #	DESCRIPTION
52	1	802-0100	POWER SUPPLY
51	1	709-7102	M21 POWER SUPPLY CABLE
50	1	702-9161	AUDIO CONNECTOR BOARD
49	1	702-9143	AUDIO DIGITIZER BOARD
48	1	702-9142	M21 DISPLAY/KEYBOARD
7	1	601-0175	M21 FRONT PANEL SFTWR
6	1	601-0174	M21 VOICE STOR. SFTWR
5	1	601-0173	M21 DECODE PROM SFTWR
44	A/R	561-0003	CONTACT CEMENT
43	A/R	561-0002	SUPER GLUE
42	2"	525-1499	SHRINK TUBE 3/4"
41	4"	525-0250	SHRINK TUBE 1/4"
40.7	1	449-9051	BAG,20X18X26 (UNIT)
40.6	1	449-9042	BAG, PLASTIC 2X3
40.5	1	449-9019	BAG, PLASTIC 5X7
40.4	1	449-0089	ACCESSORY BOX
40.3	1	449-0088	M640/21 FOAM END
40.2	1	449-0087	M21 SPACER
40.1	1	449-0085	M640/21 BOX
40	1	416-3045	FUSEHOLDER, SHOCK SAFE
1 3	2	416-1577	FUSE 1A SLO-BLO
38	1	416-0013	LINE FILTER, 1A, MODULAR
12	1	416-0012	POWER CORD, MODULAR
36	1	415-9669	DECAL PT 68 FCC/PN/SN
2	1	415-9437	SLIDE POT FELT
34	1	415-9409	POWER SUPPLY COVER
12	1	415-9408	STRAIN RELIEF BRACKET
2	1	415-9345	DISPLAY LENS
31	1	415-9327	AUDIO CONNECTOR BRACKET
30	1	415-9315-1	TOP COVER
29	1	415-9314-1	BOTTOM CASE
28	1	415-9313-1	FRONT PANEL
2	1	415-9194	SPEAKER GRILLCLOTH
4	5"	408-2200	WIRE, 22GA, BLACK
25	4"	408-1605	WIRE, 16GA, WHITE
24	3"	408-1604	WIRE, 16GA, YELLOW
23	8"	408-1600	WIRE, 16GA, BLACK
9	1	403-1007	7 OF 401-0036
4	1	401-0175	2 PIN .1" HSG
20	1	401-0156	RING LUG
1	1	401-0016	12 POSN BLOCK FEM.
18	1	401-0135	3 POSN HOOD
17	1	401-0134	3 POSN, .156 FEM.
9	1	373-0019	KEYPAD
6 7	2	322-7128	16K X 8 EPROM
5	1	322-0256	32 X 8 PROM
13	1	305-0021	SPEAKER 4 OHM 5W
12	1	265-0008	WIRE RETAINER
11	8	251-1240	440 X .062 FIBER
10	8	251-1239	440 X .031 FIBER
9	4	250-0102	440X1 W/STUD
8	4	236-0004	WASHER, NYLON #10 BLACK
7	4	220-0250	1032X3/4 FH PH BLACK
6	2	220-0207	632X3/8 PAN PH
5.5	4	220-0203	632X1/4 PAN PH
5.3	4	220-0116	1024X3/4 FH BLK OX
8	13	220-0108	440X1/4 PAN PH
4	4	220-0101	44X5/16 FH PH
1	4	210-0007	10-24 SPEED NUT
3	3	210-0002	632 KEPT NUT
2	22	210-0001	440 KEPT NUT
1	1	025-9074	MANUAL

NOTES:

1. PLACE ITEM(S) IN PLASTIC BAG (2X3).
2. ATTACH ITEM(S) TO FRONT PANEL (ITEM 28) USING ADHESIVE #561-0003 OR EQUIVALENT.
3. INSTALL ONE FUSE (ITEM 39) INTO FUSE HOLDER (ITEM 40). BAG REMAINING FUSE.
4. CUT BLACK WIRE (ITEM 26) INTO TWO EQUAL PIECES. STRIP AND TIN ENDS IF EACH WIRE. CONNECT WIRES BETWEEN SPEAKER (ITEM 13) AND CONNECTOR (ITEM 21). PLUG CONNECTOR INTO 'P2' OF DISPLAY/KEYBOARD (ITEM 48).
5. PROGRAM PROM (ITEM 14) WITH SOFTWARE (ITEM 45) BEFORE INSTALLING INTO 'U10' OF AUDIO DIGITIZER (ITEM 49).
6. PROGRAM PROM (ONE OF ITEM 15) WITH SOFTWARE (ITEM 46) BEFORE INSTALLING INTO 'U22' OF AUDIO DIGITIZER (ITEM 49).
7. PROGRAM PROM (ONE OF ITEM 15) WITH SOFTWARE (ITEM 47) BEFORE INSTALLING INTO 'U13' OF DISPLAY KEYBOARD (ITEM 48).
8. INSTALL SCREWS (11 OF ITEM 5) AS SHOWN. BAG REMAING TWO SCREWS.
9. INSTALL STAKE PINS (ITEM 22) THROUGH HOLES 3-9 OF KEYPAD (ITEM 16) AS SHOWN. AFTER SOLDERING, CUT PINS ON KEYSIDE CLOSE TO SOLDER.
10. ON BACKSIDE OF KEYPAD (ITEM 16) MOUNT FIBER WASHERS (4 OF ITEM 11) TO MOUNTING TABS USING ADHESIVE #561-0002 OR EQUIVALENT.
11. INSTALL KEYPAD ASSEMBLY ON SOLDER SIDE OF DISPLAY/KEYBOARD (ITEM 48) IN 'P4' THROUGH HOLES 2-8.
12. PLACE ITEM(S) IN PLASTIC BAG (5X7).

DRAWN
CHK
APV

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL ±.XX ±.05 ±.XXX ±.005
ANGULAR ± 1°
SCALE — = 1
SHEET 1 OF 2

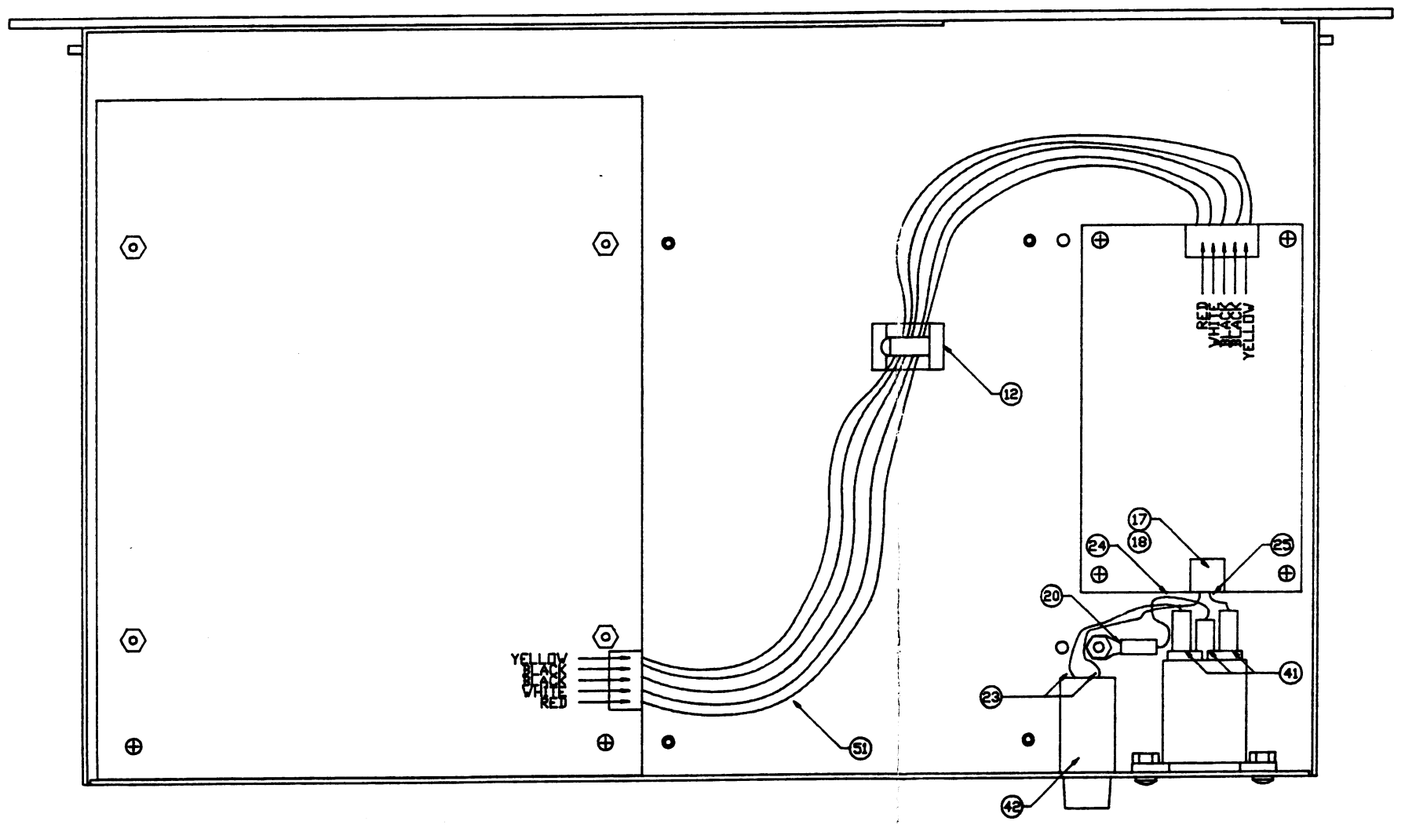
ZETRON
ZETRON, INC. 12335 134TH COURT NE, REDMOND, WA 98052

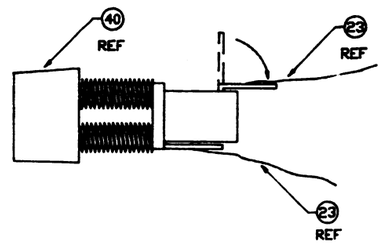
TITLE
MODEL 21
INSTANT
RECALL RECORDER

DRAWING NUMBER 901-9096 REV K SIZE D

DO NOT SCALE DRAWING

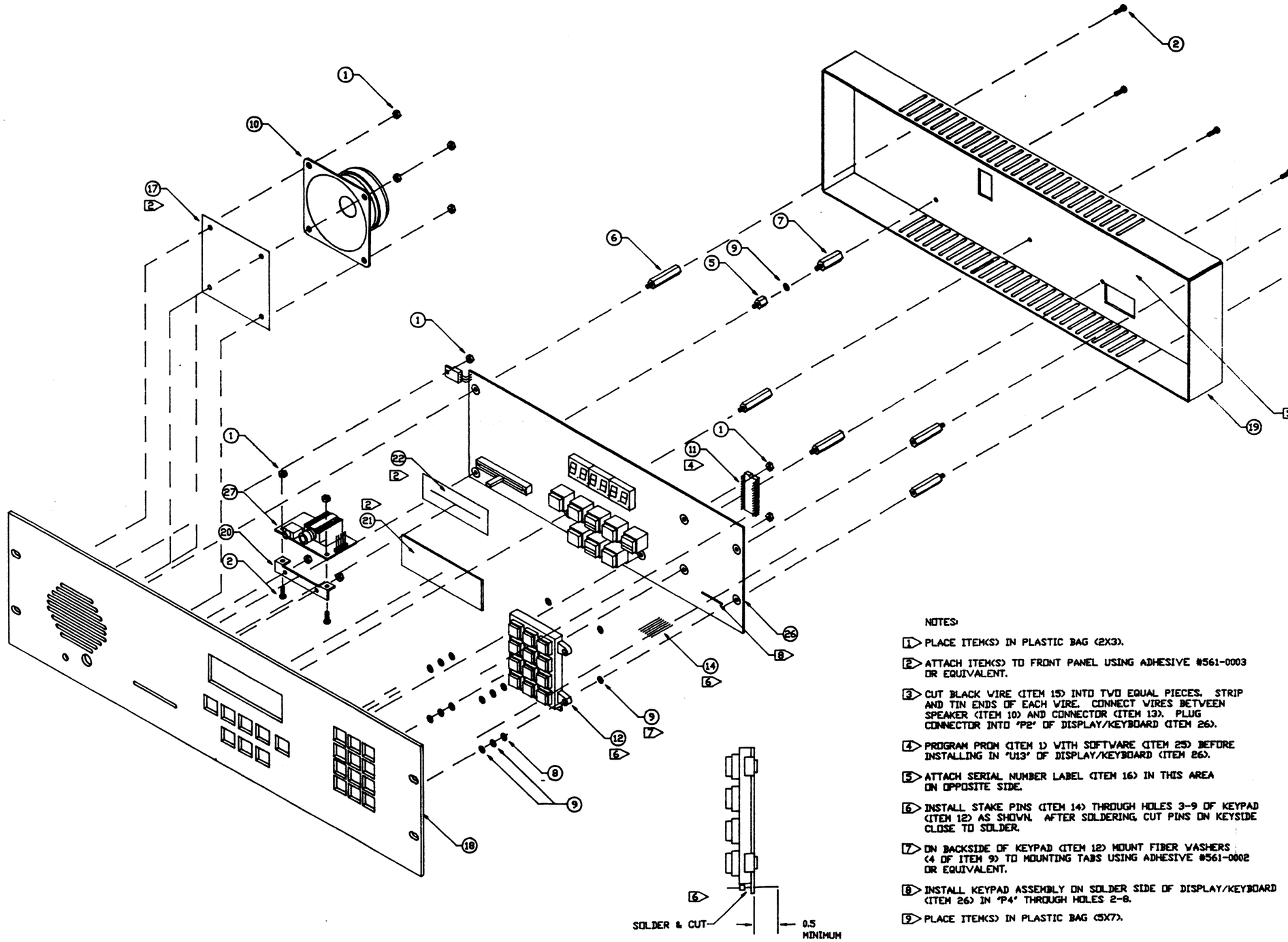
REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
	SEE PAGE 1			





DRN			ZETRON
CHK			ZETRON, INC., 16295 134TH COURT NE., REDMOND, WA 98052
APV			
UNLESS OTHERWISE SPECIFIED			TITLE: MODEL 21 INSTANT RECALL RECORDER
DECIMAL	±.XX	±.05	
	±.XXX	±.010	
ANGULAR	∠	± 1°	DRAWING NUMBER: 901-9096 REV: K SIZE: D
SCALE - = 1			DO NOT SCALE DRAWING
SHEET 2 OF 2			

REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
A	RELEASE	DM		
B	ECN 664	GM		
C	ECN 969	KM		
D	HCN 1212	DGW		
E	HCN 2033	KN		
F	HCN 2129	DGW	KAJ	4-21-93



NOTES:

1. PLACE ITEM(S) IN PLASTIC BAG (2X3).
2. ATTACH ITEM(S) TO FRONT PANEL USING ADHESIVE #561-0003 OR EQUIVALENT.
3. CUT BLACK WIRE (ITEM 15) INTO TWO EQUAL PIECES. STRIP AND TIN ENDS OF EACH WIRE. CONNECT WIRES BETWEEN SPEAKER (ITEM 10) AND CONNECTOR (ITEM 13). PLUG CONNECTOR INTO 'P2' OF DISPLAY/KEYBOARD (ITEM 26).
4. PROGRAM PROM (ITEM 1) WITH SOFTWARE (ITEM 25) BEFORE INSTALLING IN 'U13' OF DISPLAY/KEYBOARD (ITEM 26).
5. ATTACH SERIAL NUMBER LABEL (ITEM 16) IN THIS AREA ON OPPOSITE SIDE.
6. INSTALL STAKE PINS (ITEM 14) THROUGH HOLES 3-9 OF KEYPAD (ITEM 12) AS SHOWN. AFTER SOLDERING, CUT PINS ON KEYSIDE CLOSE TO SOLDER.
7. ON BACKSIDE OF KEYPAD (ITEM 12) MOUNT FIBER WASHERS (4 OF ITEM 9) TO MOUNTING TABS USING ADHESIVE #561-0002 OR EQUIVALENT.
8. INSTALL KEYPAD ASSEMBLY ON SOLDER SIDE OF DISPLAY/KEYBOARD (ITEM 26) IN 'P4' THROUGH HOLES 2-8.
9. PLACE ITEM(S) IN PLASTIC BAG (5X7).

	QTY.	PART #	DESCRIPTION
9	28	1 709-7104	REMOTE CONTROL CABLE
	27	1 702-9161	AUDIO CONNECTOR BOARD
	26	1 702-9142	M21 DISPLAY/KEYBOARD
4	25	1 601-0175	M21 FRONT PANEL SFTWR
	24	A/R 561-0003	CONTACT CEMENT
	23	A/R 561-0002	SUPER GLUE
	22.7	1 449-9051	BAG,20X18X26 (UNIT)
	22.6	1 449-9042	BAG, PLASTIC 2X3
	22.5	1 449-9019	BAG, PLASTIC 5X7
	22.4	1 449-0089	ACCESSORY BOX
	22.3	1 449-0088	M640/21 FOAM ENDS
	22.2	1 449-0087	M21 SPACER
	22.1	1 449-0085	M640/21 BOX
2	22	1 415-9437	SLIDE POT FELT
2	21	1 415-9345	DISPLAY LENS
	20	1 415-9327	AUDIO CONNECTOR BRACKET
	19	1 415-9317-1	RACK MOUNT CASE
	18	1 415-9313-1	FRONT PANEL
2	17	1 415-9194	SPEAKER GRILLCLOTH
	16	1 415-9669	DECAL PT 68 FCC/PN/SN
3	15	5' 408-2200	WIRE, 22GA, BLACK
6	14	1 403-1007	7 OF 401-0036
3	13	1 401-0175	2 PIN .1" HSG
6	12	1 373-0019	KEYPAD
4	11	1 322-7128	16K X 8 EPROM
	10	1 305-0021	SPEAKER 4 OHM 5W
	9	13 251-1240	440 X .062 FIBER
	8	4 251-1239	440 X .031 FIBER
	7	1 250-0105	440 X 5/8 W/STUD
	6	5 250-0102	440 X 1 W/STUD
	5	1 250-0101	440 X 1/4 W/STUD
1	4	4 236-0004	WASHER, NYLON #10 BLACK
1	3	4 220-0250	1032X3/4 FH PH BLACK
1	2.5	4 220-0116	1024X3/4 FH BLK OX
	2	6 220-0108	440X1/4 PAN PH
1	1.5	4 210-0007	10-24 SPEED NUT
	1	13 210-0001	440 KEPT NUT

DRN
CHK
APV

ZETRON
ZETRON, INC. 12295 134TH COURT N.E. REDMOND, WA 98052

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL .XX ±.01 .XXX ±.005
ANGULAR ∠ ± 1°
SCALE - = 1
SHEET 1 OF 1

TITLE
MODEL 21
RACK MOUNT
CONTROL

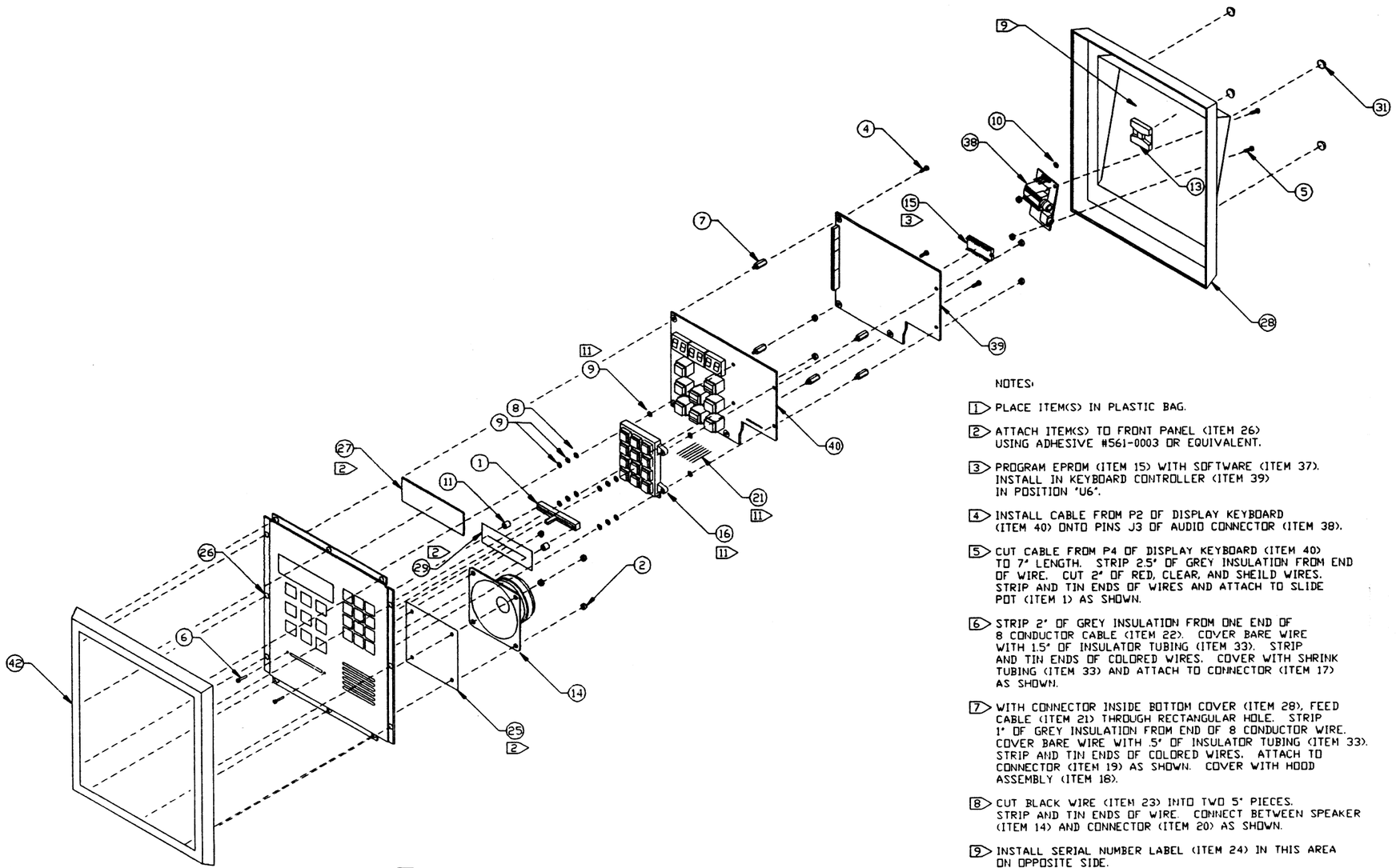
DRAWING NUMBER 901-9097 REV F SIZE D

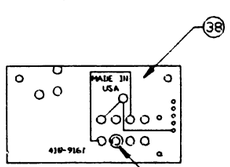
DO NOT SCALE DRAWING

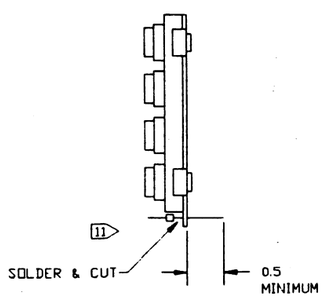
MODEL 21 REMOTE BASE PARTS LIST (901-9098G)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	1	025-9074	MANUAL, MODEL 21 INSTANT RECALL	
2.	9	210-0001	440 KEPT NUT PLATED	FRONT PANEL
3.	3	210-0002	632 KEPT NUT PLATED	FILTER, RING LUG
4.	4	210-0007	10-24 SPEED NUT	(2X3 BAG)
5.	4	220-0101	440x5/16 FLAT HEAD PHILLIPS	PWR SUPPLY COVER
6.	11	220-0108	440x1/4 PAN PHILLIPS	TOP COVER, PCB
7.	4	220-0116	1024X 3/4 FH PHIL BLK OX	(2X3 BAG)
8.	6	220-0207	632x3/8 PAN PHILLIPS	FILTER, PWR SUPPLY
9.	4	220-0250	1032x3/4 FLAT HEAD PHILLIPS BLK	(2X3 BAG)
10.	4	236-0004	WASHER, NYLON #10 BLACK	(2X3 BAG)
11.	4	250-0102	440x1 W/STUD	MEMORY BOARD
12.	1	265-0008	WIRE LATCH	PWR SUPPLY CABLE
13.	1	322-0256	32x8 PROM	702-9143, U10
14.	1	322-7128	16Kx8 EPROM	702-9143, U22
15.	1	401-0016	12 POSN BLOCK FEMALE	702-9143
16.	1	401-0134	3POSN,.156 FEMALE	POWER SUPPLY
17.	1	401-0135	3POSN,.156 HOOD	POWER SUPPLY
18.	1	401-0156	RING LUG	CHASSIS GROUND
19.	3"	408-0027	WIRE, 16GA, GREEN/YELLOW	GROUND WIRE
20.	8"	408-1600	WIRE, 16GA, BLACK	FILTER
21.	4"	408-1605	WIRE, 16GA, WHITE	FILTER
22.	1	415-9314-1	MODEL 21 BOTTOM CASE	
23.	1	415-9315-1	MODEL 21 TOP COVER	
24.	1	415-9318-1	MODEL 21 REMOTE BASE FRONT PANEL	
25.	1	415-9408	STRAIN RELIEF BRACKET	(5X7 BAG)
26.	1	415-9409	POWER SUPPLY COVER	
27.	1	415-9669	DECAL, PART 68 FCC/SN/PN	
28.	1	416-0012	POWER CORD, MODULAR	(5X7 BAG)
29.	1	416-0013	LINE FILTER,1A,MODULAR	
30.	2	416-1577	FUSE 1A SLO-BLO	INSTALL 1,1(2X3 BAG)
31.	1	416-3045	FUSEHOLDER, SHOCK SAFE	
32.	1	449-0085	M640/21 BOX	
33.	1	449-0087	M21 SPACER	
34.	1	449-0088	M640/21 FOAM END	
35.	1	449-0089	ACCESORY BOX	
36.	1	449-9019	BAG 5X7	
37.	1	449-9042	BAG, PLASTIC 2X3	
38.	1	449-9051	BAG, PLASTIC, 20X18X26	UNIT
39.	4"	525-0250	SHRINK TUBE, 1/4"	FILTER
40.	2"	525-1499	SHRINK TUBE, 3/4"	FUSEHOLDER
41.	1	601-0173	M21 DECODE PROM SOFTWARE	702-9143, U10
42.	1	601-0174	M21 VOICE STORAGE UNIT SOFTWARE	702-9143, U22
43.	1	702-9143	AUDIO DIGITIZER BOARD	
44.	1	709-7102	M21 POWER SUPPLY CABLE	
45.	1	802-0100	POWER SUPPLY	

REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
A	RELEASE	DGW		
B	ECN 970	KM		
C	HCN 1212	DGW		
C.1	HCN 1615	AH		
C.2	REDLINE	--		
D	HCN 2127	DGW	KW	1-93







NOTES:

1. PLACE ITEM(S) IN PLASTIC BAG.
2. ATTACH ITEM(S) TO FRONT PANEL (ITEM 26) USING ADHESIVE #561-0003 OR EQUIVALENT.
3. PROGRAM EPROM (ITEM 15) WITH SOFTWARE (ITEM 37). INSTALL IN KEYBOARD CONTROLLER (ITEM 39) IN POSITION 'U6'.
4. INSTALL CABLE FROM P2 OF DISPLAY KEYBOARD (ITEM 40) ONTO PINS J3 OF AUDIO CONNECTOR (ITEM 38).
5. CUT CABLE FROM P4 OF DISPLAY KEYBOARD (ITEM 40) TO 7" LENGTH. STRIP 2.5" OF GREY INSULATION FROM END OF WIRE. CUT 2" OF RED, CLEAR, AND SHEILD WIRES. STRIP AND TIN ENDS OF WIRES AND ATTACH TO SLIDE POT (ITEM 1) AS SHOWN.
6. STRIP 2" OF GREY INSULATION FROM ONE END OF 8 CONDUCTOR CABLE (ITEM 22). COVER BARE WIRE WITH 1.5" OF INSULATOR TUBING (ITEM 33). STRIP AND TIN ENDS OF COLORED WIRES. COVER WITH SHRINK TUBING (ITEM 33) AND ATTACH TO CONNECTOR (ITEM 17) AS SHOWN.
7. WITH CONNECTOR INSIDE BOTTOM COVER (ITEM 28), FEED CABLE (ITEM 21) THROUGH RECTANGULAR HOLE. STRIP 1" OF GREY INSULATION FROM END OF 8 CONDUCTOR WIRE. COVER BARE WIRE WITH .5" OF INSULATOR TUBING (ITEM 33). STRIP AND TIN ENDS OF COLORED WIRES. ATTACH TO CONNECTOR (ITEM 19) AS SHOWN. COVER WITH HOOD ASSEMBLY (ITEM 18).
8. CUT BLACK WIRE (ITEM 23) INTO TWO 5" PIECES. STRIP AND TIN ENDS OF WIRE. CONNECT BETWEEN SPEAKER (ITEM 14) AND CONNECTOR (ITEM 20) AS SHOWN.
9. INSTALL SERIAL NUMBER LABEL (ITEM 24) IN THIS AREA ON OPPOSITE SIDE.
10. ATTACH SPACER (ITEM 10) TO SOLDER SIDE OF AUDIO CONNECTOR BOARD (ITEM 38) USING ADHESIVE #561-0002 OR EQUIVALENT AS SHOWN.
11. INSTALL STAKE PINS (ITEM 21) THROUGH HOLES 3-9 OF KEYPAD (ITEM 16) AS SHOWN. AFTER SOLDERING, CUT PINS ON KEYSIDE CLOSE TO SOLDER.
12. ON BACKSIDE OF KEYPAD (ITEM 16) MOUNT FIBER WASHERS (4 OF ITEM 9) TO MOUNTING TABS USING ADHESIVE #561-0002 OR EQUIVALENT.

	ITEM	QTY.	PART #	DESCRIPTION
	42	1	810-0012	DSS COVER
1	41	1	709-7104	M21 CONTROL UNIT CABLE
	40	1	702-9240	M21 DISPLAY/KEYBOARD
	39	1	7029223	M21 KEYBOARD CONTROLLER
	38	1	702-9161	M21 AUDIO CONN. BD.
3	37	1	601-0175	M21 FP SOFTWARE
	36	A/R	561-0003	CONTACT CEMENT
	35	A/R	561-0002	SUPER GLUE
	34	2"	525-0375	3/8" SHRINK TUBING
6 7	33	2"	525-0002	INSULATING TUBING
	32	1	449-9000	BOX, SHIPPING
	31	4	431-0005	FOOT, BUMPON
1	30	1	416-1577	FUSE AGC 1A SLO-BLO
2	29	1	415-9437	SLIDE POT FELT
	28	1	415-9430	M21T BOTTOM COVER
2	27	1	415-9428	LED DISPLAY LENS
	26	1	415-9396-1	M21T FRONT PANEL
2	25	1	415-9194	SPEAKER GRILL CLOTH
	24	1	415-9669	DECAL, GEN SN. PART 68
8	23	10"	408-2200	22GA WIRE, BLACK
	22	4'	408-0016	8 COND SHIELDED CABLE
11	21	1	403-1007	7 OF 401-0036
8	20	1	401-0175	2 POS CONNECTOR
	19	1	401-0155	DE-9S
	18	1	401-0039	9 PIN HOOD
	17	1	401-0038	9 PIN DB, MALE
11	16	1	373-0019	KEYBOARD
3	15	1	322-7128	16KX8 250NS EPROM
	14	1	305-0021	SPEAKER 4 OHM 5W
	13	1	265-0003	MOUNT PLATE, CABLE HOLD
	12	1	265-0001	TY-WRAP, STD
	11	2	251-2500	440 X 1/4
10	10	1	251-1250	440 X 1/8
	9	12	251-1240	440 X .062 FIBER
	8	4	251-1239	440 X .031 FIBER
	7	5	250-0104	440 X 1/2 W/STUD
	6.5	2	250-0099	440X1/2" THD SPACER
	6	2	220-6100	M2 X12MM
	5	2	220-0212	440 X 3/8 FH
	4	3	220-0108	440 X 1/4 PH
	3	4	220-0104	440 TAP PAN PILLIPS
	2	10	210-0001	440 KEPT NUT
	1	1	107-0001	100K SLIDE POT

DRN
CHK
APV

ZETRON

ZETRON, INC. 12335 134TH COURT NE, REDMOND, WA 98052

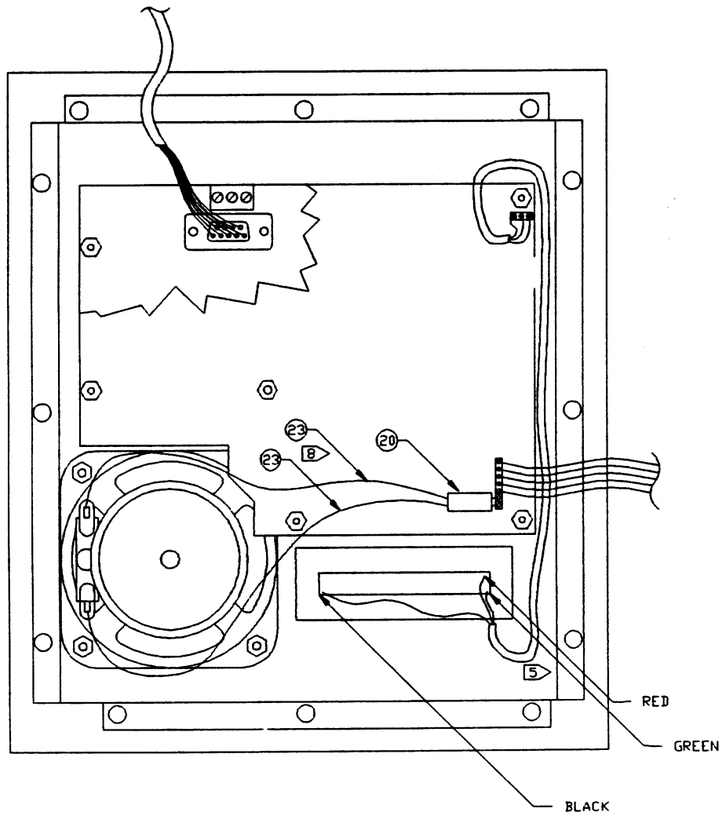
TOLERANCES (EXCEPT AS NOTED)
DECIMAL ± .XX ±.01, ± .XXX ±.005
ANGULAR ± 1°
SCALE: - = 1
SHEET 1 OF 2

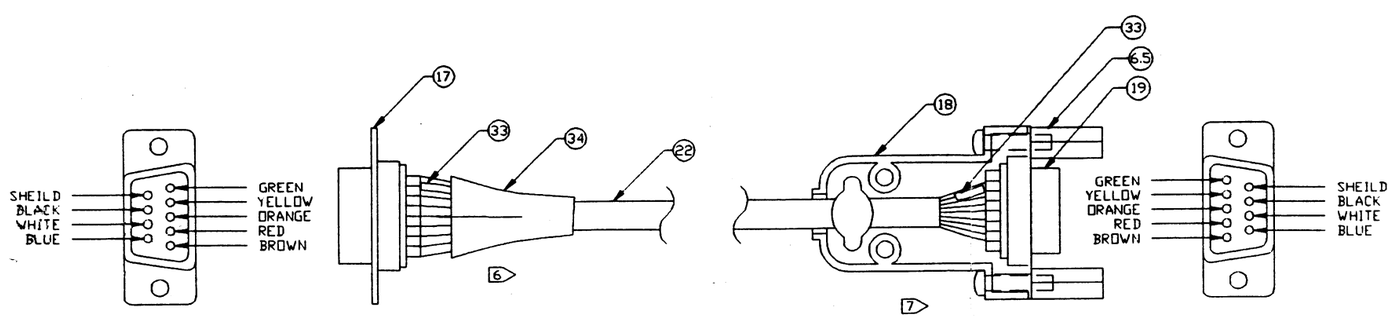
TITLE: MODEL 21T TABLETOP INSTANT RECALL RECORDER

DRAWING NUMBER: 901-9115 REV: D SIZE: D

DO NOT SCALE DRAWING

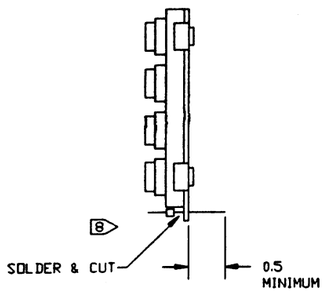
REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
	SEE SHEET 1 OF 2			





DRN		ZETRON
CHK		ZETRON INC. 12335 134TH COURT NE. REDMOND. WA 98052
APV		
TOLERANCES (EXCEPT AS NOTED)		TITLE: MODEL 21T TABLETOP INSTANT RECALL RECORDER
DECIMAL	± XX ± .01 / ± .XXX ± .005	
ANGULAR	∠ ± 1°	DRAWING NUMBER: 901-9115 REV: D SIZE: D
SCALE: - = 1		
SHEET: 2 OF 2		DO NOT SCALE DRAWING

REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
A	RELEASE	DGW		
B	ECN 970	KM		
C	HCN 1212	DGW		
D	HCN 1466A	DGW		
E	HCN 2033	AH		
F	HCN 2127	DGW		1-93



NOTES:

1. PLACE ITEM(S) IN PLASTIC BAG.
2. ATTACH ITEM(S) TO FRONT PANEL USING ADHESIVE #561-0003 OR EQUIVALENT.
3. PROGRAM EPROM (ITEM 13) WITH SOFTWARE (ITEM 29), INSTALL IN KEYBOARD CONTROLLER (ITEM 31) AT POSITION U6.
4. INSTALL CABLE FROM P2 OF DISPLAY KEYBOARD (ITEM 32) ONTO PINS J3 OF AUDIO CONNECTOR (ITEM 30), AS SHOWN.
5. CUT CABLE FROM "P4" OF LEFT SIDE DISPLAY KEYBOARD TO 5" LENGTH AND ATTACH TO LEFT POT (ITEM 1) AS SHOWN IN DETAIL A.
6. CUT CABLE FROM "P4" OF RIGHT SIDE DISPLAY KEYBOARD TO 9" LENGTH AND ATTACH TO RIGHT POT (ITEM 1) AS SHOWN IN DETAIL A.
7. INSTALL SERIAL NUMBER LABEL IN THIS AREA, ON OPPOSITE SIDE.
8. INSTALL STAKE PINS (ITEM 16) THROUGH HOLES 3-9 OF KEYPAD (ITEM 14) AS SHOWN. AFTER SOLDERING, CUT PINS ON KEYSIDE CLOSE TO SOLDER.
9. ON BACKSIDE OF KEYPAD (ITEM 14) MOUNT FIBER WASHERS (4 OF ITEM 9) TO MOUNTING TABS USING ADHESIVE #561-0002 OR EQUIVALENT.

	ITEM	QTY.	PART #	DESCRIPTION
1	33	2	709-7104	M21 CONTROL UNIT CABLE
	32	2	702-9240	M21 DISPLAY.KEYBOARD
	31	2	702-9223	M21 KEYBOARD CONTRL.
	30	2	702-9161	M21 AUDIO CONN. BOARD
3	29	1	601-0175	M21 FP SOFTWARE
	28	A/R	561-0003	CONTACT CEMENT
	27	A/R	561-0002	SUPER GLUE
	26	1	449-9016	SHIPPING BOX
1	25	1	416-1577	FUSE AGC 1A SLO-BLO
2	24	2	415-9428	M21 LED DISPLAY LENS
	23	1	415-9421-1	M21RD BACK COVER
	22	1	415-9420-1	M21RD FRONT COVER
	21	1	415-9406	M21 VOLUME CONTROL BKT
	20	2	415-9327	M21 AUDIO CONN. PCB BKT
2	19	1	415-9194	M20R SPEAKER GRILL
8	18	1	415-9669	DECAL PT 68 FCC/PN/SN
	17	20"	408-2200	22GA. WIRE, BLACK
	16	2	403-1007	7 OF 401-0036
	15	2	401-0175	2 POS. CONNECTOR
	14	2	373-0019	KEYBOARD
3	13	2	322-7128	16KX8 250NS EPROM
	12	1	305-0021	SPEAKER 4 OHM 5W
	11	2	265-0013	CAP FOR 265-0012
	10	2	265-0012	KNOB W/INDICATOR BLOCK
	9	28	251-1240	440X.062 FIBER
	8	8	250-1239	440X.031 FIBER
	7	18	250-0104	440X1.2 W/STUD
1	5	4	236-0004	WASHER, NYLON #10 BLK
1	4	4	220-0250	1032X3/4 FH PHILLIPS
	3	13	220-0108	440X1/4 PH SCREW
	2	20	210-0001	440 KEPT NUT
	1	2	107-0002	10K ROTARY POT

DWN
CHK
APV

ZETRON

ZETRON, INC. 12735 134TH COURT NE. REDMOND, WA 98052

TOLERANCES (EXCEPT AS NOTED)
DECIMAL ± XX ±.01, ± XXX ±.005
ANGULAR ± 1°
SCALE: - = 1
SHEET 1 OF 2

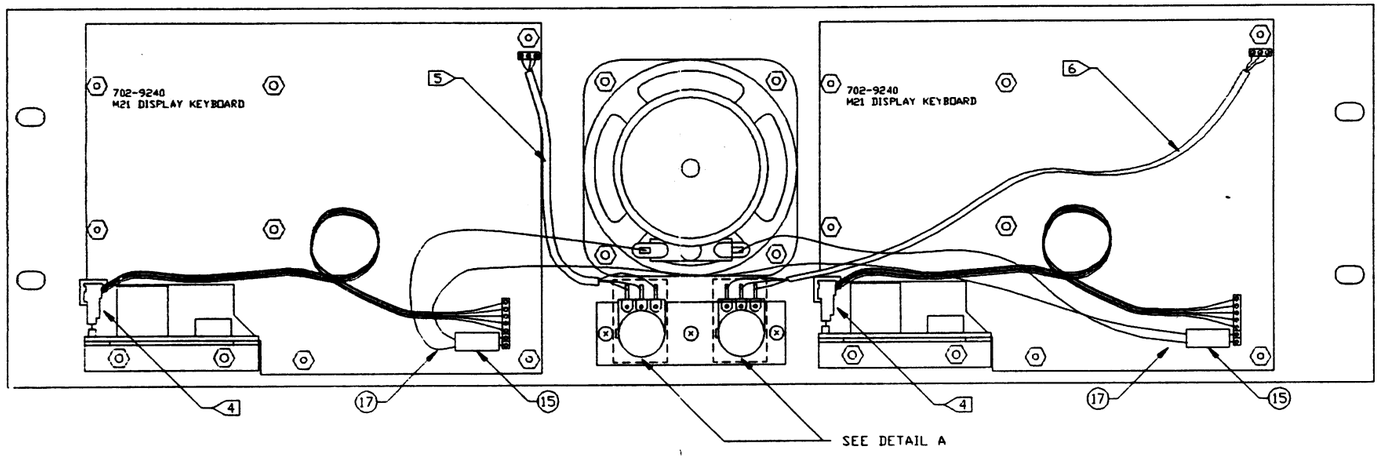
TITLE: MODEL 21 DUAL RACK MOUNT CONTROLLER

DRAWING NUMBER: 901-9116 REV: F SIZE D

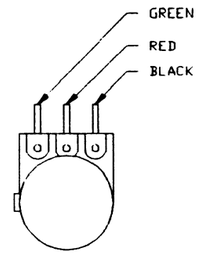
DO NOT SCALE DRAWING

REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
	SEE SHEET 1 OF 2			

VIEW A-A

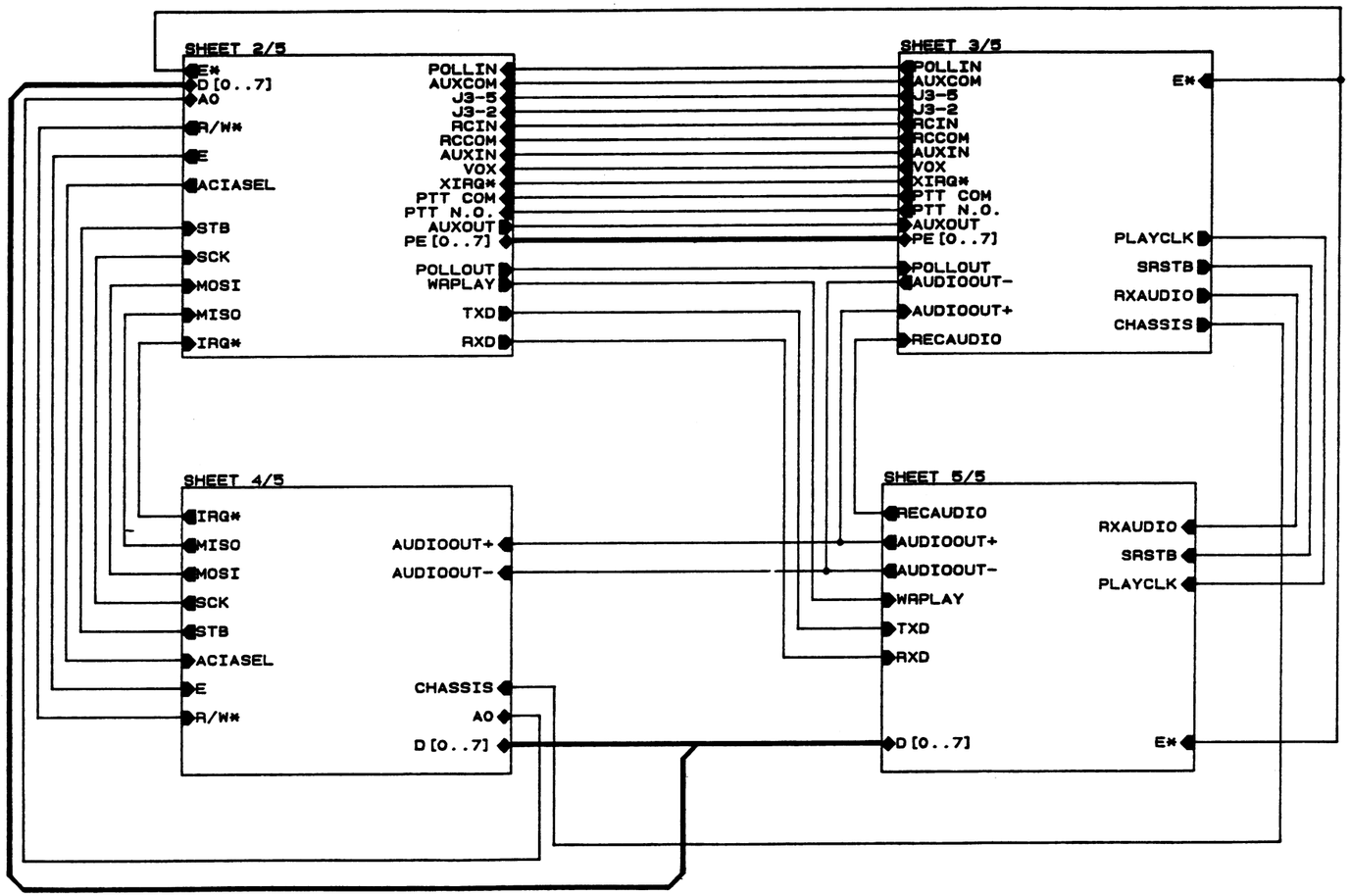


DETAIL A



DRN		ZETRON	
CHK		ZETRON, INC. 12335 134TH COURT NE. REDMOND WA 98052	
APV		TITLE: MODEL 21 DUAL RACK MOUNT CONTROLLER	
TOLERANCES (EXCEPT AS NOTED)		DRAWING NUMBER: 901-9116	REV: F
DECIMAL	± .X ± .01 / ± .XXX ± .005		SIZE: D
ANGULAR	± 1°	DO NOT SCALE DRAWING	
SCALE: - = 1/1			
SHEET: 2 OF 2			

REV	DESCRIPTION	DRN	APV	DATE
A	RELEASE			
B	ECN 661/683	DSW		07/28/89
C	ECN 968	KJN	[illegible]	07/19/90
D	ECN 1844	GWH	[illegible]	4/16/92
E	HCN 2237	KN		



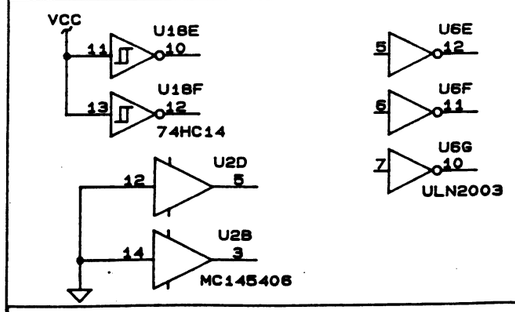
NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5%.
2. ALL CAPACITORS ARE IN MICROFARADS.

LEGEND

#	NOT INSTALLED
_____X_____	CUT TRACE
--------	JUMPER WIRE

SPARE GATES

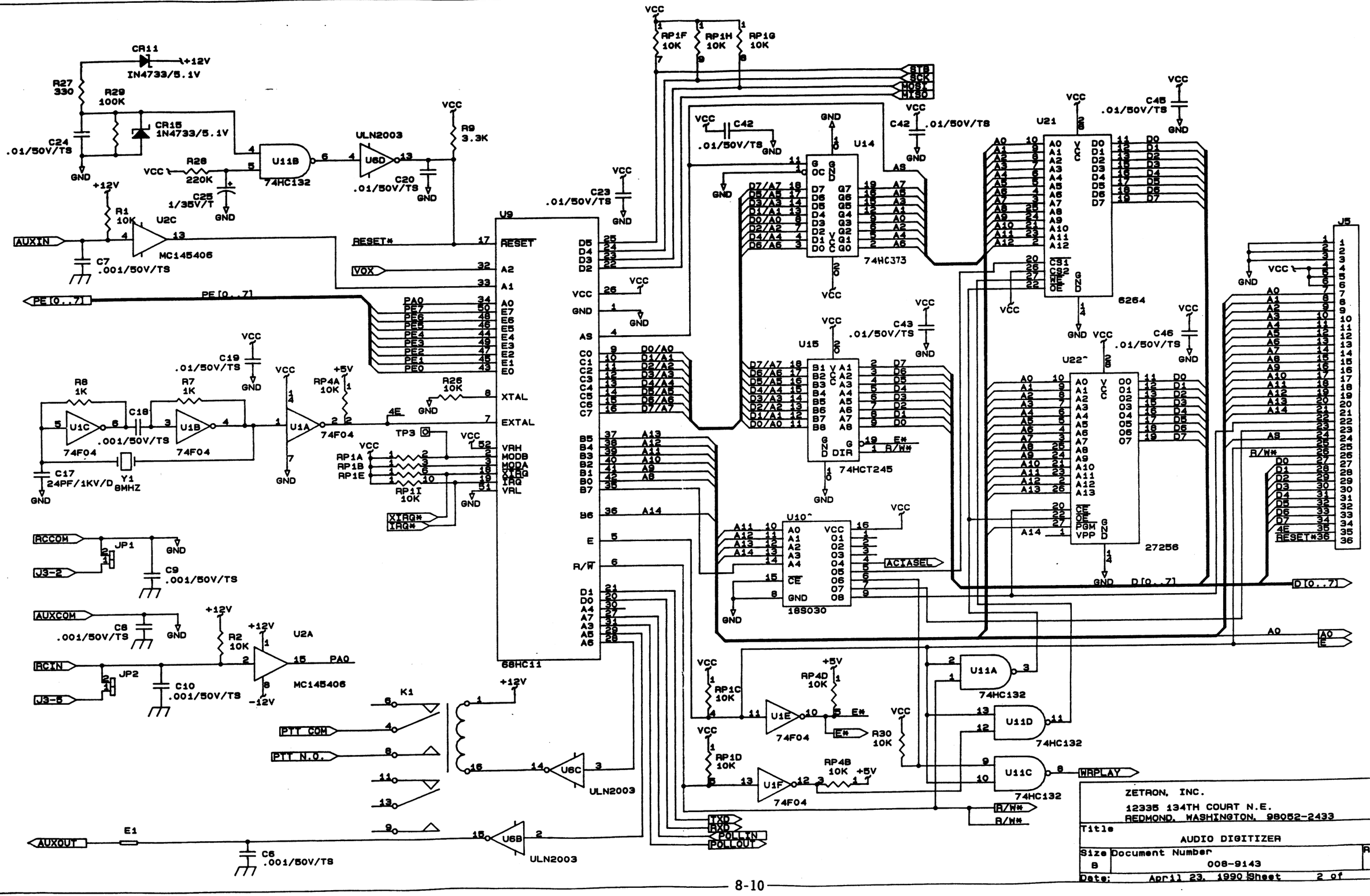


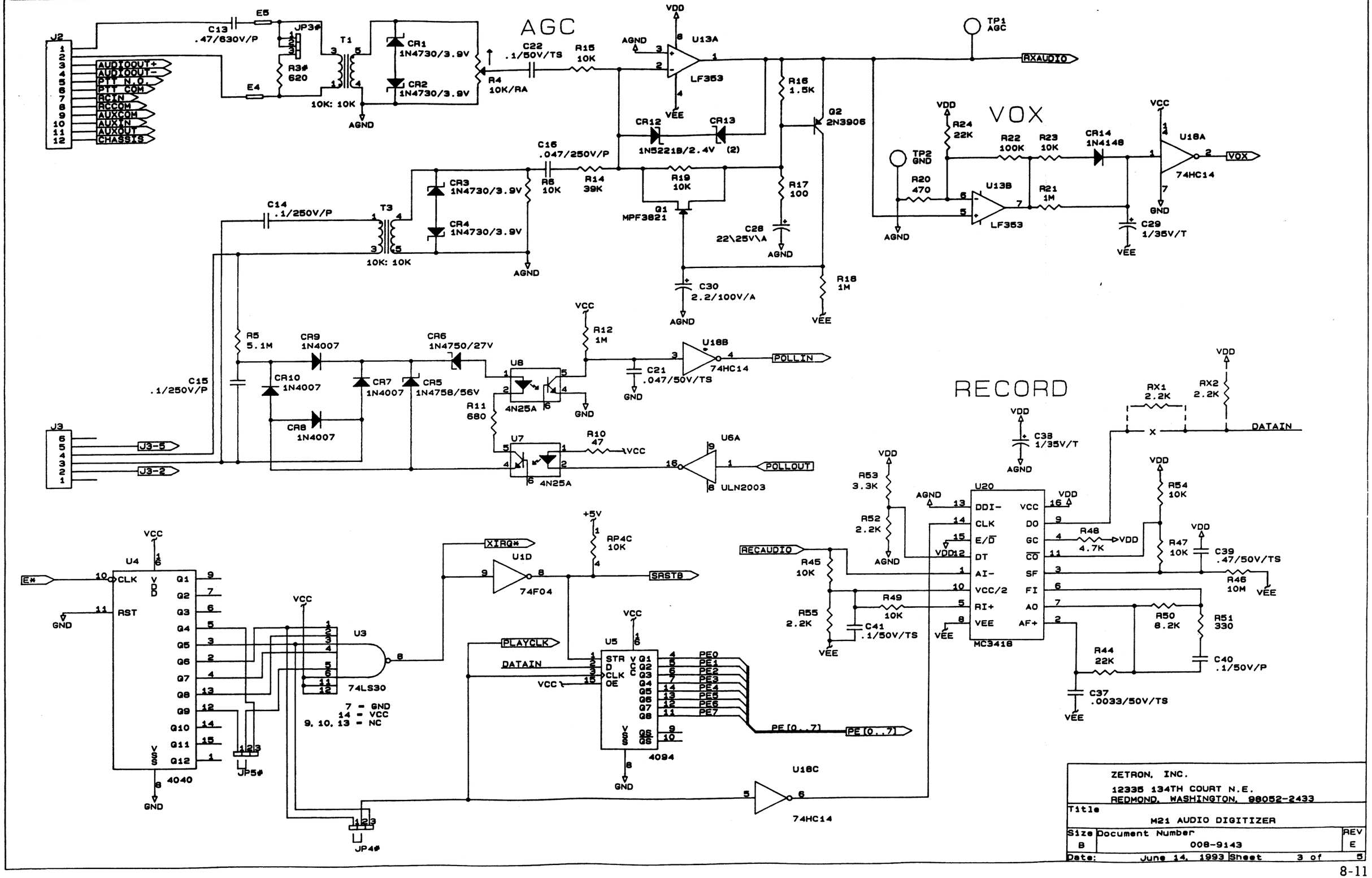
ZETRON, INC.
12335 134TH COURT N.E.
REDMOND, WASHINGTON, 98052-2433

Title: M21 AUDIO DIGITIZER

Size	Document Number	REV
B	008-9143	E

Date: April 23, 1990 Sheet 1 of 5


CR11
IN4733/5.1V
+12V
R27 330
R29 100K
CR15 1N4733/5.1V
C24 .01/50V/TS
GND
R28 220K
C25 1/35V/T
U11B
74HC132
ULN2003
U6D
R9 3.3K
C20 .01/50V/TS
VCC
+12V
R1 10K
U2C
AUXIN
MC145406
C7 .001/50V/TS
RESET*
VOX
PE[0..7]
U9
68HC11
RESET
A2
A1
A0
E7
E6
E5
E4
E3
E2
E1
E0
C19 .01/50V/TS
R8 1K
R7 1K
U1C
U1B
74F04
C18 .001/50V/TS
C17 24PF/1KV/D
Y1 8MHZ
U1A
RP4A 10K
+5V
R26 10K
4E
XTAL
EXTAL
TP3
RP1A
RP1B
RP1E
RP1I 10K
VRH
MODB
MODA
XIRQ
IRQ
VRL
XIRQ*
IRQ*
RP1F 10K
RP1H 10K
RP1G 10K
STB
SCK
MOSI
MISO
C42 .01/50V/TS
C23 .01/50V/TS
U14
74HC373
U15
74HCT245
U10^
18S030
ACIASEL
C43 .01/50V/TS
C45 .01/50V/TS
C46 .01/50V/TS
U21
U22^
6264
27256
D[0..7]
J5
AS
R/W*
RESET*
A0
E
RCCOM
JP1
J3-2
C9 .001/50V/TS
AUXCOM
C8 .001/50V/TS
R2 10K
U2A
RCIN
JP2
J3-5
C10 .001/50V/TS
MC145406
K1
PTT COM
PTT N.O.
U6C
ULN2003
AUXOUT
E1
C6 .001/50V/TS
U6B
TXD
RXD
POLLIN
POLLOUT
RP1C 10K
RP4D 10K
U1E
74F04
E*
R30 10K
RP1D 10K
RP4B 10K
U1F
R/W*
U11A
U11D
U11C
74HC132
WRPLAY
ZETRON, INC.
12335 134TH COURT N.E.
REDMOND, WASHINGTON, 98052-2433
Title
AUDIO DIGITIZER
Size B
Document Number 008-9143
REV E
Date: April 23, 1990
Sheet 2 of 5

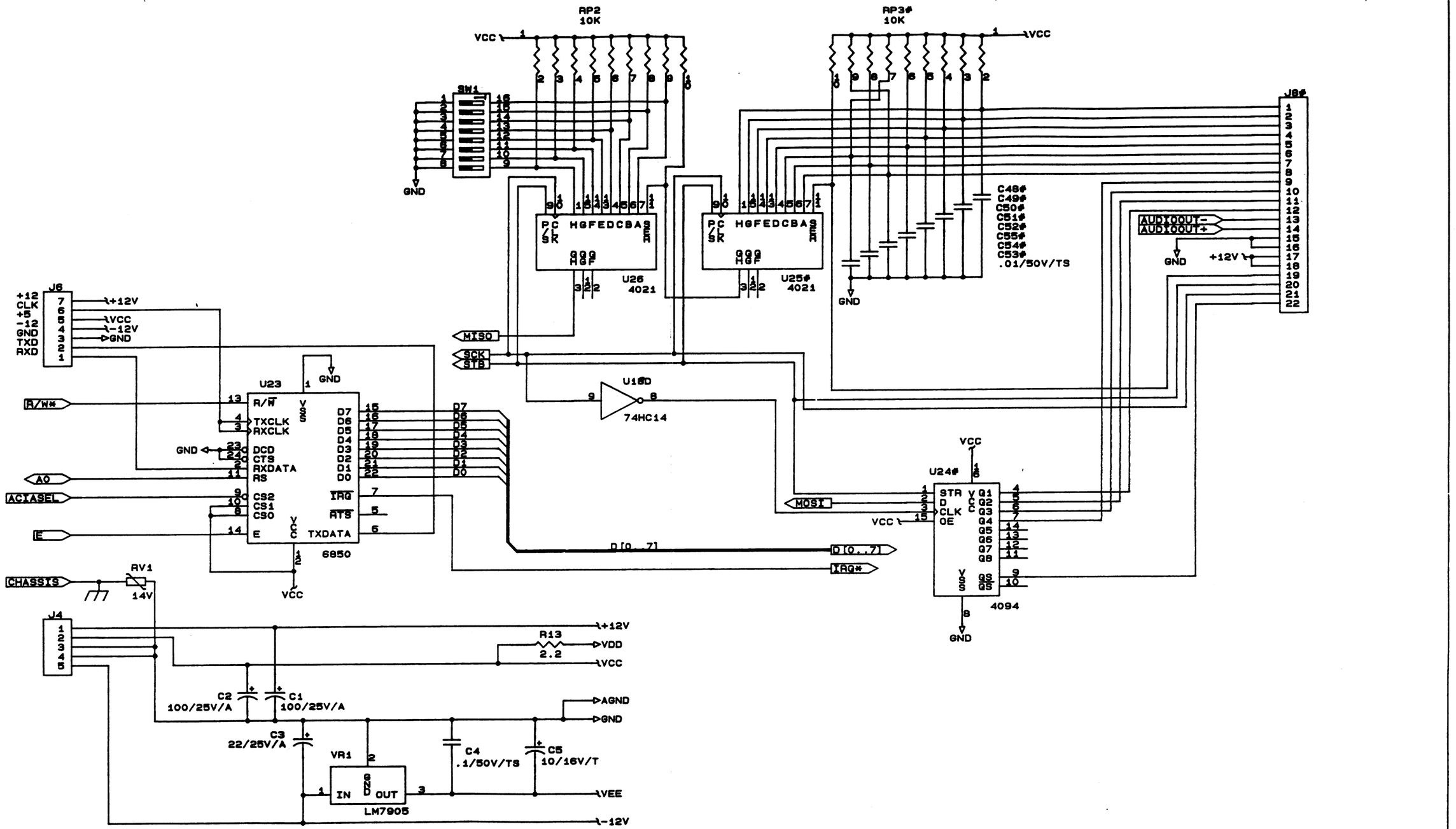


ZETRON, INC.
12335 134TH COURT N.E.
REDMOND, WASHINGTON, 98052-2433

Title: M21 AUDIO DIGITIZER

Size: B | Document Number: 008-9143 | REV: E

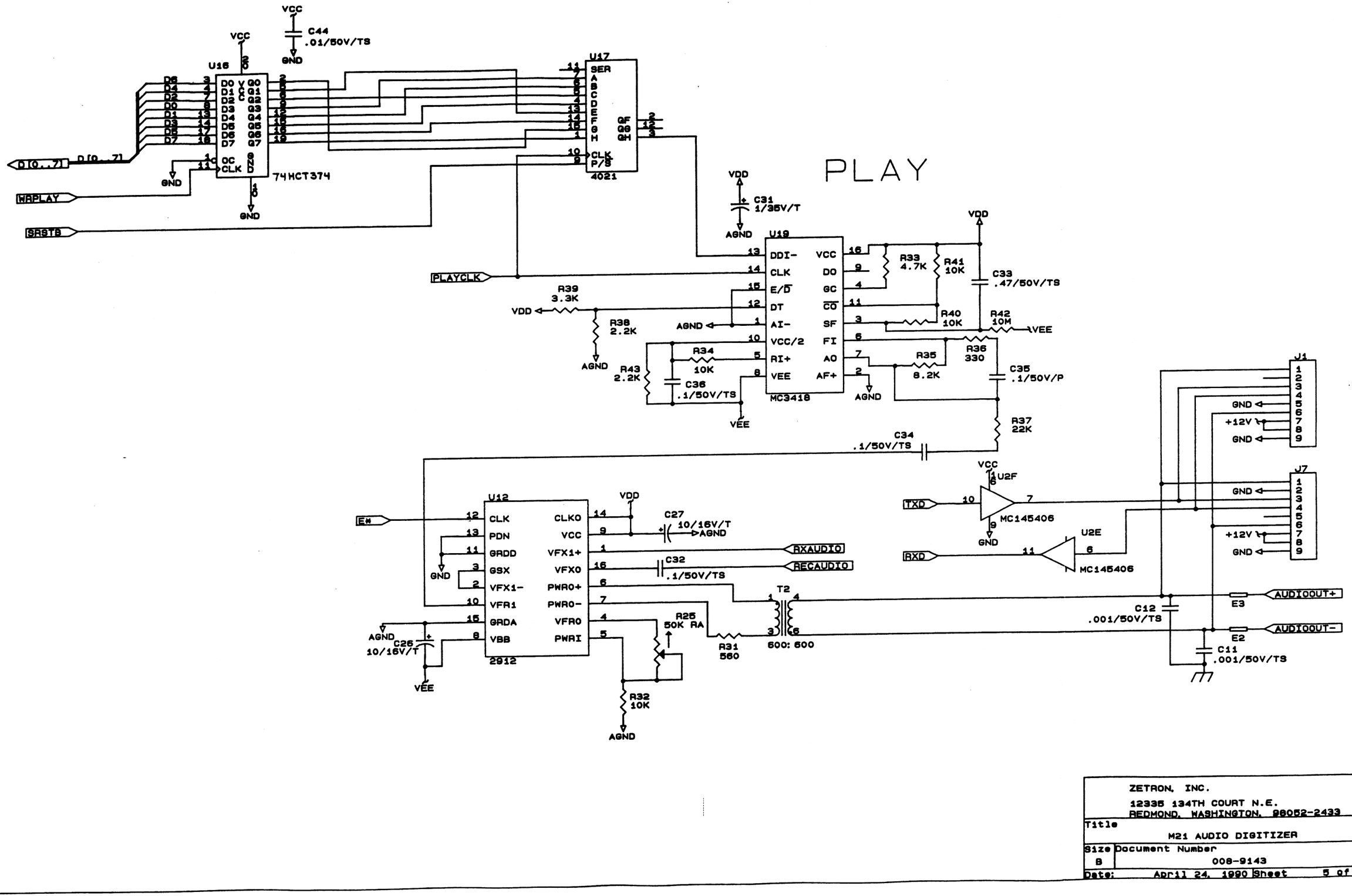
Date: June 14, 1993 | Sheet 3 of 5



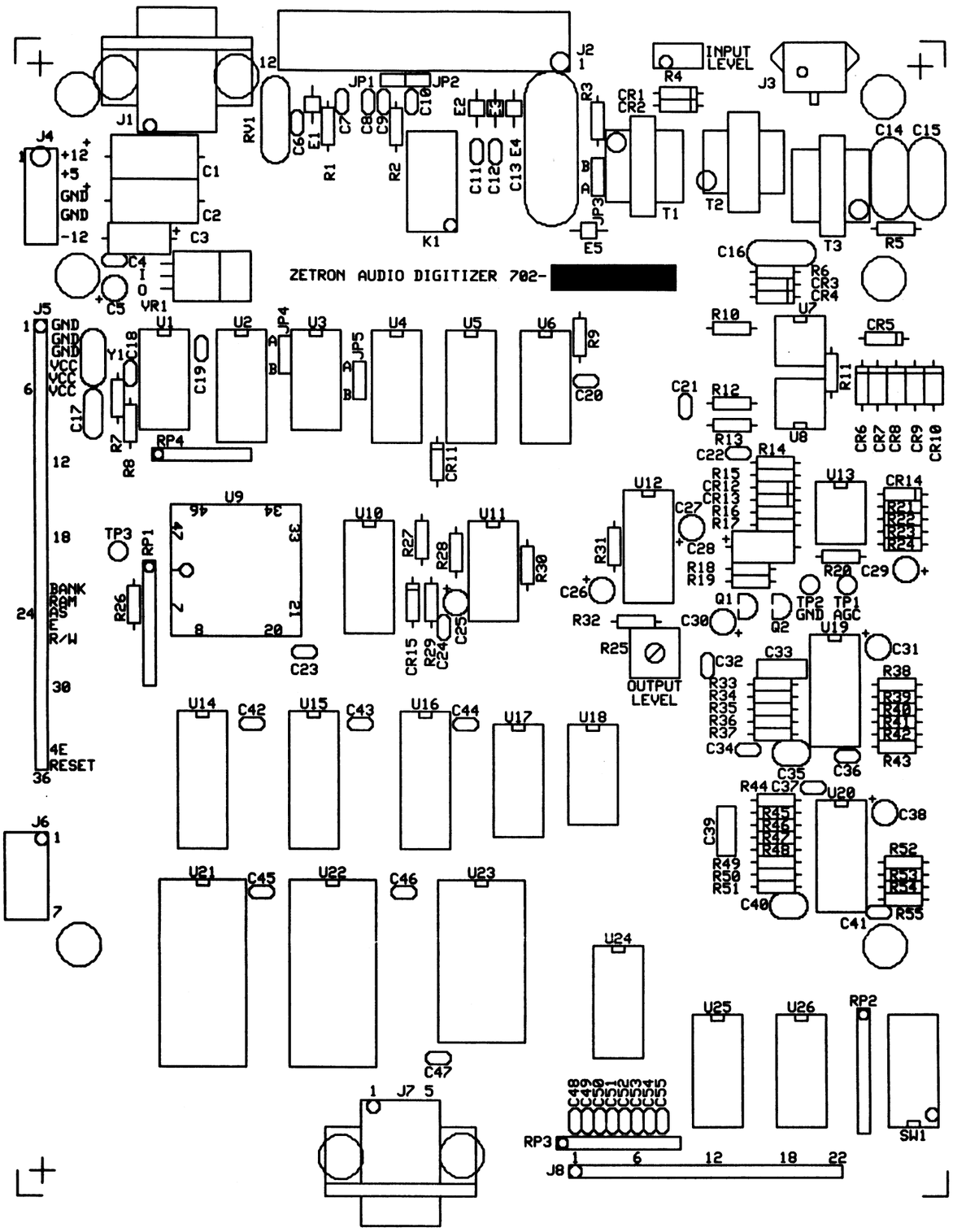
ZETRON, INC.
12335 134TH COURT N.E.
REDMOND, WASHINGTON, 98052-2433

Title: M21 AUDIO DIGITIZER		
Size: B	Document Number: 008-9143	REV: E
Date: April 24, 1990	Sheet 4 of 5	

PLAY



ZETRON, INC. 12335 134TH COURT N.E. REDMOND, WASHINGTON, 98052-2433		
Title: M21 AUDIO DIGITIZER		
Size: B	Document Number: 008-9143	REV: E
Date: April 24, 1990	Sheet 5 of 5	


ZETRON AUDIO DIGITIZER 702-[redacted]
J1
J2
J3
J4
J5
J6
J7
J8
INPUT LEVEL
OUTPUT LEVEL
TP1 AGC
TP2 GND
TP3
RESET
BANK COM
R/W
SW1

AUDIO DIGITIZER BOARD PARTS LIST (702-9143E)

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFG.PART NO.
1.	1	101-0013	2.2 OHM .25W 5%	R13	
2.	1	101-0047	47 OHM	R10	
3.	1	101-0049	100	R17	
4.	3	101-0061	330	R27 36 51	
5.	1	101-0065	470	R20	
6.	1	101-0067	560	R31	
7.	1	101-0069	680	R11	
8.	2	101-0073	1K	R7 8	
9.	1	101-0075	1.5K	R16	
10.	6	101-0081	2.2K	R38 43 52 55 RX1 RX2	
11.	3	101-0085	3.3K	R9 39 53	
12.	2	101-0089	4.7K	R33 48	
13.	2	101-0095	8.2K	R35 50	
14.	16	101-0097	10K	R1 2 6 15 19 23 26 30 32 34 40 41 45 47 49 54	
15.	3	101-0105	22K	R24 37 44	
16.	1	101-0111	39K	R14	
17.	2	101-0121	100K	R22 29	
18.	1	101-0129	220K	R28	
19.	3	101-0145	1M	R12 18 21	
20.	2	101-0160	10M	R42 46	
21.	1	101-0155	5.1M	R5	
22.	1	105-0002	VARISTOR 14V	RV1	V22ZA3
23.	1	107-0010	10K POT RA	R4	
24.	1	107-0502	50K POT	R25	
25.	2	119-0006	10K X 9 R-SIP	RP1 2	
26.	1	119-0008	10K X 7 R-SIP	RP4	
27.	1	150-0024	24 PF 1KV	C17	
28.	8	151-0020	.001 UF 50V TS	C6-12 18	
29.	1	151-0090	.0033 UF 50V TS	C37	
30.	10	151-0120	.01 UF 50V TS	C19 20 23 24 42-47	
31.	1	151-0130	.047 UF 50V TS	C21	
32.	6	151-0180	.1 UF 50V TS	C4 22 32 34 36 41	
33.	2	151-0199	.47 UF 50V TS	C33 39	
34.	2	152-0010	.1/250V POLY	C14 15	
35.	2	152-0012	.1 UF 50V 5% POLY	C35 40	
36.	1	152-0020	.47 UF 630V POLY	C13	
37.	1	152-0251	.047/250V POLY	C16	
38.	4	154-0025	1 UF 35V TANT	C25 29 31 38	
39.	3	154-0100	10 UF 16V TANT	C5 26 27	
40.	1	155-0012	2.2 UF 100V AL RAD	C30	
41.	2	155-0055	22 UF 25V ALUM	C3 28	
42.	2	155-0080	100 UF 25V ALUM	C1 2	
43.	5	210-0001	440 NUT	XVR1,XJ1 7	
44.	4	220-0102	440x3/8	XJ1 7	

AUDIO DIGITIZER BOARD PARTS LIST (702-9143E) cont'd

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFG.PART NO.
45.	1	220-0106	440x5/16	XVR1	
46.	1	305-0003	600 OHM AUDIO	T2	42TM016
47.	5	305-0007	BEAD, FERRITE	E1-5	
48.	2	305-0103	10K:10K OHM AUDIO	T1 3	MR671-1459
49.	2	311-0007	UL OPTO INSULATOR	U7 8	4N25A
50.	1	314-7430	8 INPUT NAND	U3	74LS30
51.	1	316-0353	OP-AMP DUAL BIFET	U13	LF353
52.	1	316-7905	-5V REGULATOR	VR1	MA7905C
53.	1	317-5406	DUAL RS-232 DRIVER	U2	MC145406D
54.	1	321-2912	CODEC FILTER	U12	2912A
55.	1	321-6264	8K X 8 RAM	U21	HC6264 LP-15
56.	1	321-6811	UP-HC MOS	U9	MOT68HC11AOFN
57.	1	321-6851	VART 2MHZ	U23	MC68B50P
58.	2	323-3418	CVSD VOICE DIG	U19 20	MC3418CP
59.	2	323-4021	8-BIT LOAD SHFT REG	U17 26	MC14021B
60.	1	323-4040	12 BIT BINARY CTR	U4	MC14040B
61.	1	323-4094	8 STAGE SERIAL REG	U5	CD4094B
62.	1	324-4132	QUAD NAND	U11	74HC132
63.	1	324-4373	OCTAL LATCH	U14	74HC373
64.	1	324-7414	HEX SCHMITT	U18	74HC14
65.	1	325-4245	OCTAL XCVR	U15	74HCT245
66.	1	325-4374	OCTAL DFF REG TS	U16	74HCT374
67.	1	326-7404	HEX INVERTER	U1	74F04
68.	1	340-2003	RELAY DRIVER .50V	U6	ULN2003
69.	1	340-3821	JFET N-CHAN	Q1	MPF3821
70.	1	340-3906	PNP	Q2	2N3906
71.	1	342-3009	SILICON	CR14	1N4148
72.	4	342-3011	SILICON 1A 1000V	CR7-10	1N4007
73.	4	343-3020	1W 3.9V +-10%	CR1-4	1N4730
74.	2	343-3029	1W 5.1V +- 5%	CR11 15	1N4733
75.	1	343-3112	1W 27V +-5%	CR6	1N4750
76.	1	343-3115	1W 56V +-10%	CR5	1N4758
77.	2	343-3015	1/2W 2.4V +-5%	CR12 13	1N5221B
78.	1	371-0008	SW OCTAL DIP	SW1	
79.	1	376-0800	8MHZ CRYSTAL	Y1	
80.	1	380-0030	DPDT 12V MINI	K1	
81.	1	401-0021	DB9S RA PC MOUNT	J1	
82.	1	401-0022	DB9C RA PC MOUNT	J7	
83.	2	401-0042	DB LOCK SCREW	XJ1	
84.	7	401-0052	STAKE PINS	TP1 2 3(1EA)	
				JP1 2(2EA)	

AUDIO DIGITIZER BOARD PARTS LIST (702-9143E) cont'd

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFG.PART NO.
85.	1	401-0067	7 POS RA CONN	J6	
86.	1	401-0086	12 POS RA PINS	J2	
87.	36	401-0065	36 x .1 x 1"	J5	
88.	1	401-6008	5 PIN .156 CTR	J4	
89.	2	401-7000	6 COND RA RJ11	J3	
90.	2	402-3040	MINI JUMPER	XJP1 *NOTE 2	
				XJP2 *NOTE 2	
91.	2	407-0006	SKT, 06 PIN DIP	XU7 8	
92.	1	407-0008	SKT, 08 PIN DIP	XU13	
93.	4	407-0014	SKT, 14 PIN DIP	XU1 3 11 18	
94.	10	407-0016	SKT, 16 PIN DIP	XU2 4-6 10 12 17 19 20 26	
95.	3	407-0020	SKT, 20 PIN DIP	XU14-16	
96.	1	407-0024	SKT, 24 PIN DIP	XU23	
97.	2	407-0028	SKT, 28 PIN DIP	XU21 22	
98.	1	407-0052	SKT, 52 PIN QUAD	XU9	
99.	1	410-9143D	PCB, ZETRON		

NOT INSTALLED:
C48-55
J8
JP3 4 5
R3
RP3
U10 22 24 25

NOTES: Notes are for production use only.

REV	DESCRIPTION	ON	AP	DT
G	HCN 1764	DW	MH	8/93

RESTORE
REVERSE
PLAY
FORWARD
SAVE
PREVIOUS MARK
MARK
NEXT MARK

CENTRACOM II INTERFACE

NOTES:
UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 1/4 W, 5%.
2. ALL CAPACITORS ARE IN MICROFARADS.

LEGEND:
▲ POSITIVE OR NEGATIVE VOLTAGE
▽ DIGITAL GND
⊙ ANALOG GND
– CONNECTION ON SAME SHEET
* NOT INSTALLED

SPARE GATES

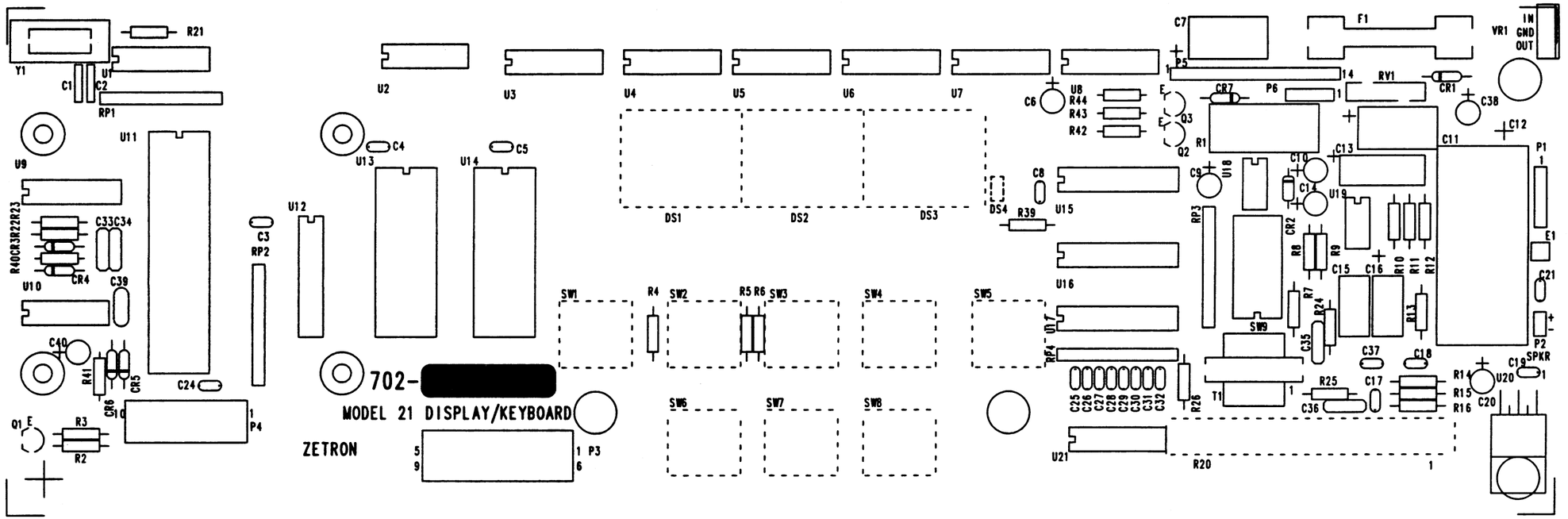
RECORDER
OUT
COMMON
TO SPEAKER
RETURN

ZETRON

SCALE
DATE 3/15/5
APPROVED BY
DRAWN BY
SHEET 1 OF 1
TITLE M21 - DISPLAY/KEYBOARD
DRAWING NO. 008-9142
G

MODEL 21 DISPLAY/KEYBOARD SILKSCREEN (702-9142G)

SILKSCREEN



MODEL 21 DISPLAY/KEYBOARD PARTS LIST (702-9142G)

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFG.PART NO.
1	1	101-0010	1 OHM 1/4W 5%	R13	
2.	1	101-0025	10	R15	
3.	1	101-0047	47	R12	
4.	4	101-0049	100	R22-25	
5.	4	101-0057	220	R4-6 14	
6.	3	101-0085	3.3K	R2 43 44	
7.	1	101-0089	4.7K	R40	
8.	1	101-0093	6.8K	R11	
9.	7	101-0097	10K	R3 7 9 10 21 26 42	
10.	1	101-0107	27K	R16	
11.	1	101-0113	47K	R8	
12.					
13.	1	101-0150	2.7M	R41	
14.	1	103-3050	5 OHM 5W	R1	
15.	1	105-0002	VARISTOR 14V	RV1	V22ZA3
16.	1	107-0001	100K SLIDE POT	R20	
17.	4	119-0006	10Kx9 R-SIP	RP1-4	
18.	2	150-0024	24 PF 1KV 10%	C1 2	
19.	4	150-0096	1000PF 1KV	C33-36	
20.	1	150-0110	.01UF 50V	C37	
21.	1	151-0020	.001 UF 50V TS	C21	
22.	1	151-0027	270 PF 50V TS	C19	
23.	14	151-0120	.01 UF 50V TS	C3-5 8 17 24-32	
24.	1	151-0180	.1 UF 50V TS	C18	
24.1	1	152-0012	.1 UF 50V	C39	
25.	1	152-0040	4.7 UF 50V N.P.	C15	
26.	2	154-0025	1 UF 35V TANT	C38 40	
27.	5	154-0100	10 UF 16V TANT	C6 9 10 14 20	
28.	1	155-0050	10 UF 25V ALUM	C13	
29.	1	155-0055	22 UF 25V ALUM	C16	
30.	2	155-0080	100 UF 25V ALUM	C7 11	
31.	1	155-0085	470 UF 100V ALUM	C12	
32.	2	220-0107	440X3/16 PAN PHLPS	XP3	
33.	2	250-0101	440x1/4 W/STUD	XP3	
33.5	2	250-0099	440X1/2 THREADED	XP3	
34.	1	305-0003	AUDIO XFMR 600 OHM	T1	42TM016
35.	1	305-0007	FERRITE BEAD	E1	
36.	3	311-0030	DUAL LED 7-SEG	DS1-3	
37.	2	314-4244	OCTAL BUS DRIVER	U16 17	74LS244
38.	1	314-4373	OCTAL LATCH TS	U12	74LS373
39.	1	314-4374	OCTAL D-FF REG.TS	U15	74LS374
40.	1	316-1458	DUAL OP AMP	U19	MC1458P1
41.	1	316-2003	8W AUDIO AMP	U20	LM2002T
42.	1	316-7660	VOLTAGE CONV.	U18	ICL7660CPA
43.	1	316-7805	REGULATOR +5V	VR1	LM340-5
44.	1	317-5406	DUAL RS-232 DRIVER	U9	MC145406
45.	1	321-6264	8Kx8 RAM	U14	HM6264LP-15
46.	1	321-6803	MICROPROCESSOR	U11	MC6803P

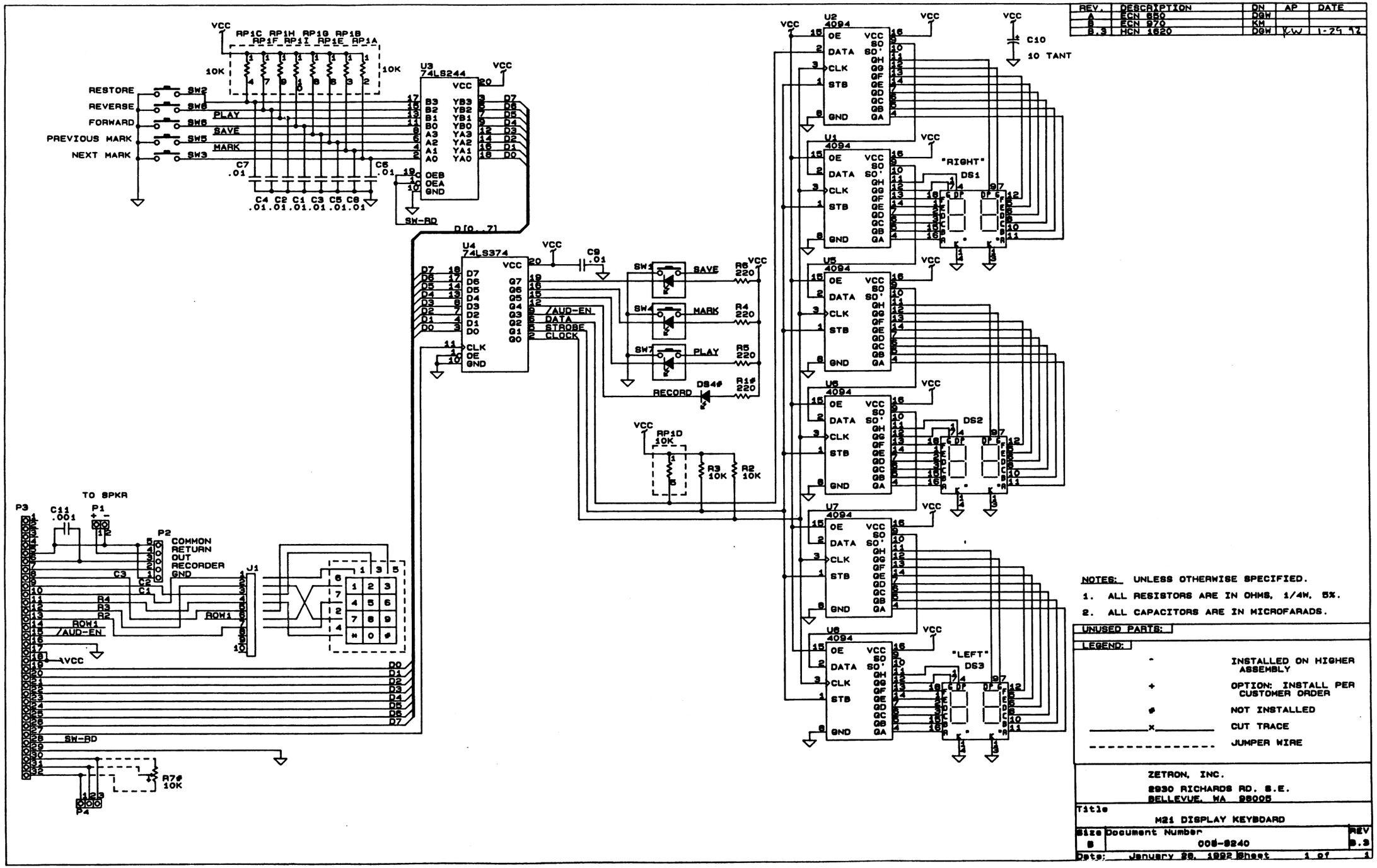
MODEL 21 DISPLAY/KEYBOARD PARTS LIST (702-9142G) cont'd

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFG.PART NO.
47.	6	323-4094	8 STAGE SER. REG.	U3-8	CD4094B
48.	1	323-4053	3PDT SWITCH	U21	MC144053
49.	1	324-4132	QUAD NAND SCHMIDT	U10	MCH74HC132
50.	1	326-4139	DUAL 2-4 LN DEC.	U1	74F139
51.	1	326-7432	QUAD OR	U2	74F32
52.	1	340-0014	NPN DARLINGTON	Q3	MPSA14
53.	2	340-3904	NPN 40V/200 MA	Q1 2	2N3904
54.	1	342-0001	SILICON 1A 100V	CR1	1N4002
55.	5	342-3009	SILICON	CR2 4-7	1N4148
56.	1	343-3029	1W 5.1V 5%	CR3	1N4733
57.	5	371-0003	SINGLE KEY-NO LT	SW2 4-6 8	
58.	3	371-0004	SINGLE KEY-RED LED	SW1 3 7	
59.	1	371-0010	DIP SW, 8 POS.	SW9	
60.	1	376-0245	2.4576 MHZ	Y1	
61.	1	401-0010	10-POS. THRU PCB	P4	
62.					
63.	1	401-0124	DB9	P3	
64.	1	401-0136	5 POS CONN. .1" CTR	P1	
65.	1	401-0160	5 POS HOOD	XP1	
65.1	1	403-0002	2 OF 401-0052	XP2 (SPEAKER LEADS)	
66.	1	403-0004	4 OF 401-0052	P6	
67.	1	406-1014	14 OF 401-0108	P5	
68.	2	407-0008	SKT, 8 PIN DIP	XU18 19	
69.	2	407-0014	SKT, 14 PIN DIP	XU2 10	
70.	9	407-0016	SKT, 16 PIN DIP	XU1 3-9 21	
71.	4	407-0020	SKT, 20 PIN DIP	XU12 15-17	
72.	2	407-0028	SKT, 28 PIN DIP	XU13,XU14	
73.	1	407-0040	SKT, 40 PIN DIP	XU11	
74.	8"	408-2200	22 GA, WIRE, BLK	XP1 (PINS 1 & 5)	
75.	4"	408-2201	22 GA, WIRE, WHT	XP1 (PIN 4)	
76.	8"	408-2202	22 GA, WIRE, GRN	XP1 (PINS 2 & 3)	
77.	1	410-9142D	PCB, ZETRON		
78.	1	416-1217	8K/32K SMART WATCH	XU14	
79.	1	416-1577	1 AMP S.B.	F1	
80.	2	416-3040	FUSE CLIP	XF1	

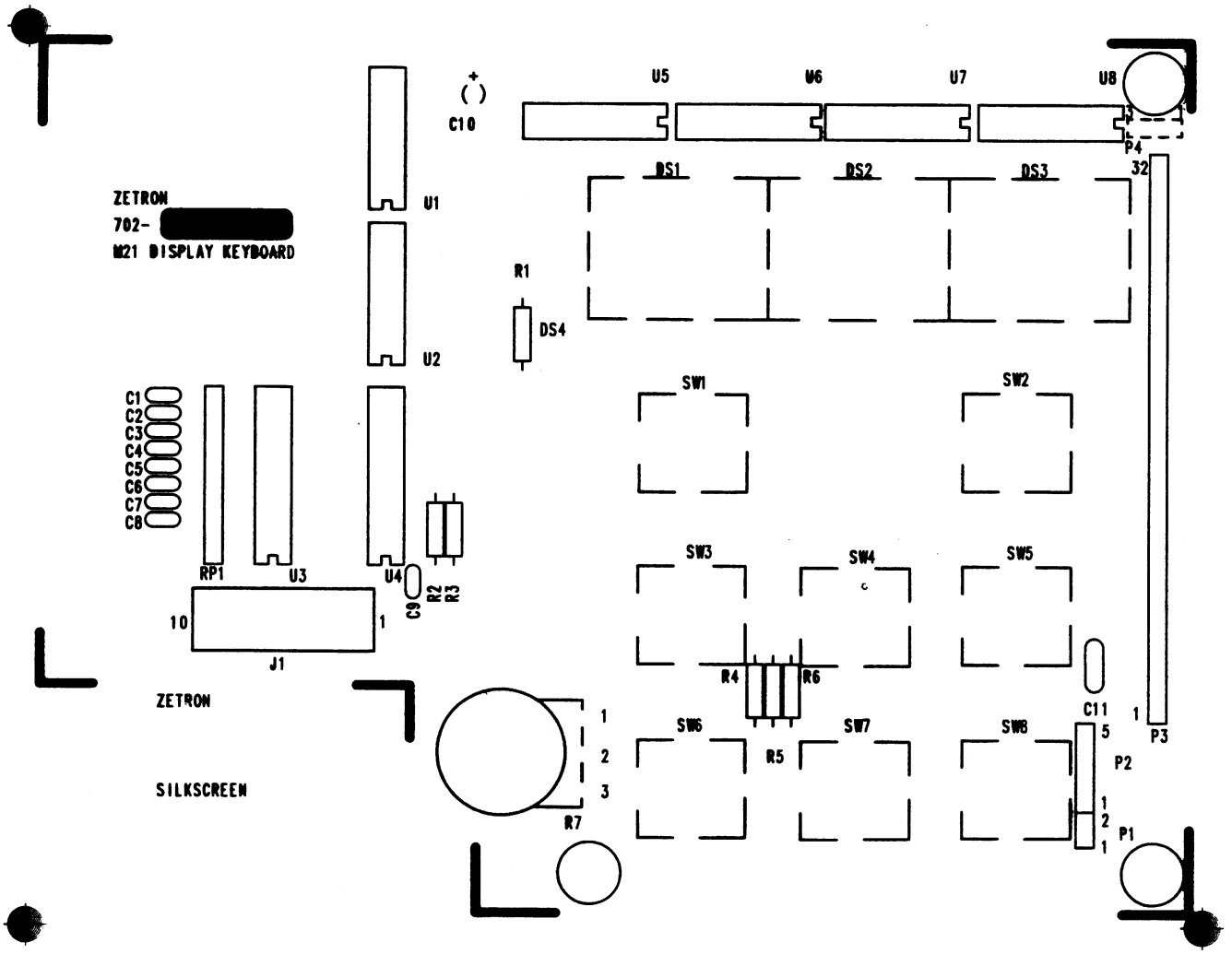
NOT INSTALLED:
DS4
P2
R39
U13

DESIGNATORS NOT USED:
R17-19 27-38
C22-23

MODEL 21 DISPLAY KEYBOARD SCHEMATIC (008-9240B.3)



MODEL 21 DISPLAY KEYBOARD SILKSCREEN (702-9240B.3)



MODEL 21 DISPLAY KEYBOARD PARTS LIST (702-9240B.3)

LEGEND:
= NOT INSTALLED
^ = INSTALLED ON HIGHER ASSEMBLY
+ = OPTION, INSTALL PER CUSTOMER ORDER

ITEM	QTY	COMPONENT REFERENCE	PART NO.	DESCRIPTION	MANUFACTURE P/N
1	3	R1#,R4,R5,R6	101-0057	220 OHM 1/4W 5% CARBON FILM	
2	2	R2,R3	101-0097	10K 1/4W 5% CARBON FILM	
3	0	R7#	107-0002	10K ROTORY POT	RK1631110-10 KB
4	1	RP1	119-0006	10K x 9 R-SIP	4610X-101-103
5	9	C1,C2,C3,C4,C5,C6,C7,C8, C9	151-0120	.01 UF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C103K
6	1	C11	152-0089	.001 UF 50V +-5% POLYESTER	ECQBIH102JZ
7	1	C10	154-0100	10 UF 16V TANTALUM	ECS-FICE106K
8	0	DS4#	311-0010	LED RED LAMP	HLMP3300
9	3	DS1,DS2,DS3	311-0030	DUAL LED 7-SEG AMBER	LN5240A/OK
10	1	U3	314-4244	OCTAL BUS DRIVER NON-INV TS	74LS244
11	1	U4	314-4374	OCTAL D-FF REG TS	74LS374
12	6	U1,U2,U5,U6,U7,U8	323-4094	8 STAGE SERIAL REG	CD4094B
13	5	SW2,SW3,SW5,SW6,SW8	371-0003	SINGLE KEY-NO LIGHT	JM2005#01
14	3	SW1,SW4,SW7	371-0004	SINGLE KEY-RED LED	JM2004#01
15	1	J1	401-0010	10-POS THRU PCB	22-14-2104
16	1	P1	405-0002	2 OF 401-0030	
17	1	P3	406-0032	32 OF 401-0108	
18	1	XP2	265-0001	TY-WRAP	
19	1	XP2 *NOTE 2	401-0136	5 POS CONNECTOR .1" CENTERS	
20	1	XP2	401-0160	CONNECTOR COVER	
21	6	XU1,XU2,XU5,XU6,XU7,XU8	407-0016	SKT, 16 PIN DIP	
22	2	XU3,XU4	407-0020	SKT, 20 PIN DIP	
23	12"	P4 *NOTE 3	408-0021	TELEPHONE WIRE (4 WIRES)	
24	20"	P2 *NOTE 1	408-2200	22 GA, WIRE, BLK	
25	10"	P2	408-2201	22 GA, WIRE, WHT	
26	20"	P2 *NOTE 1	408-2202	22 GA, WIRE, GRN	
27	1		410-9240B	PCB	

MODEL 21 CONTROLLER BOARD SCHEMATIC (008-9223D)

REV	DESCRIPTION	DN	APD	DATE
B	ECN 660	DGW		
C	ECN 980	KM		
D	HCN 1369	DGW		

NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5%.
2. ALL CAPACITORS ARE IN MICROFARADS.

UNUSED PARTS

LEGEND

- INSTALL ON HIGHER ASSY.
- # NOT INSTALLED
- + OPTION, INSTALLED PER CUSTOMER ORDER.
- X CUT TRACE
- JUMPER WIRE

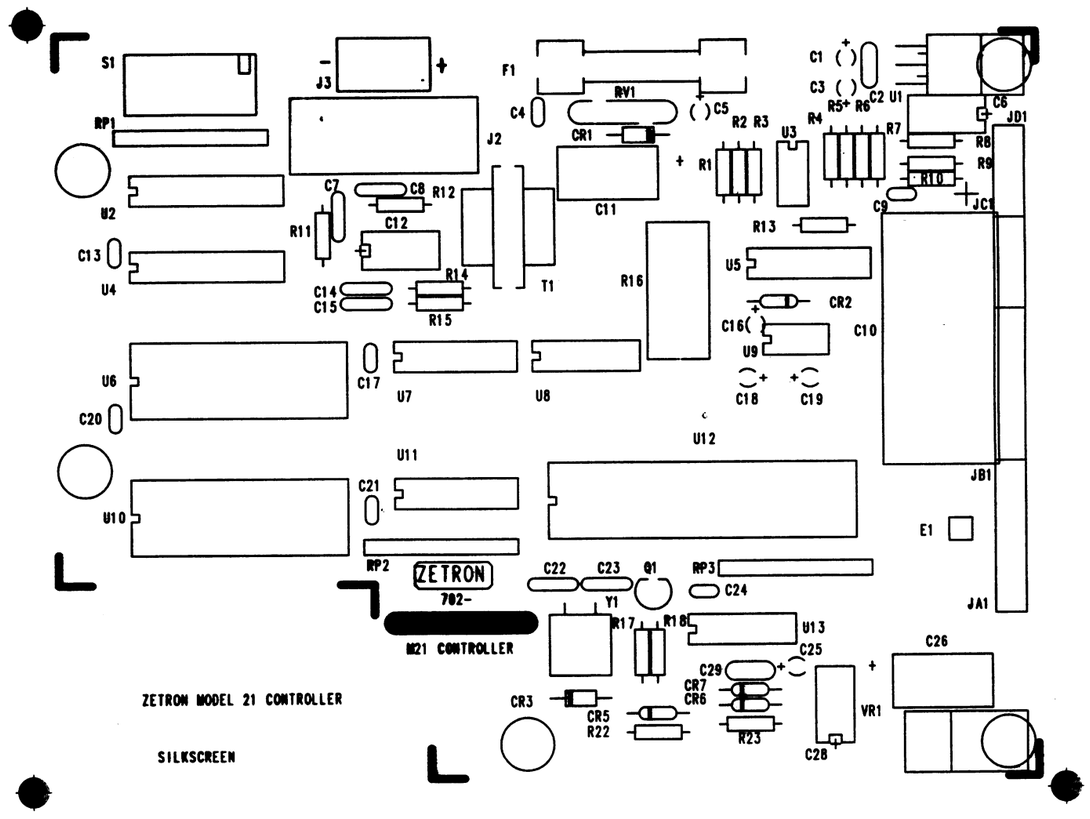
ZETRON, INC.
12335 134th COURT N.E.
REDMOND, WA 98052-2433

Title: M21 CONTROLLER

Size: B | Document Number: 008-9223 | REV: D

Date: March 15, 1991 | Sheet 1 of 1

MODEL 21 CONTROLLER BOARD SILKSCREEN (702-9223D.1)



MODEL 21 CONTROLLER PARTS LIST (702-9223D.1)

LEGEND:
= NOT INSTALLED
^ = INSTALLED ON HIGHER ASSEMBLY
+ = OPTION (INSTALL PER CUSTOMER ORDER).

Item	Quantity	Reference	Part	Description	Mfg.Part No.
1	1	R10	101-0010	1 OHM 1/4W 5% CARBON FILM	1/4-5%
2	1	R9	101-0025	10 OHM 1/4W 5% CARBON FILM	
3	1	R1	101-0047	47 OHM 1/4W 5% CARBON FILM	
4	4	R11,R12,R14,R15	101-0049	100 OHM 1/4W 5% CARBON FILM	
5	1	R8	101-0057	220 OHM 1/4W 5% CARBON FILM	
6	1	R7	101-0073	1K 1/4W 5% CARBON FILM	
7	1	R17	101-0085	3.3K 1/4W 5% CARBON FILM	
8	1	R22	101-0089	4.7K 1/4W 5% CARBON FILM	
9	1	R3	101-0093	6.8K 1/4W 5%	
10	5	R2,R4,R5,R13,R18	101-0097	10K 1/4W 5% CARBON FILM	
11	1	R6	101-0113	47K 1/4W 5% CARBON FILM	
12	1	R23	101-0150	2.7M 1/4W 5% CARBON FILM	
13	1	R16	103-3050	5 OHM 5W 5% CARBON FILM	PW PW5
14	1	RV1	105-0002	VARISTOR 14V AC	V22ZA3
15	3	RP1,RP2,RP3	119-0006	10K x 9 R-SIP	4610X-101-103
16	2	C22,C23	150-0024	24 PF 1KV +-10% CERAMIC DISC	GG-240K
17	4	C7,C8,C14,C15	150-0096	1000 PF 1KV +-20% CERAMIC DISC	GE-102G
18	0	C4#	151-0010	100 PF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C101K
19	5	C13,C17,C20,C21,C24	151-0120	.01 UF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C103K
20	1	C9	151-0180	.1 UF 50V +-10% CERAMIC, UNSTABLE	AVXSR205E104MAA
21	1	C29	152-0012	.1 UF 50V +-5% POLYESTER	ECQ-V1H104JZ
22	1	C12	152-0040	4.7 UF 50V NON-POLAR ELECTROLYTIC	EHN-4.7M50BA
23	1	C2	152-0085	.01 UF 50V +- 5% POLYESTER	ECQ-V1H103JZ
24	3	C1,C5,C25	154-0025	1 UF 35V TANTALUM	ECS-F-35E1
25	4	C3,C16,C18,C19	154-0100	10 UF 16V TANTALUM	ECS-FICE106K
26	1	C28	155-0050	10 UF 25V +50%-10% AXIAL ALUMINUM ELECTROLYTIC	ECE-B1EU100
27	1	C6	155-0055	22 UF 25V +50%-10% AXIAL ALUMINUM ELECTROLYTIC	TLBIE220M
28	2	C11,C26	155-0080	100 UF 25V +-5% AXIAL ALUMINUM ELECTROLYTIC	ECE-B1EV101S
29	1	C10	155-0085	470 UF 100V +-20% AXIAL ALUMINUM ELECTROLYTIC	ECE-B2AU471
30	1	T1	305-0003	AUDIO XFMR 600 OHM	42TM016
31	1	E1 *NOTE 1	305-0007	BEAD FERRITE PLZ	56-590-65-3
32	1	U2	314-4244	OCTAL BUS DRIVER NON-INV TS	74LS244
33	1	U4	314-4373	OCTAL LATCH TS	74LS373
34	1	U3	316-1458	DUAL OP-AMP	MC1458P1
35	1	U1	316-2003	8W AUDIO AMP HORIZ MOUNT	LM2002T
36	1	U9	316-7660	VOLTAGE CONVERTER	ICL7660CPA
37	1	VR1	316-7805	REGULATOR, +5V 1.5A	LM340T-5
38	1	U7	317-5406	DUAL RS-232 DRIVER	MC145406D
39	1	U10	321-6264	8K X 8 RAM 150NS (5NS write hold)	MB-8461A-10L
40	1	U12	321-6804	MICROPROCESSOR WITH RAM	6803U4CP
41	0	U6^	322-7128	16Kx8 250NS EPROM	27128TMS
42	1	U5	323-4053	3PDT SWITCH	MC144053
43	1	U13	324-4132	QUAD NAND SCHMIDT	MCH74HC132

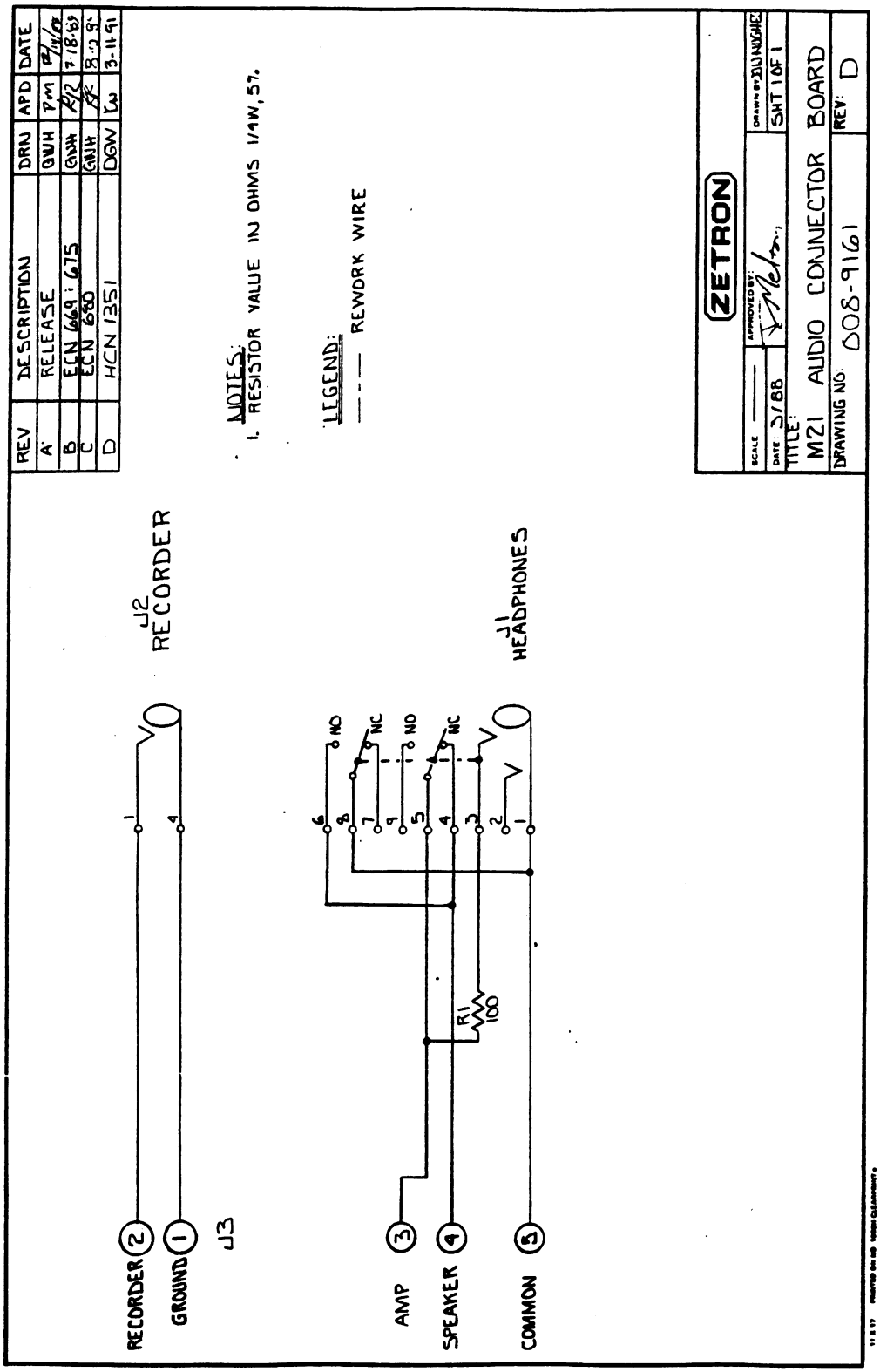
MODEL 21 CONTROLLER PARTS LIST (702-9223D.1) cont'd

Item	Quantity	Reference	Part	Description	Mfg.Part No.
44	1	U11	326-4139	DUAL 1 OF 4	74F139N
45	1	U8	326-7432	QUAD OR	MC74F32P
46	1	Q1	340-3904	NPN 40V/200MA	2N3904
47	1	CR1	342-0001	SILICON 1A 100V .50 SP	1N4002
48	4	CR2,CR5,CR6,CR7	342-3009	SILICON .50 SP	1N4148
49	1	CR3	343-3029	1W 5.1V +-5% .50 SP	1N4733A
50	1	S1	371-0010	DIP SW, 8 POS	CTS-206-008
51	1	Y1 *NOTE 1	376-0245	2.4576 MHz HC33/HC18 CASE	2.4576MHz-HC33
52	1	J3	401-0060	3-POS TERM BLK	2MV-03
53	1	J2	401-0124	DB 9 STR TEN PCB	DE-9S
54	2	JA1,JB1 *NOTE 2	407-0110	SKT, 10 PIN SIP	65780-046
55	2	JC1,JD1 *NOTE 2	407-0112	SKT, 6 PIN SIP	65780-042
56	1	F1	416-1577	FUSE 1A SLO-BLO	MDL 1
57	2	XJ2	210-0001	440 KEPT NUT	
58	2	XJ2	234-0010	440 STAR WSHR	
59	4	XJ2	250-0101	440x1/4 W/STUD	
60	2	XU3,XU9	407-0008	SKT, 8 PIN DIP	
61	2	XU8,XU13	407-0014	SKT, 14 PIN DIP	
62	3	XU5,XU7,XU11	407-0016	SKT, 16 PIN DIP	
63	2	XU2,XU4	407-0020	SKT, 20 PIN DIP	
64	2	XU6,XU10	407-0028	SKT, 28 PIN DIP	
65	1	XU12	407-0040	SKT, 40 PIN DIP	
66	1	PCB, M21 CONTROLLER	410-9223C	PCB	
67	1	XU10	416-1217	8K/32K SMART WATCH	
68	2	XF1	416-3040	FUSE CLIPS	

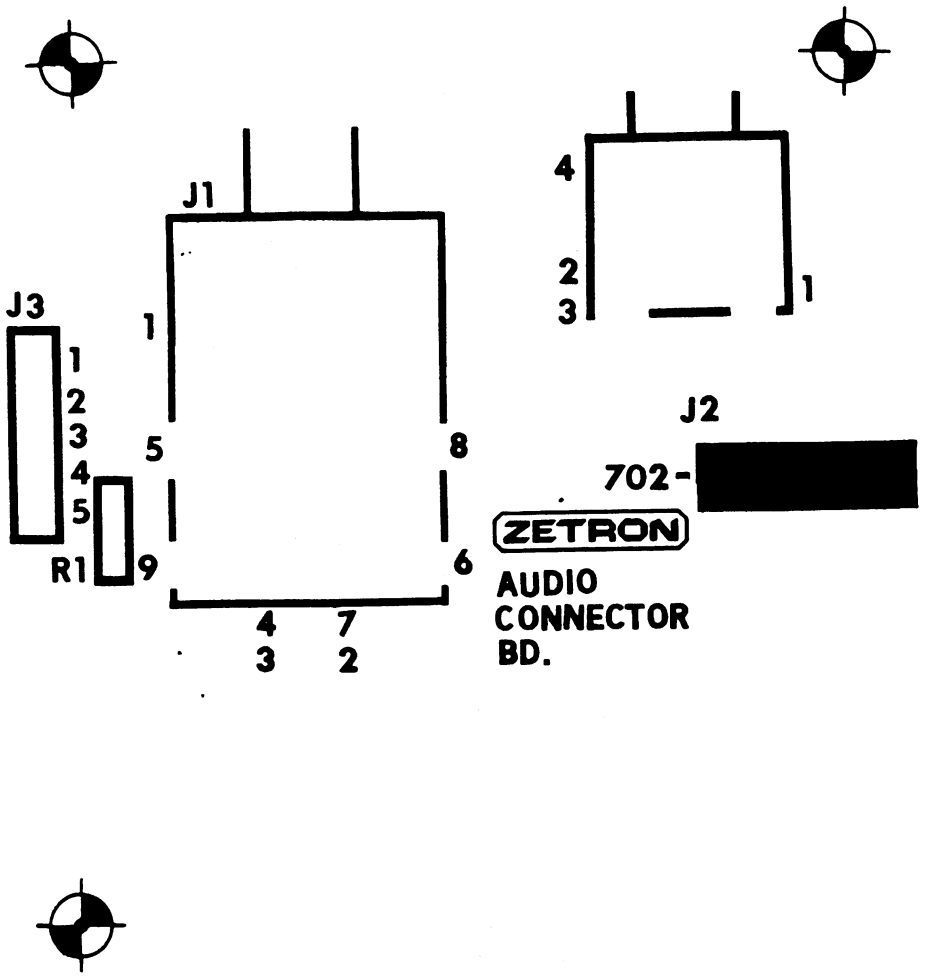
NOTES:
1. SECURE COMPONENT TO BOARD USING 22GA. WIRE OR EQUIV.
2. MOUNT ON SOLDER SIDE.

DESIGNATORS NOT USED:
C27
CR4
R19-21

AUDIO CONNECTOR BOARD SCHEMATIC (008-9161D)



AUDIO CONNECTOR BOARD SILKSCREEN (702-9161C)



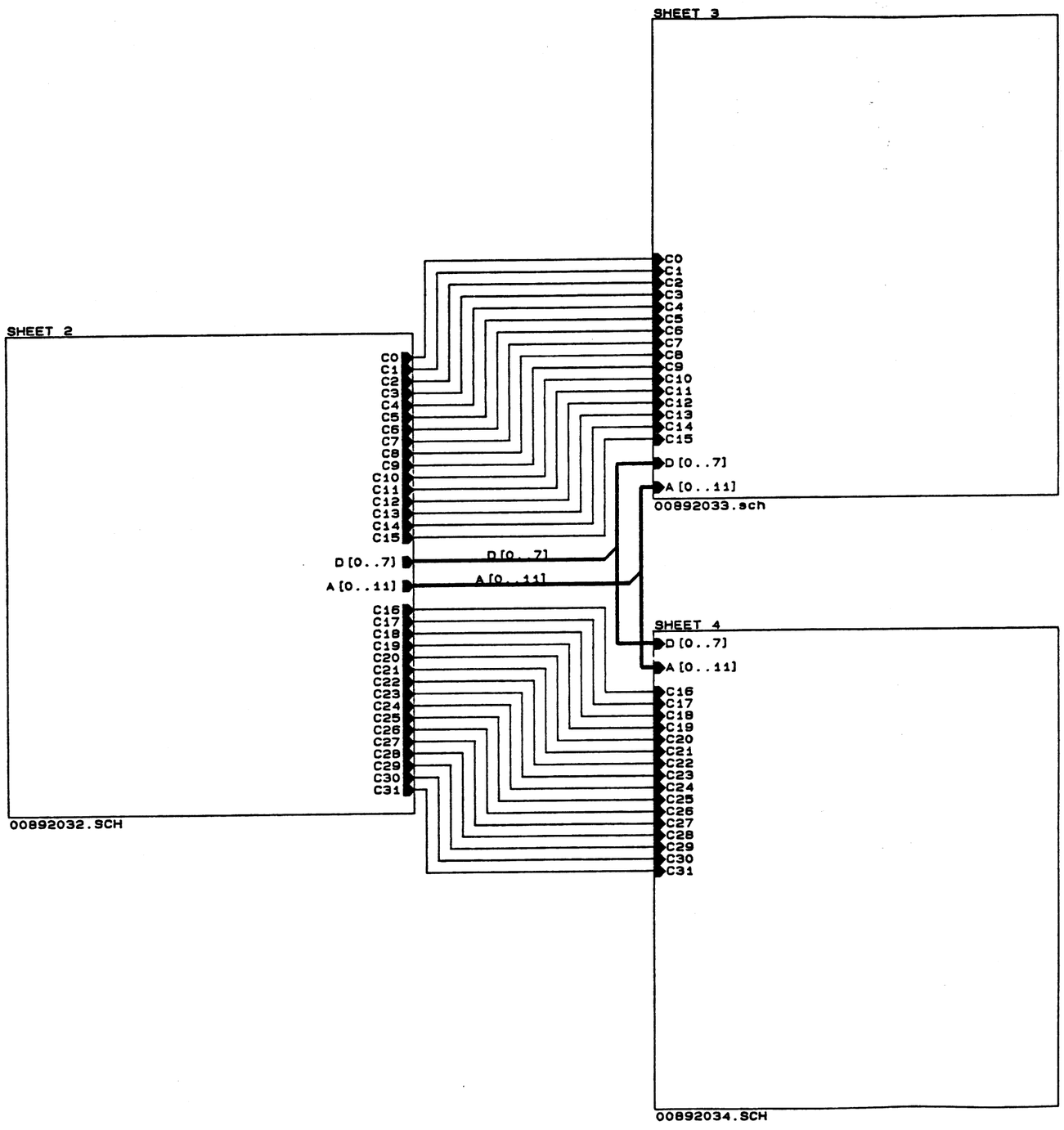
AUDIO CONNECTOR BOARD PARTS LIST (702-9161D)

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFG.PART NO.
1.	1	101-0049	100 OHM 1/4W 5%	R1	
2.	1	401-0034	3 CON STEREO JACK	J2	
3.	1	401-0127	HEADPHONE JACK	J1	
4.	5	401-1364	.025X.30 PIN	J3	
5.	1	410-9161B	PCB		

8-MINUTE MEMORY OPTION PARTS LIST (950-9133B)

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFR. PART #
1.	16	321-4257	256Kx4 DRAM	U5-12,U21-28	UPD4256V12
2.	1	702-9203	M21 8-MINUTE RAM BD.		

REV.	DESCRIPTION	DN	APVD	DATE
B	ECN 642	DGW		
B	ECN 789	GWH		
C	ECN 887	GWH		
D	ECN 1148	KM		
E	HCN 1328	DGW		
F	ECN 1574	GWH		
G	HCN 1868	DGW	[illegible]	[illegible] 11/1/92



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL CAPACITORS ARE IN MICROFARADS.
2. ALL RESISTORS ARE IN OHMS. 1/4W. 5%.

UNUSED PARTS:

LEGEND:

^	INSTALLED ON HIGHER ASSEMBLY
+	OPTION (INSTALL PER CUSTOMER ORDER)
#	NOT INSTALLED
____X____	CUT TRACE
- - - - - - - - - -	JUMPER WIRE

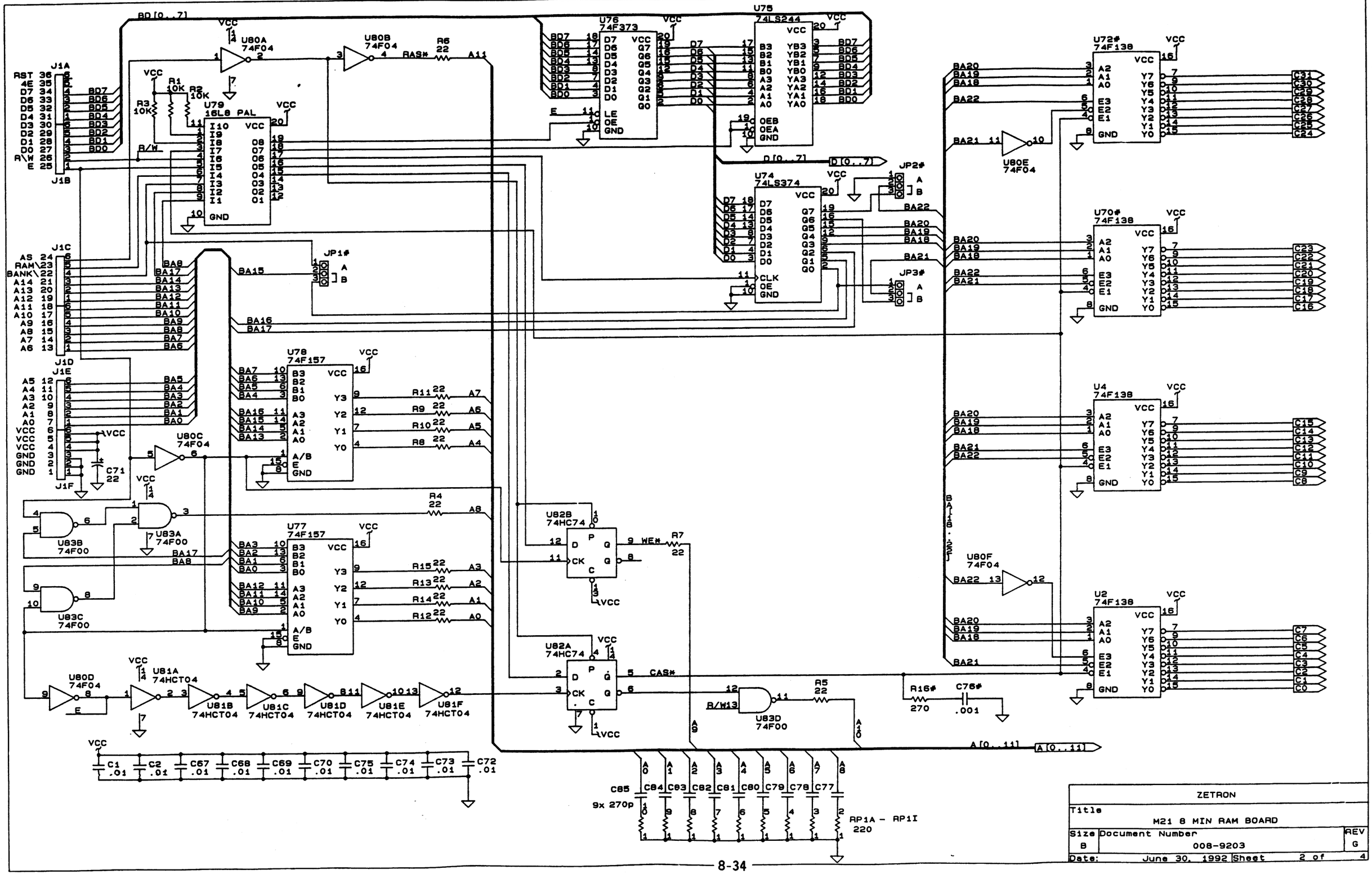
ZETRON, INC.

12335 134TH COURT N.E.
REDMOND, WASHINGTON, 98052-2433

Title: M21 8 MIN RAM BOARD

Size	Document Number	REV
B	008-9203	G

Date: May 20, 1992 Sheet 1 of 4

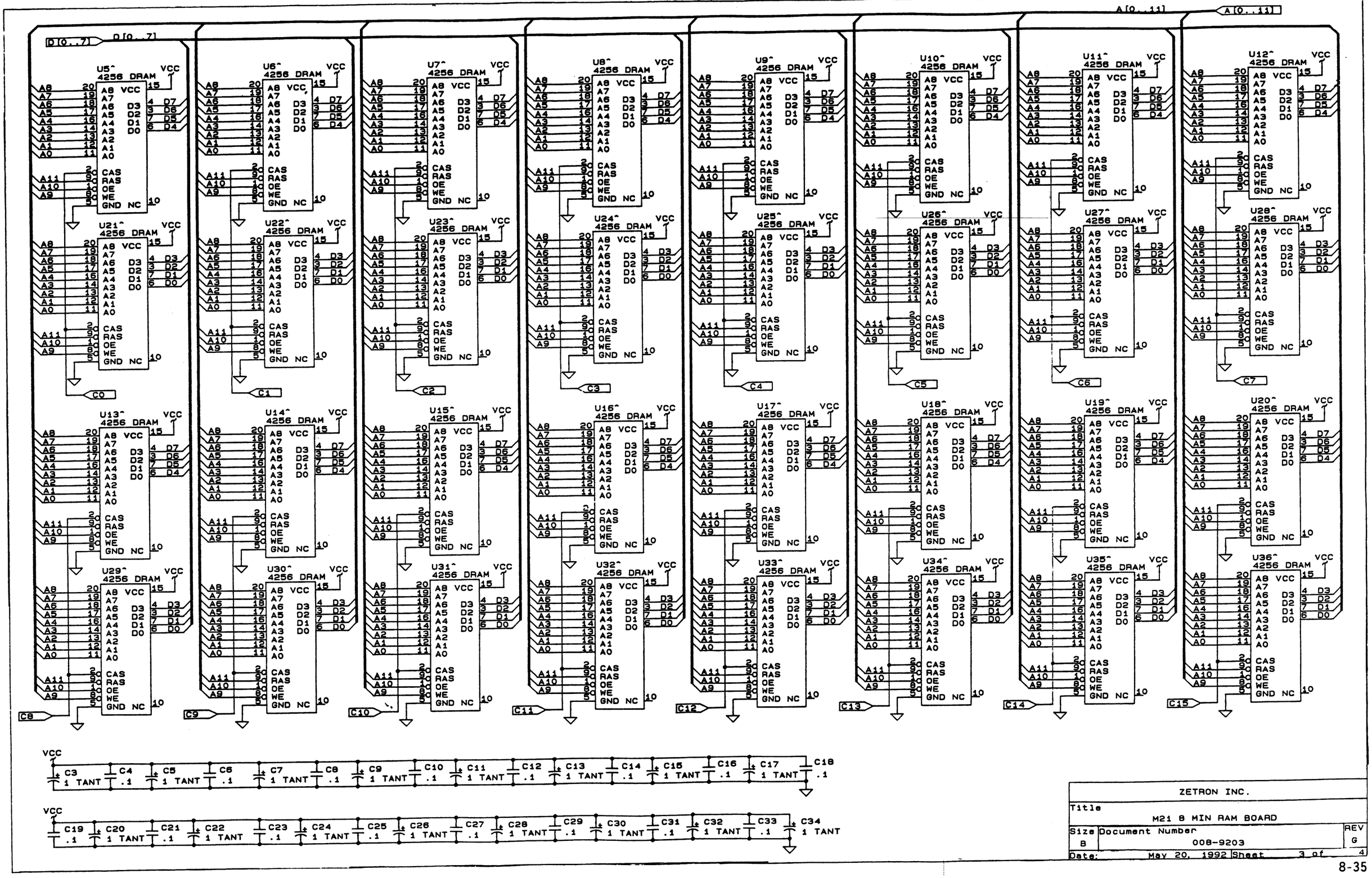


ZETRON

Title: M21 8 MIN RAM BOARD

Size	Document Number	REV
B	008-9203	G

Date: June 30, 1992 Sheet 2 of 4



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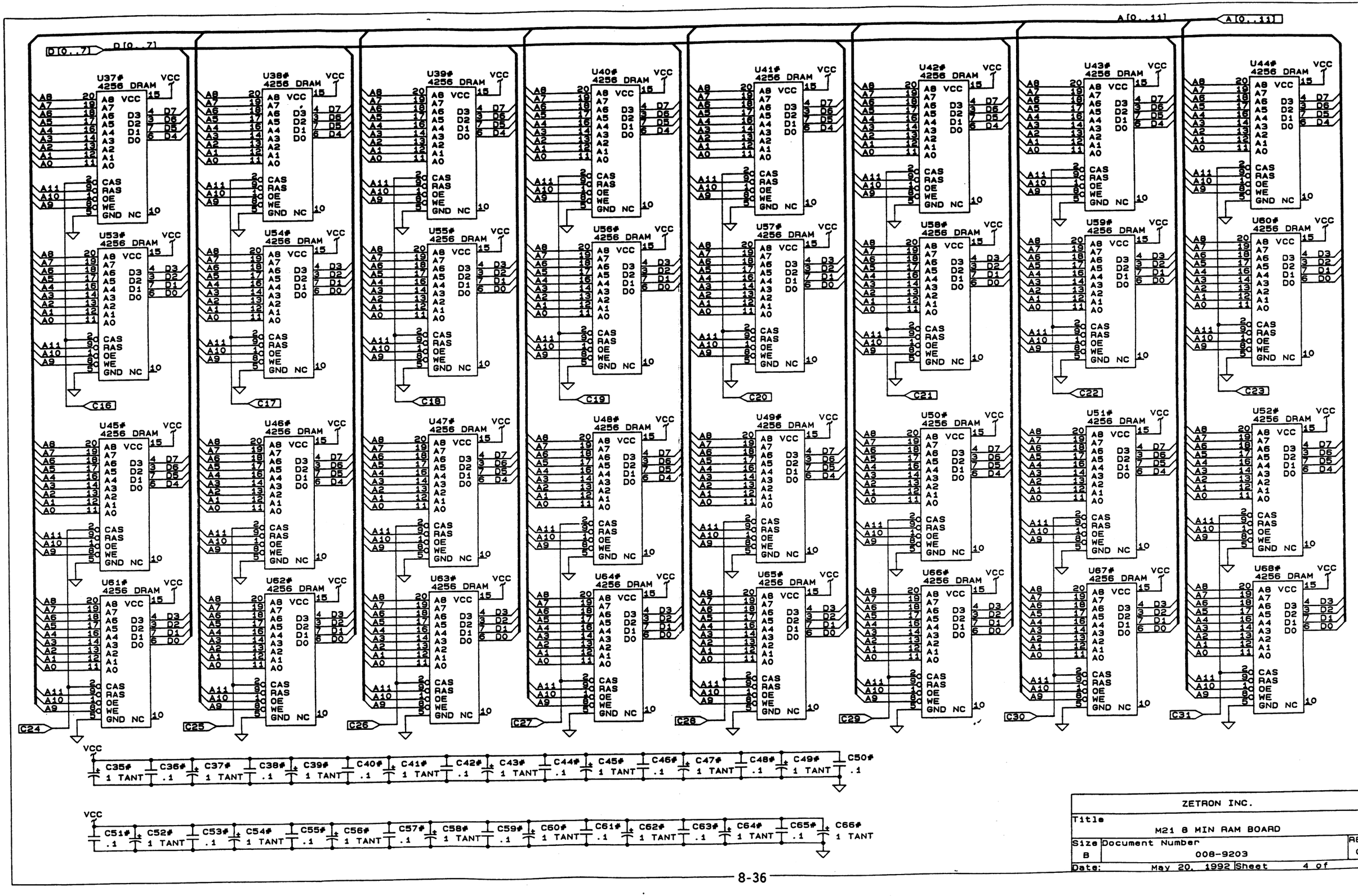
Size: B	Document Number: 008-9203	REV: G
Date: May 20, 1992	Sheet 3 of 4	



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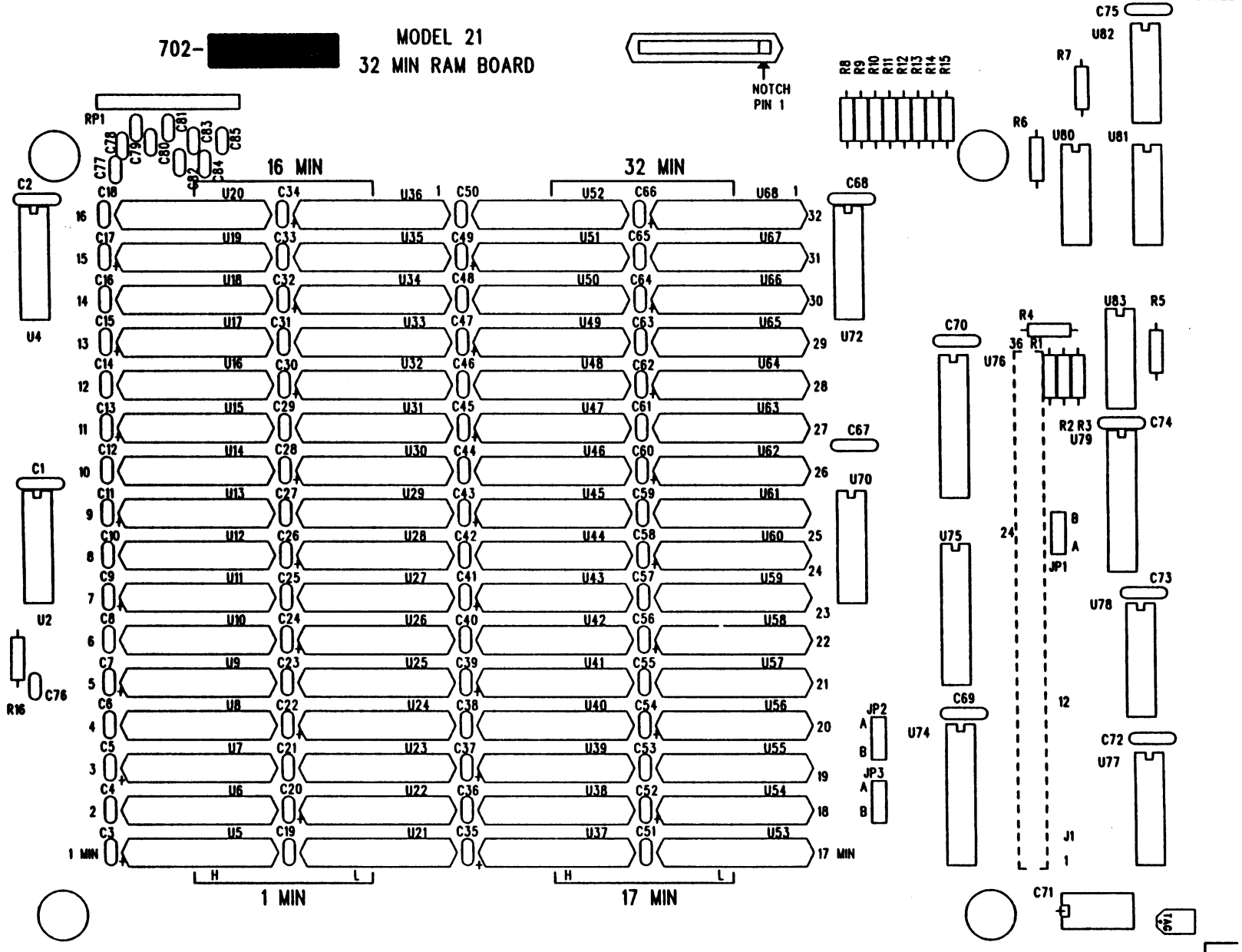
Size: B	Document Number: 008-9203	REV: G
Date: May 20, 1992	Sheet 4 of 4	


702-[redacted]
MODEL 21
32 MIN RAM BOARD
NOTCH
PIN 1
RP1
16 MIN
32 MIN
1 MIN
17 MIN
H
L
U4
U72
U2
U70
U76
U75
U74
U82
U80
U81
U83
U79
U78
U77
R16
R7
R6
R4
R5
R1
R2
R3
JP1
JP2
JP3
J1
C1
C2
C67
C68
C69
C70
C71
C72
C73
C74
C75
C76

8-MINUTE RAM BOARD PARTS LIST (702-9203G)

LEGEND:
+ = OPTION
# = NOT INSTALLED
^ = INSTALLED ON HIGHER ASSY

Item	Quantity	Reference	Part	Description	Mfg.Part No.
1	12	R4,R5,R6,R7,R8,R9,R10, R11,R12,R13,R14,R15	101-0033	22 OHM 1/4W 5% CARBON FILM	
2	0	R16#	101-0059	270 OHM 1/4W 5% CARBON FILM	
3	3	R1,R2,R3	101-0097	10K 1/4W 5% CARBON FILM	
4	1	RP1	119-0011	220 x 9 R-SIP	4610X-101-221
5	10	C1,C2,C67,C68,C69,C70, C72,C73,C74,C75	150-0110	.01 UF 50V 80%-20% CERAMIC DISC	DF-103Z
6	0	C76#	151-0020	.001 UF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C102K
7	9	C77,C78,C79,C80,C81,C82, C83,C84,C85	151-0027	270 PF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C271K
8	16	C4,C6,C8,C10,C12,C14,C16, C18,C19,C21,C23,C25,C27, C29,C31,C33,C36#,C38#, C40#,C42#,C44#,C46#,C48#, C50#,C51#,C53#,C55#,C57#, C59#,C61#,C63#,C65#	151-0180	.1 UF 50V +-10% CERAMIC, UNSTABLE	AVXSR205E104MAA
9	16	C3,C5,C7,C9,C11,C13,C15, C17,C20,C22,C24,C26,C28, C30,C32,C34,C35#,C37#, C39#,C41#,C43#,C45#,C47#, C49#,C52#,C54#,C56#,C58#, C60#,C62#,C64#,C66#	154-0025	1 UF 35V TANTALUM	ECS-F-35E1
10	1	C71	155-0055	22 UF 25V +50%-10% AXIAL ALUMINUM ELECTROLYTIC	TLBIE220M
11	1	U75	314-4244	OCTAL BUS DRIVER NON-INV TS	74LS244
12	1	U74	314-4374	OCTAL D-FF REG TS	74LS374
13	0	U5^,U6^,U7^,U8^,U9^,U10^, U11^,U12^,U13^,U14^,U15^, U16^,U17^,U18^,U19^,U20^, U21^,U22^,U23^,U24^,U25^, U26^,U27^,U28^,U29^,U30^, U31^,U32^,U33^,U34^,U35^, U36^,U37#,U38#,U39#,U40#, U41#,U42#,U43#,U44#,U45#, U46#,U47#,U48#,U49#,U50#, U51#,U52#,U53#,U54#,U55#, U56#,U57#,U58#,U59#,U60#, U61#,U62#,U63#,U64#,U65#, U66#,U67#,U68#	321-4257	256 X 4 DRAM ZIP	UPD4256V12
14	1	U79 *NOTE 1	322-1608	PAL 16L8	16L8LPC
15	1	U82	324-7474	DUAL D FLIP FLOP	74HC74
16	1	U81	325-7404	HEX INVERTER	74HCT04P
17	2	U2,U4,U70#,U72#	326-4138	1 OF 8 DECODER	MC74F138N

8-MINUTE RAM BOARD PARTS LIST (702-9203G) cont'd

Item	Quantity	Reference	Part	Description	Mfg.Part No.
18	2	U78,U77	326-4157	QUAD 2-INPUT MUX	MC74F157N
19	1	U76	326-4373	OCTAL TRANSPARENT LACTH	MC74F373N
20	1	U83	326-7400	QUAD NAND	74F00
21	1	U80	326-7404	HEX INVERTER	MC74F04N
22	0	JP1♯,JP2♯,JP3♯	403-0003	3 OF 401-0052	
23	6	J1F,J1E,J1D,J1C,J1B,J1A	407-0112	SKT, 6 PIN SIP	65780-042
24	4	XU80,XU81,XU82,XU83	407-0014	SKT, 14 PIN DIP	
25	4	XU2,XU4,XU77,XU78	407-0016	SKT, 16 PIN DIP	
26	32	XU5,XU6,XU7,XU8,XU9,XU10, XU11,XU12,XU13,XU14,XU15, XU16,XU17,XU18,XU19, XU20,XU21,XU22,XU23,XU24, XU25,XU26,XU27,XU28,XU29, XU30,XU31,XU32,XU33,XU34, XU35,XU36,	407-0019	SKT, 20 PIN SIP	
27	4	XU74,XU75,XU76,XU79	407-0020	SKT, 20 PIN DIP	
28	3	JP1,JP2,JP3 (POS B)	408-0001	WIRE JUMPER	
29	1	PCB	410-9144C	M21 32 MIN RAM BOARD	
30	1	XU79 *NOTE 1	601-0179	M21 RAM BD PAL CODE	

NOTES:
1. TO BE PROGRAMMED AND INSTALLED BY PRODUCTION TEST.

16-MINUTE MEMORY OPTION PARTS LIST (950-9134B)

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF.	MFR. PART #
1.	32	321-4257	256Kx4 DRAM	U5-U36	UPD4256V12
2.	1	702-9203	M21 8-MINUTE RAM BD.		

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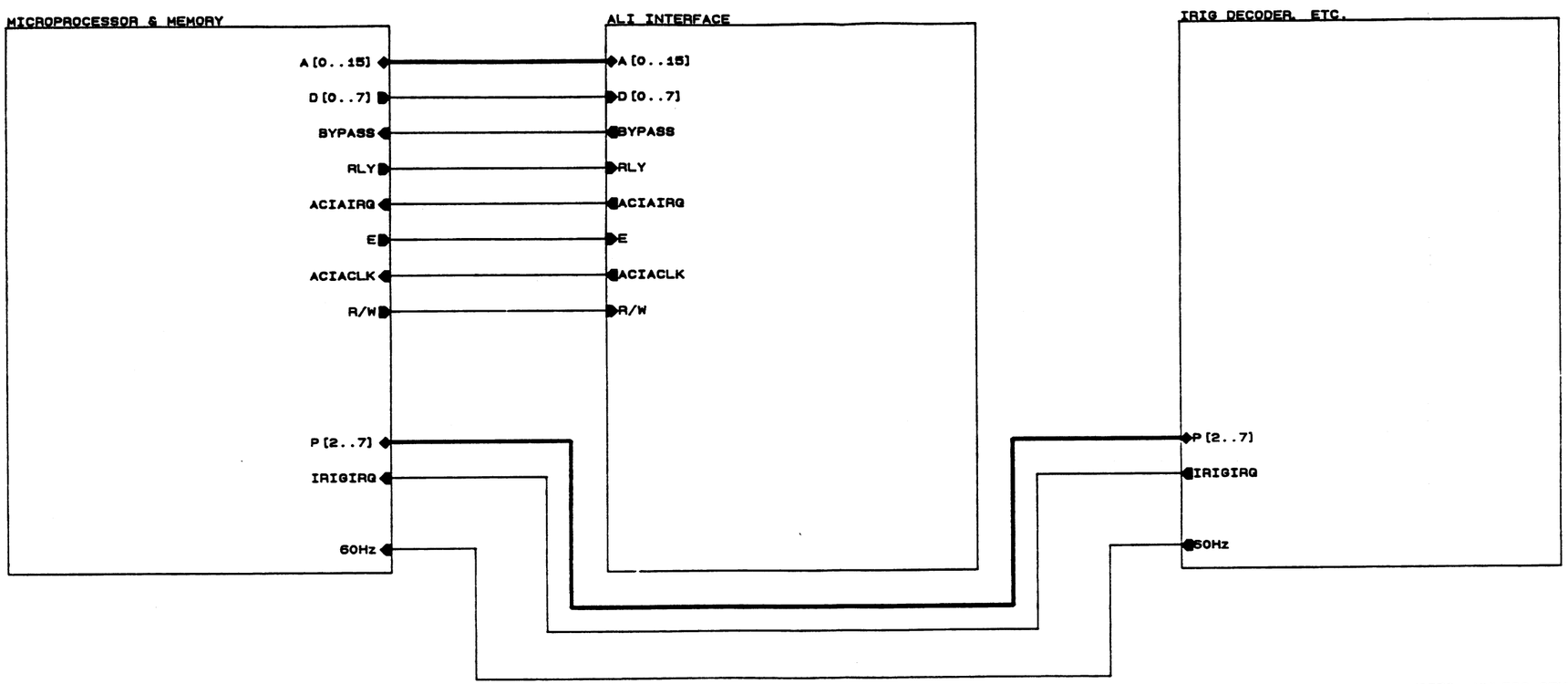
MODEL 21 ALI OPTION PARTS LIST (950-9131A)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	4	220-0108	440x5/8 FH PHILLIPS	
2.	1	322-7128	16Kx8 250NS EPROM	U12
3.	1	601-????	SOFTWARE	U12
4.	1	702-9145	ALI INTERFACE BD.	
5.	1	709-9114	M21 ALI PRIMARY CABLE	
6.	1	709-9115	M21 ALI SECONDARY CABLE	

MODEL 21 ALI/IRIG INTERFACE BOARD SCHEMATIC (008-9145C) Sheet 1 of 4

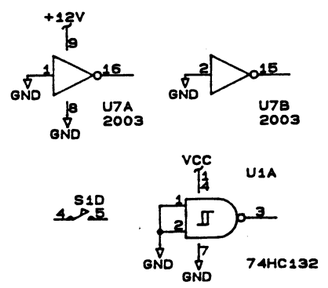
REV	DESCRIPTION	DN	APR	DATE
A	RELEASE			
B	ECN 659	KN		
C	HCN 1367	DGW	[illegible]	3-15-91



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL CAPACITORS ARE IN MICROFARADS.
2. ALL RESISTORS ARE IN OHMS, 1/4W, 5%.

SPARE PARTS



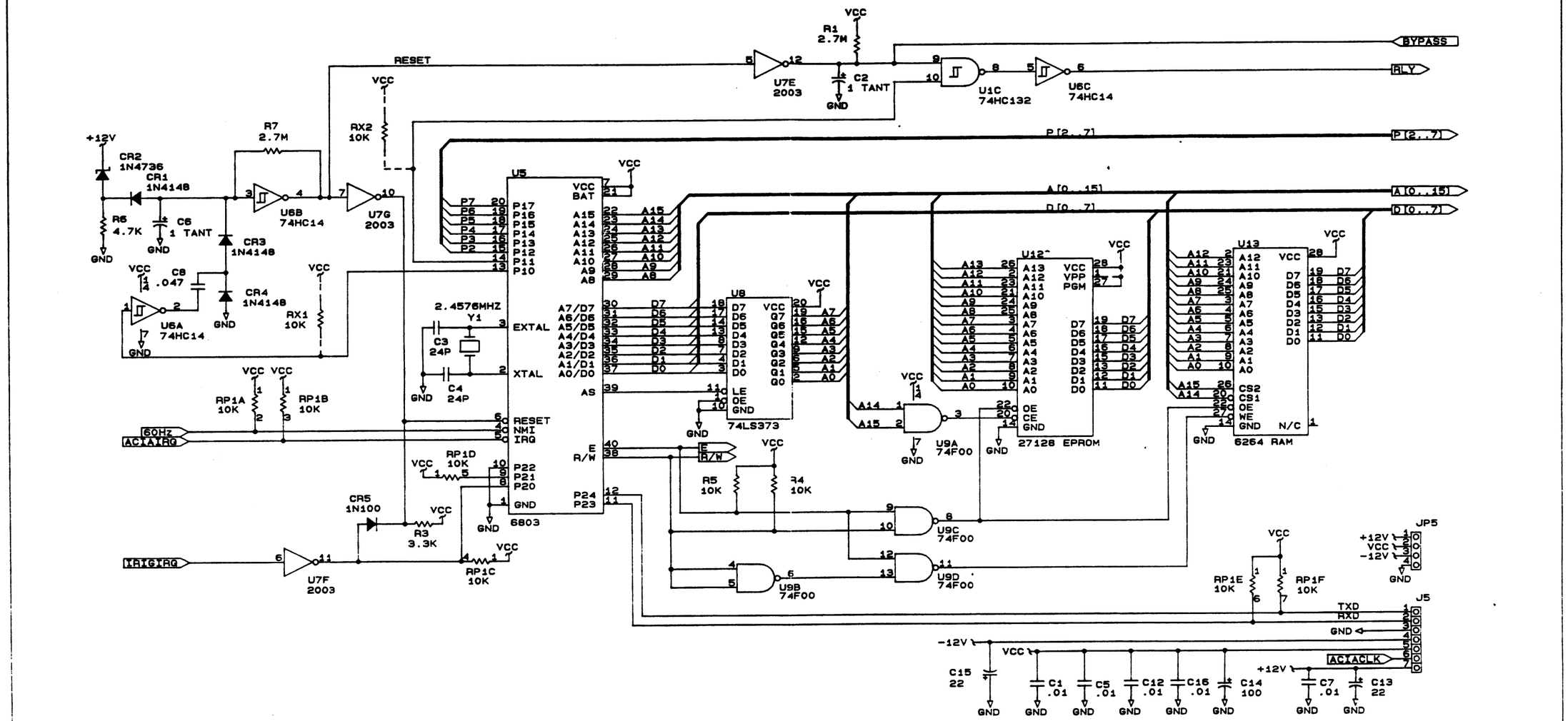
LEGEND

*	NOT INSTALLED
____X____	CUT TRACE
----------	JUMPER WIRE

ZETRON, INC.
12335 134TH COURT N.E.
REDMOND, WASHINGTON, 98052-2433

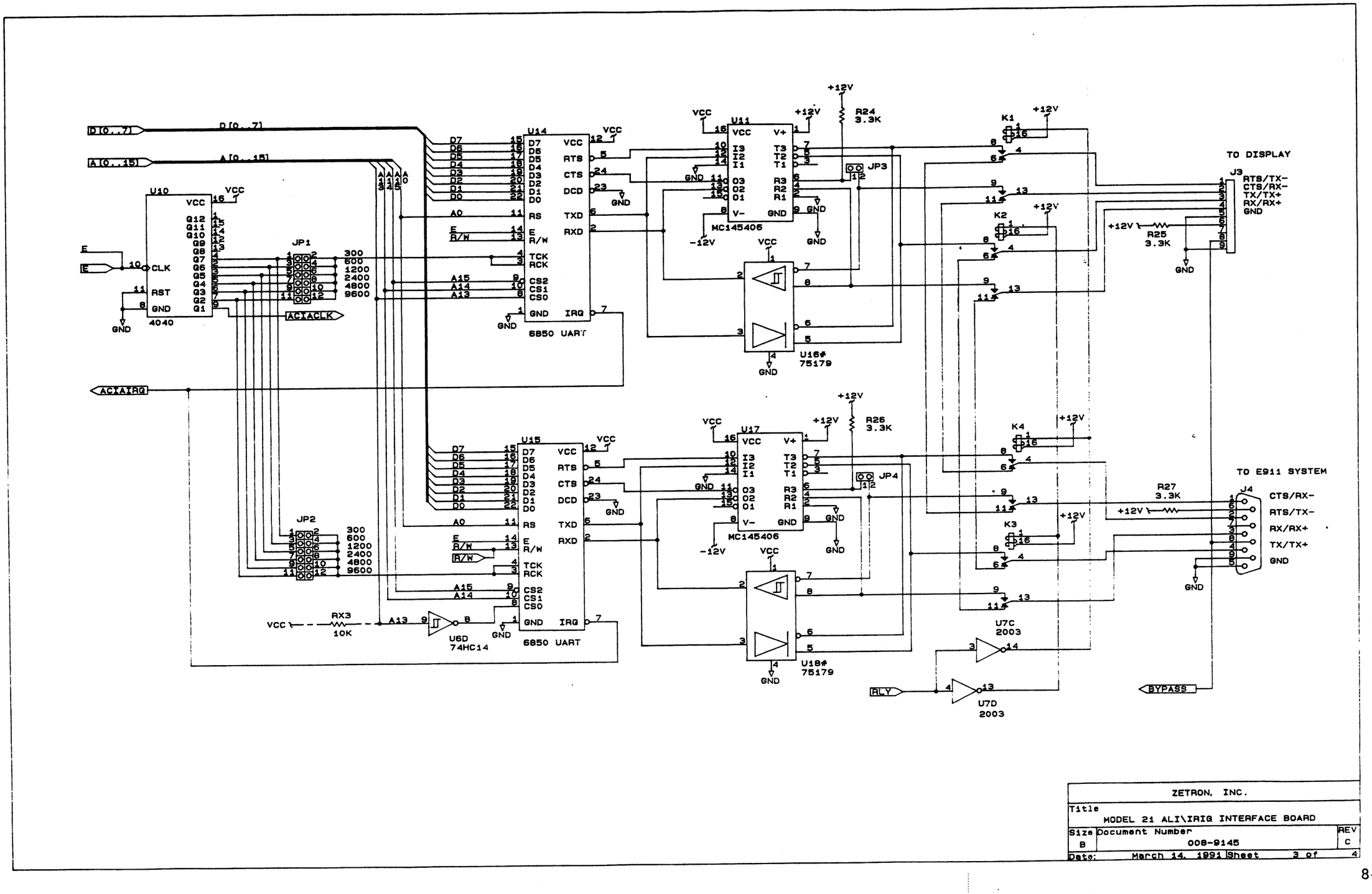
Title: MODEL 21 ALI\IRIG INTERFACE BOARD		
Size: B	Document Number: 008-9145	REV: C
Date: March 14, 1991	Sheet 1 of 4	

MODEL 21 ALI/IRIG INTERFACE BOARD SCHEMATIC (008-9145C) Sheet 2 of 4



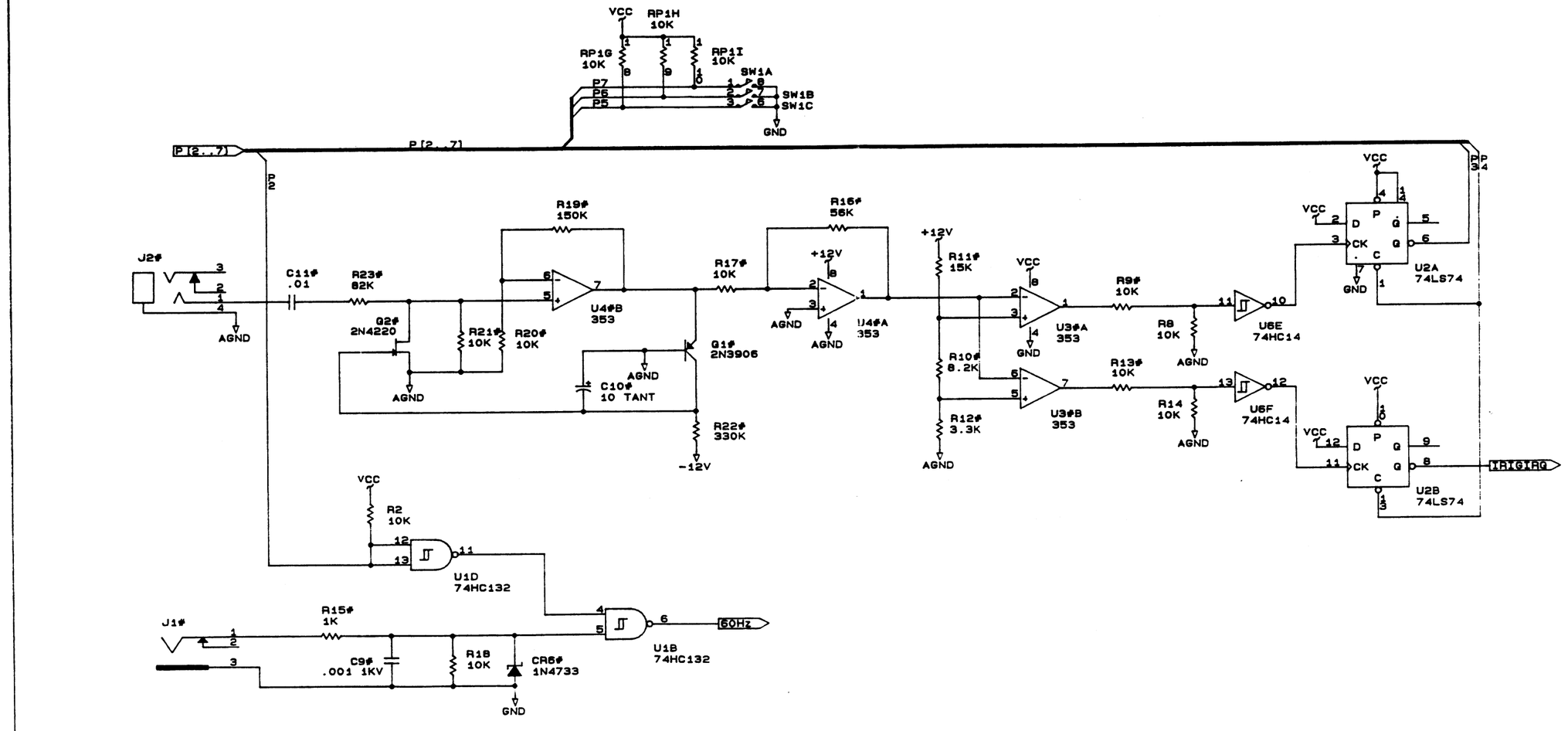
ZETRON, INC.		
Title: MODEL 21 ALI\IRIG INTERFACE BOARD		
Size: B	Document Number: 008-9145	REV: C
Date: March 14, 1991	Sheet 2 of 4	

MODEL 21 ALI/IRIG INTERFACE BOARD SCHEMATIC (008-9145C) Sheet 3 of 4



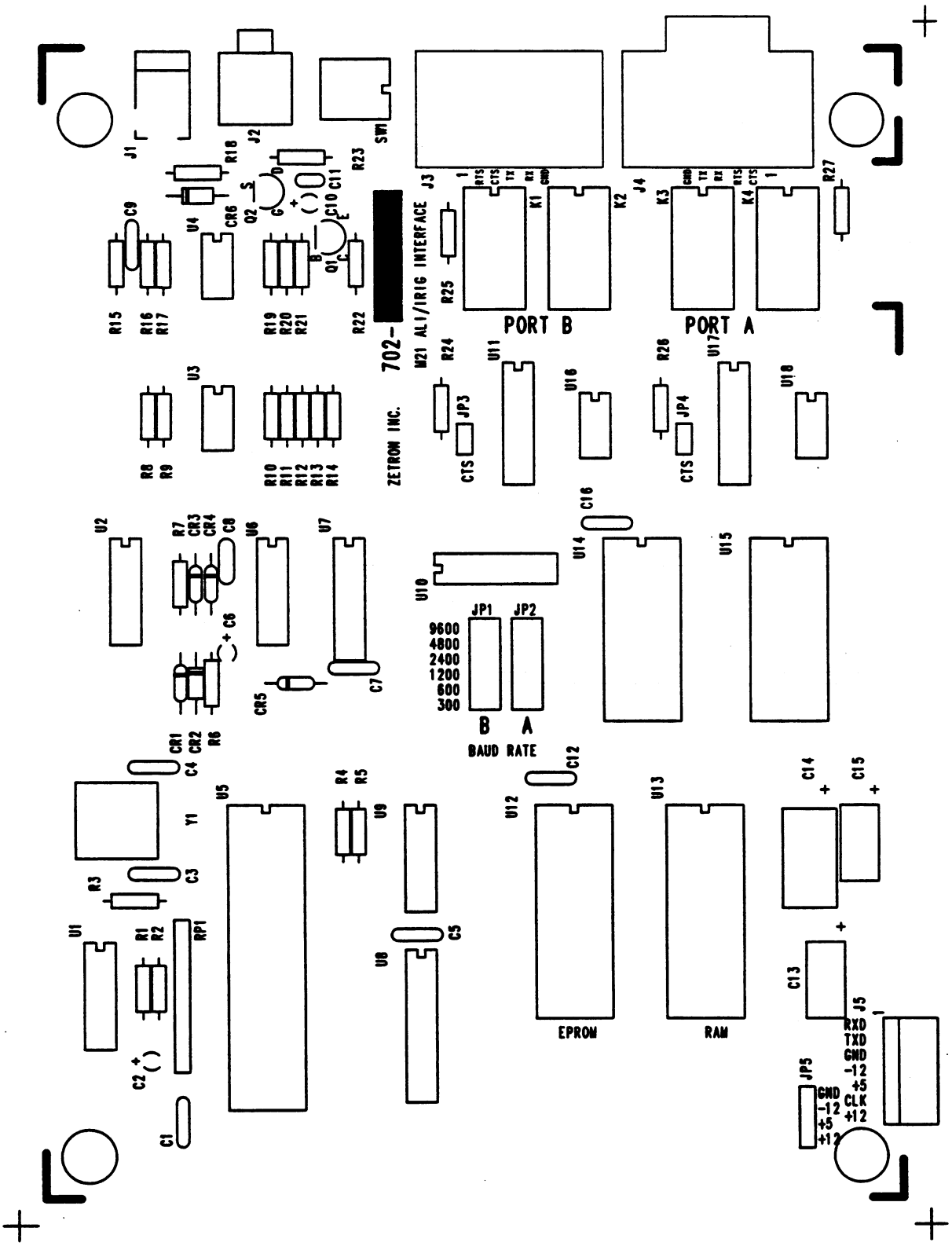
ZETRON, INC.		
Title: MODEL 21 ALI\IRIG INTERFACE BOARD		
Size: B	Document Number: 008-9145	REV: C
Date: March 14, 1991	Sheet: 3 of 4	

MODEL 21 ALI/IRIG INTERFACE BOARD SCHEMATIC (008-9145C) Sheet 4 of 4



ZETRON, INC.		
Title: MODEL 21 ALI\IRIG INTERFACE BOARD		
Size: B	Document Number: 008-9145	REV: C
Date: March 14, 1991	Sheet 4 of 4	

MODEL 21 ALI/IRIG INTERFACE BOARD SILKSCREEN (702-9145C)



MODEL 21 ALI/IRIG INTERFACE BOARD PARTS LIST (702-9145C)

Item	Quantity	Reference	Part	Description	Mfg.Part No.
1	0	R15♯	101-0073	1K 1/4W 5% CARBON FILM	
2	5	R3,R12♯,R24,R25,R26,R27	101-0085	3.3K 1/4W 5% CARBON FILM	
3	1	R6	101-0089	4.7K 1/4W 5% CARBON FILM	
4	0	R10♯	101-0095	8.2K 1/4W 5% CARBON FILM	
5	9	RX1,R2,RX2,RX3,R4,R5,R8, R9♯,R13♯,R14,R17♯,R18, R20♯,R21♯	101-0097	10K 1/4W 5% CARBON FILM	
6	0	R11♯	101-0101	15K 1/4W 5% CARBON FILM	
7	0	R16♯	101-0115	56K 1/4W 5% CARBON FILM	
8	0	R23♯	101-0119	82K 1/4W 5% CARBON FILM	
9	0	R19♯	101-0125	150K 1/4W 5% CARBON FILM	
10	0	R22♯	101-0133	330K 1/4W 5% CARBON FILM	
11	2	R1,R7	101-0150	2.7M 1/4W 5% CARBON FILM	
12	1	RP1	119-0006	10K x 9 R-SIP	4610X-101-103
13	2	C3,C4	150-0024	24 PF 1KV +-10% CERAMIC DISC	GG-240K
14	0	C9♯	150-0096	1000 PF 1KV +-20% CERAMIC DISC	GE-102G
15	5	C1,C5,C7,C12,C16	150-0110	.01 UF 50V 80%-20% CERAMIC DISC	DF-103Z
16	0	C11♯	151-0120	.01 UF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C103K
17	1	C8	152-0250	.047 UF 50V POLYESTER	ECQ-VIH473JZ
18	2	C2,C6	154-0025	1 UF 35V TANTALUM	ECS-F-35E1
19	0	C10♯	154-0100	10 UF 16V TANTALUM	ECS-FICE106K
20	2	C13,C15	155-0055	22 UF 25V +50%-10% AXIAL ALUMINUM ELECTROLYTIC	TLBIE220M
21	1	C14	155-0080	100 UF 25V +-5% AXIAL ALUMINUM ELECTROLYTIC	ECE-B1EV101S
22	1	U8	314-4373	OCTAL LATCH TS	74LS373
23	1	U2	314-7474	DUAL D FLIP FLOP	74LS74
24	0	U3♯,U4♯	316-0353	OP-AMP, DUAL BIFET	LF353
25	0	U16♯,U18♯	316-5179	DUAL DIFF DRIVER	SN75179B
26	2	U11,U17	317-5406	DUAL RS-232 DRIVER	MC145406D
27	1	U13	321-6264	8K X 8 RAM 150NS (5NS write hold)	MB-8461A-10L
28	1	U5	321-6803	MICROPROCESSOR	MC6803P
29	2	U14,U15	321-6850	ACIA	MC6850
30	0	U12^	322-7128	16Kx8 250NS EPROM	27128TMS
31	1	U10	323-4040	12-BIT BINARY CNTR	MC14040B
32	1	U1	324-4132	QUAD NAND SCHMIDT	MCH74HC132
33	1	U6	324-7414	HEX SCHMIDT	74HC14
34	1	U9	326-7400	QUAD NAND	SN74F00N
35	1	U7	340-2003	RELAY DRIVER 50V/.5A	ULN2003
36	0	Q2♯	340-3821	JFET N-CHAN Vp=-2.5V	MPF3821
37	0	Q1♯	340-3906	PNP 40V/200MA	2N3906
38	1	CR5	342-3008	DO NOT USE - GERMANIUM .50 SP	1N100
39	3	CR1,CR3,CR4	342-3009	SILICON .50 SP	1N4148
40	0	CR6♯	343-3029	1W 5.1V +-5% .50 SP	1N4733A
41	1	CR2	343-3031	1W 6.8V +-5% .50 SP	1N4736A
42	2	S1,SW1	371-0007	SW QUAD DIP	CTS-194-4S
43	1	Y1	376-0245	2.4576 MHz HC33/HC18 CASE	2.4576MHz-HC33
44	4	K1,K2,K3,K4	380-0030	DPDT 12V COIL MINI	DS2E-M-DC12V
45	0	J1♯	401-0013	DC POWER CONN F PCB MNT	16PJ032
46	1	J3	401-0021	DB9 S	DEP-9S-CA
47	1	J4	401-0022	CON DB9 RA	DBP-9PCA
48	0	J2♯	401-0034	3 CON STEREO JACK	16PJ108

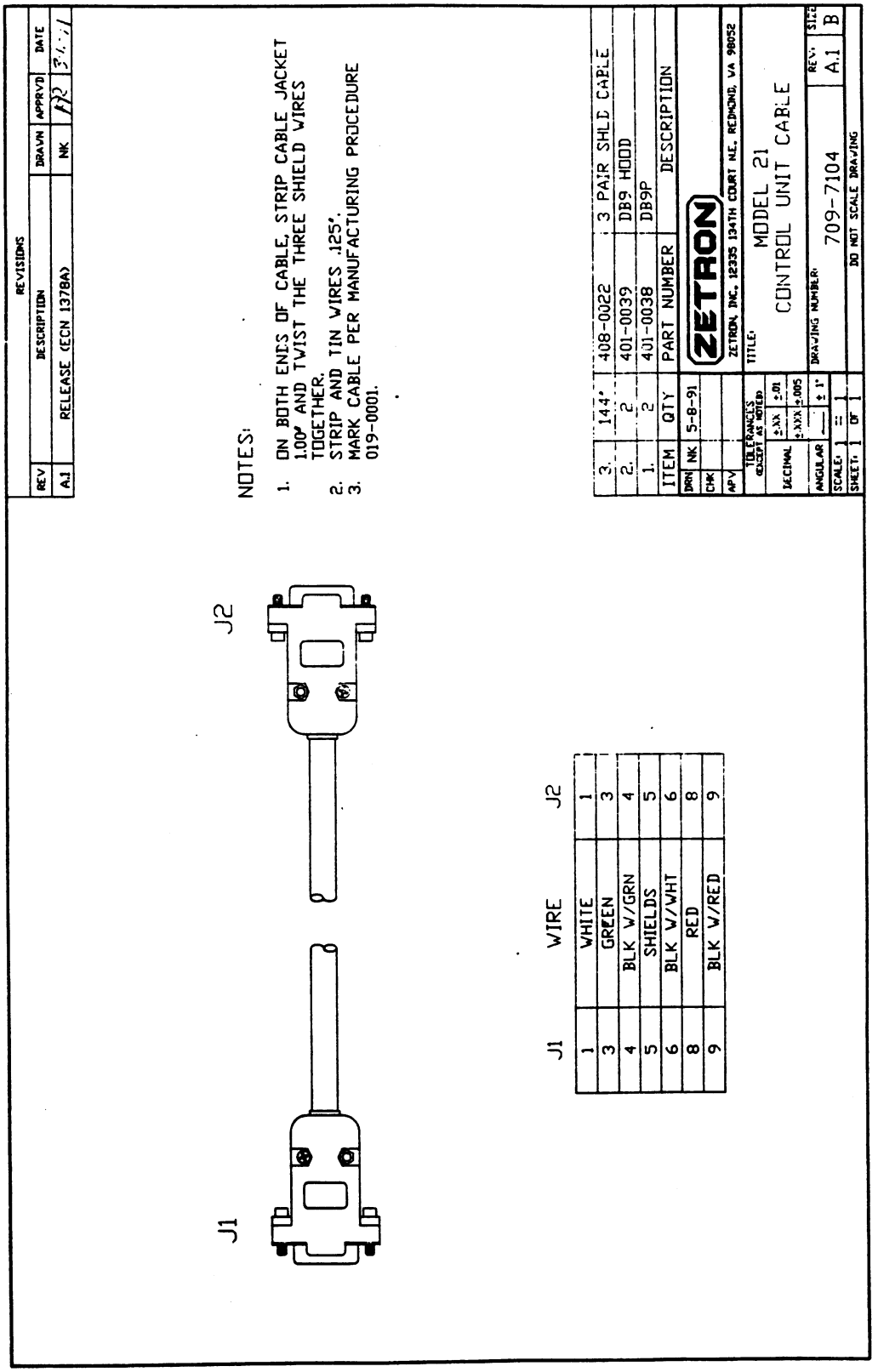
MODEL 21 ALI/IRIG INTERFACE BOARD PARTS LIST (702-9145C) cont'd

Item	Quantity	Reference	Part	Description	Mfg.Part No.
49	2	JP3,JP4	403-0002	2 OF 401-0052	
50	1	JP5	403-0004	4 OF 401-0052	
51	2	JP1,JP2	403-0206	12 OF 401-0052 (2X6)	
52	1	J5	405-0007	7 OF 401-0030	
53	4	XJ3,XJ4	210-0001	440 KEPT NUT	
54	4	XJ3,XJ4	220-0108	440x1/4" PAN PHIL	
55	2	XJ3,XJ4	401-0042	DB LOCK SCREWS	
56	4	XJ1,XJ2,XJ3,XJ4	402-3040	MINI JUMPER	
			J1,J2 - 1200		
57	4	XU3,XU4,XU16,XU18	407-0008	SKT, 08 PIN DIP	
58	4	XU1,XU2,XU6,XU9	407-0014	SKT, 14 PIN DIP	
59	4	XU7,XU10,XU11,XU17	407-0016	SKT, 16 PIN DIP	
60	1	XU8	407-0020	SKT, 20 PIN DIP	
61	2	XU14,XU15	407-0024	SKT, 24 PIN DIP	
62	2	XU12,XU13	407-0028	SKT, 28 PIN DIP	
63	1	XU5	407-0040	SKT, 40 PIN DIP	
64	1	PCB	410-9145B	PCB, M21 ALI/IRIG INTERFACE	

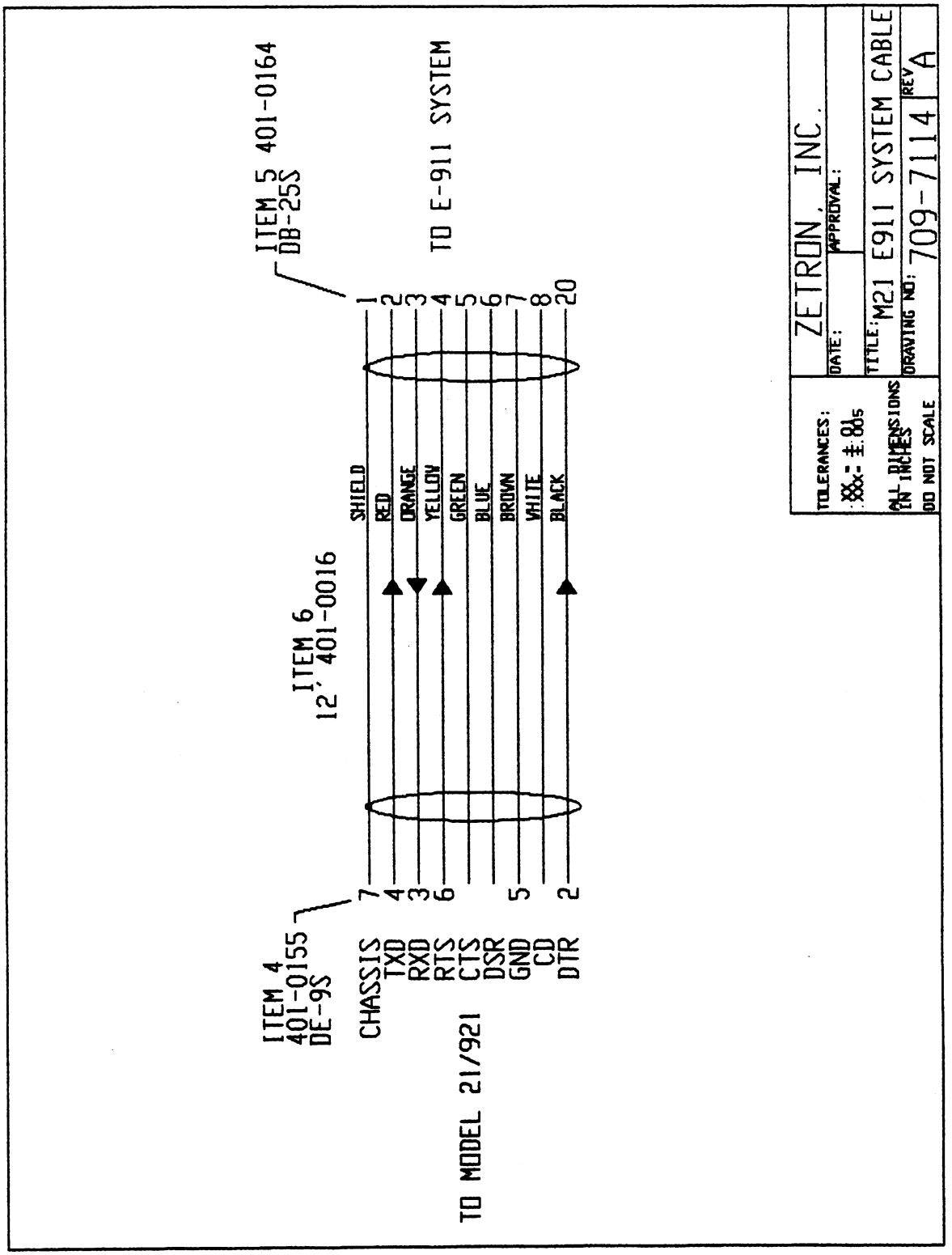
NOTES:

1. INSTALL RX1 BETWEEN U5.7 AND U5.13
2. INSTALL RX2 BETWEEN U5.14 AND U5.21
3. INSTALL RX2 BETWEEN U6.9 AND U6.14

MODEL 21 CONTROL UNIT CABLE DRAWING (709-7104A.1)



MODEL 21 E911 SYSTEM CABLE DRAWING (709-7114A)

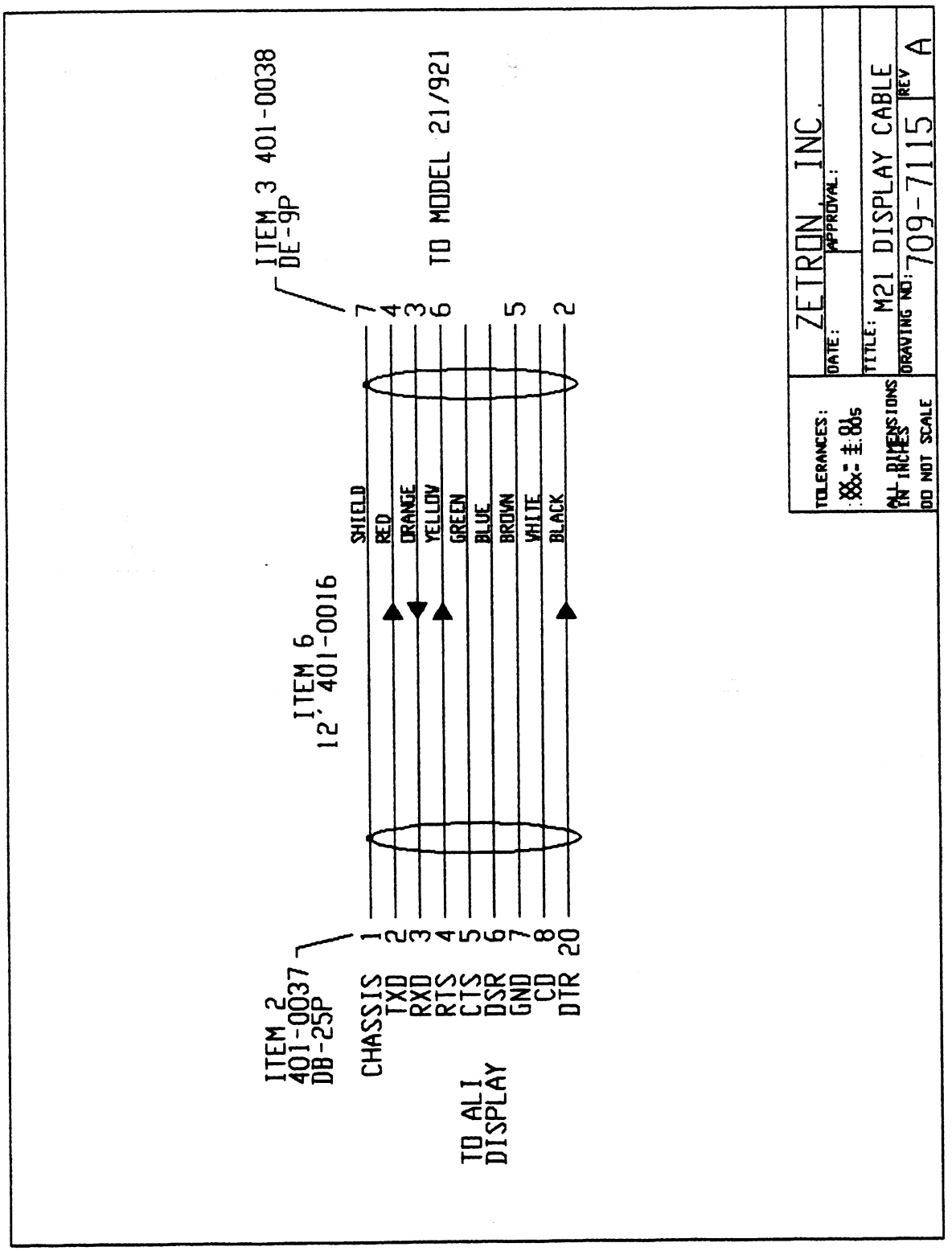


MODEL 21 E911 SYSTEM CABLE PARTS LIST (709-7114A)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	1	265-0002	TY-WRAP W/LABEL	NOTE 1
2.	1	401-0039	9 PIN HOOD	
3.	1	401-0040	25 PIN HOOD	
4.	1	401-0155	CON 9PD FEMALE	
5.	1	401-0164	DB-25S	
6	6'	408-0004	3-COND.	

NOTES:
1. MARK WITH PART NUMBER AND REVISION.

MODEL 21 ALI DISPLAY CABLE DRAWING (709-7115A)

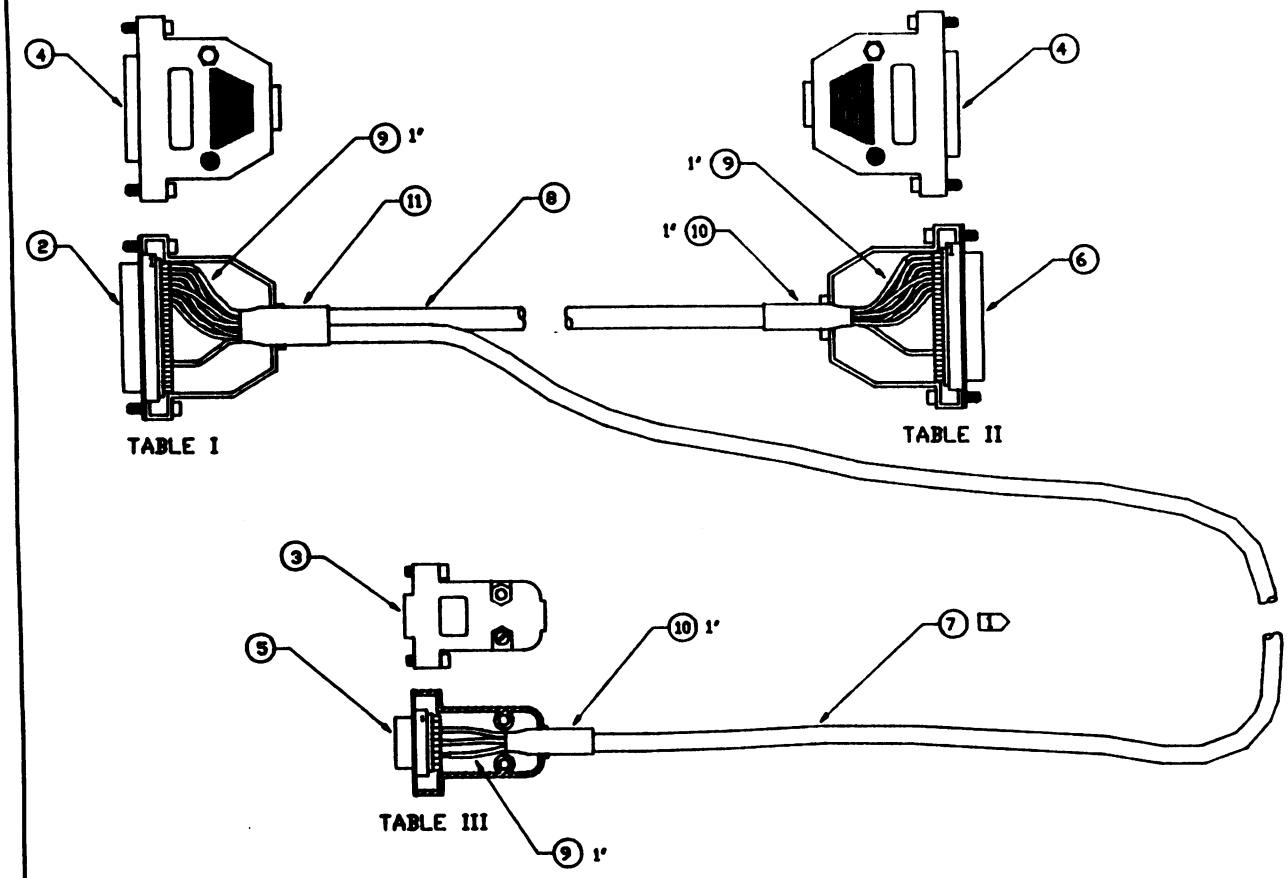


MODEL 21 ALI DISPLAY CABLE PARTS LIST (709-7115A)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	1	265-0002	TY-WRAP W/LABEL	NOTE 1
2.	1	401-0037	25 PIN DB	
3.	1	401-0038	9 PIN DB	
4.	1	401-0039	9 PIN HOOD	
5.	1	401-0040	25 PIN HOOD	
6.	6′	408-0004	3-COND.	

NOTES
1. MARK WITH PART NUMBER AND REVISION.

REVISIONS				
REV	DESCRIPTION	DRAWN	APPRVD	DATE
A.1	REDLINE	AH		



NOTES:

1. CUT RED WIRE OF 3 COND CABLE FLUSH WITH OUTER JACKET ON BOTH ENDS.
2. INSTALL 1' CLEAR INSUL. TUBING ON SHIELD WIRES.
3. MARK PER MANUFACTURING PROCEDURES 019-0001.

TABLE I

	PIN	8 COND COLOR	3 COND COLOR	SIGNAL
2	1	SHIELD	SHIELD	CHASSIS
	2	RED	N/C	TXD
	3	ORANGE	WHITE	RXD
	4	YELLOW	N/C	RTS
	5	GREEN	N/C	CTS
	6	BLUE	N/C	DSR
	7	BROWN	BLACK	GND
	8	WHITE	N/C	CD
	9-19	N/C	N/C	
	20	BLACK	N/C	DTR
	21-25	N/C	N/C	

TABLE II

	PIN	COLOR	SIGNAL
2	1	SHIELD	CHASSIS
	2	RED	TXD
	3	ORANGE	RXD
	4	YELLOW	RTS
	5	GREEN	CTS
	6	BLUE	DSR
	7	BROWN	GND
	8	WHITE	CD
	9-19	N/C	
	20	BLACK	DTR
	21-25	N/C	

TABLE III

	PIN	COLOR	SIGNAL
	1	N/C	
	2	N/C	
	3	WHITE	RXD
	4	N/C	
	5	BLACK	GND
	6	N/C	
2	7	SHIELD	CHASSIS
	8	N/C	
	9	N/C	

	ITEM	QTY	PART NUMBER	DESCRIPTION
	11	1'	525-0375	SHRINK TUBE 3/8"
	10	2'	525-0250	SHRINK TUBE 1/4"
	9	3'	525-0002	INSUL. TUBE CLEAR
	8	9'	408-0016	8 COND SHIELDED CABLE
	7	144'	408-0004	3 COND SHIELDED CABLE
	6	1	401-0164	25 PIN DB FEMALE
	5	1	401-0155	CONN. 9 PIN D FEMALE
	4	2	401-0040	25 PIN HOOD
	3	1	401-0039	9 PIN HOOD
	2	1	401-0037	25 PIN DB MALE
3	1	1	265-0002	TY-WRAP W/ LABEL

DRN AH 9-8-93
CHK
APV

ZETRON, INC. 12868 194TH COURT NE, REDMOND, WA 98052

TITLE: MODEL 21 ALI TAP CONTROL CABLE

DRAWING NUMBER: 709-7118 REV: A.1 SIZE: C

DO NOT SCALE DRAWING