Digital Voice Recorder

Owner's Manual

Firmware Version 2

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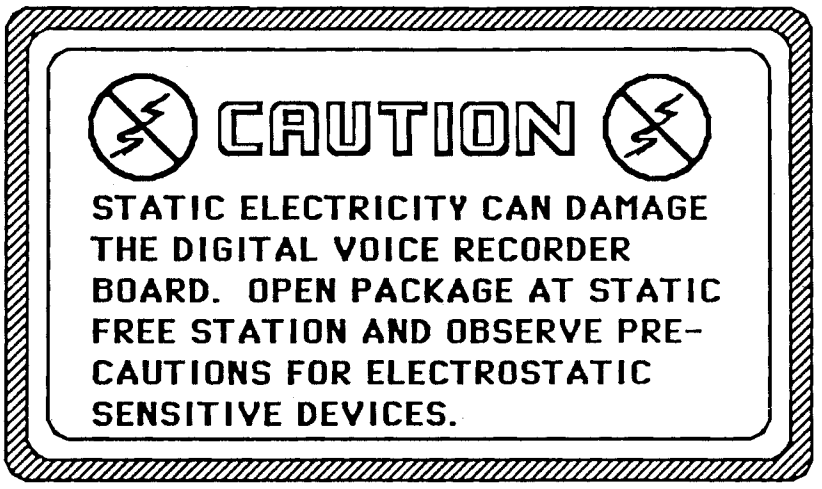

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1/87 Rev 2

About this manual . . .

This manual describes the installation and operation of ACC's Digital Voice Recorder. A command code summary is provided in Chapter 5. Troubleshooting hints are included in Chapter 7. The programming sheets in Chapter 8 simplify documenting what you've programmed and recorded in your DVR. Many of the common questions which have been asked are answered in Chapter 9.

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Chapter 1
Introduction

ACC's Digital Voice Recorder (DVR) is a multichannel solid-state digital audio recorder that remotely records and plays back audio through your repeater systems. It allows you to remotely record all of your repeater controller's programmable messages and offers a Touch-Tone activated voice mailbox. The DVR makes your repeater an information center, enhancing the communications through your system.

No Compromise Audio

The DVR preserves the full audio fidelity of your repeater. Its highest quality level results in recordings indistinguishable from the original. Your repeater is judged by how it sounds, and the DVR keeps it sounding first class. High quality recording is especially important when your "celebrity" or other favorite voices record IDs and other announcements. Playback sounds "live".

You Decide

The DVR allows recording and playback of a number of variable length audio "tracks". You choose the quality level of different tracks. Select the highest quality reproduction for your favorite IDs, and conserve memory by choosing a secondary level of audio quality for less frequently used messages. The DVR uses only as much memory as the length of the track, so there's no "wasted space" when you record.

Easy To Use Mailbox

Now it's easy to leave messages for other repeater users without having to remember lots of codes. Just enter a simple Touch-Tone command and talk. You're guided through the entire process of leaving a message with voice prompts, so the mailbox couldn't be easier to use. And your voice mail messages can say anything you want, since you say them!

To leave a voice message, enter a simple command and the DVR will ask who your message is for. Say who it's for (like "Tom"), then say your message. To see if there are any messages for you, ask it with a simple command and the DVR will list who has messages waiting ("Pete", "Joe", "Tom"). If you're Tom, you can retrieve your message by simply pressing number 3 on your Touch-Tone pad.

For a large number of users, and more message privacy, the 100 slot "semi-private" mailbox works like Post Office Boxes. Leave messages directly for your friends and retrieve your own any time. Special "run time variable" audio tracks let your repeater automatically notify you when there is mail waiting.

The DVR Grows As Your System Grows

You can start with inexpensive and readily available computer memories from us or from your neighborhood computer store and add more a row at a time. As your needs increase, you can expand to a full megabyte, lengthening the recording time with no hardware changes.

And the DVR can be expanded to three-in-one. This means that one DVR can service three fully independent repeater systems or two repeaters and the phone line (access from the telephone is achieved by connecting a DVR channel to the telephone interface of the controller). All three channels can be recording or playing back at the same time.

Start out with the single channel DVR - you can upgrade anytime. Or go in together with others that share your site to reduce the cost all around.

Synergy

Your ACC RC-850 or RC-85 Repeater Controller and the DVR work together to enhance the value of each other. Any or all of the remotely programmable messages of the controller may be made up of DVR audio tracks. That means many IDs, tail messages, bulletin board announcements, and other messages can be stored at one time. With the '850 controller, the various messages can even be scheduled. And since a message can consist of several tracks joined together, each track can be used in more than one message to make the most of the recording time available.

Reliability

Since the DVR is fully solid-state and there are no moving parts, it's ideal for use in remote locations and harsh environments – there's simply nothing to wear out.

Remember . . . the synthesized speech in your controller is the "voice of the repeater". The DVR records your voice and your users' voices to enhance communications through your repeater system.

101 Ways To Use Your Digital Voice Recorder On Your Repeater

- ✓ Welcome a new user to your repeater.
- ✓ Congratulate a user for upgrading his license.
- ✓ Use a "ho-ho-ho" courtesy tone for Christmas.
- ✓ Provide instructions for visiting users.
- ✓ Use a "champagne cork pop" courtesy tone on New Year's.
- ✓ Remind users to drive safely.
- ✓ Announce intruder with "Help, help, call the police".
- ✓ Remind your users of an upcoming flea market.
- ✓ Provide talk-in information for your hamfest.
- ✓ Solicit volunteers for your bike-a-thon.
- ✓ Record remote base memory names with QTH of system.
- ✓ Advise users of status of an emergency situation.
- ✓ Announce new technical additions to the repeater system.
- ✓ Warn users of weather advisories.
- ✓ Check out the audio on your new handheld.
- ✓ Wish a user "happy birthday".
- ✓ Use a "firecracker" courtesy tone on July 4th.
- ✓ Use a "gobble-gobble" courtesy tone on Thanksgiving.
- ✓ Feature a celebrity voice for your repeater's ID.
- ✓ Custom tailor emergency autodial response messages.
- ✓ Provide instructions on how to use the repeater.
- ✓ Announce the code practice schedule.
- ✓ Distribute system information to control operators.
- ✓ Replay bits of interest from the Westlink broadcast.
- ✓ Tell a friend you can't make the meeting.
- ✓ Announce the call sign slots of new users.
- ✓ Let new users introduce themselves.
- ✓ Check out the audio quality on your new mobile mic.
- ✓ Use "thunder-clap" courtesy tone during wx emergency.
- ✓ Provide a brief club meeting directory.
- ✓ Congratulate a new ham for getting his license.
- ✓ Ask a friend how he likes his new rig.
- ✓ Encourage users to respond to open FCC matters.
- ✓ Remind users what to bring on field day.
- ✓ Provide directions to the field day site.
- ✓ Do a sample FD QSO so users know what to expect.
- ✓ Announce field day results.
- ✓ Provide a local net directory.
- ✓ ID your repeater using your favorite sexy voice.
- ✓ Provide a short "repeater directory" for your area.
- ✓ Solicit volunteers for your walk-a-thon.
- ✓ Remind users of proper repeater procedure.
- ✓ Provide info about repeater's facilities and coverage.
- ✓ Announce availability of a new repeater in the area.
- ✓ Put a siren on the alarm message.
- ✓ Rent a DVR channel to a commercial site user.
- ✓ Offer holiday greetings to your users.
- ✓ Play an alarm clock sound when the repeater signs on.
- ✓ Remind all of the upcoming repeater coordination meeting.
- ✓ Ask scanner listeners to call you for info on being a ham.
- ✓ Thank a friend for doing you a favor.
- ✓ Announce the results of your club's election.
- ✓ Welcome your new club president and cabinet.
- ✓ Remind users of ARRL sponsored events.
- ✓ Ask another repeater user to give you a call.
- ✓ Announce when club owned gear is available for loan.
- ✓ Tell a friend about a new circuit you found.
- ✓ Use a "sleigh-bell" courtesy tone on Christmas.
- ✓ Leave a message for your wife to get over the phone.
- ✓ Include your repeater's location in its IDs.
- ✓ Include the name of your repeater organization in the IDs.
- ✓ Round up a group interested in getting on ATV.
- ✓ Have rptr say "Brrr, it's cold up here" after first snow.
- ✓ Notify users of the latest info on the local packet board.
- ✓ Leave a phone number and time for someone to call you.
- ✓ Announce presence of a rare DX station on 20 meters.
- ✓ Announce current propagation conditions.
- ✓ Announce upcoming OSCAR passes.
- ✓ Remind users about an upcoming contest.
- ✓ Announce roads washed out during a storm.
- ✓ Direct users to other repeaters during an emergency.
- ✓ Ask a friend when he'll be on the air.
- ✓ Congratulate a user for getting married.
- ✓ Congratulate a user on having a baby.
- ✓ Remind users of an upcoming club meeting.
- ✓ Promote the speaker for your next club meeting.
- ✓ Let the speaker for your next meeting promote himself!
- ✓ Provide directions to your club meeting place.
- ✓ Provide minutes of your last club meeting.
- ✓ Provide a brief report from your club's officers.
- ✓ Remind users that it's time to pay club dues.
- ✓ Announce the results of your club's contest.
- ✓ Thank a club member for his equipment donation.
- ✓ Praise members for donated time on club projects.
- ✓ Have a rooster crow when the repeater signs on.
- ✓ Tell a friend you're done using his wattmeter.
- ✓ Solicit volunteers to teach the ham classes.
- ✓ Provide a schedule of ham classes.
- ✓ Congratulate the graduates of your ham classes.
- ✓ Provide announcements of other club's activities.
- ✓ Announce equipment for sale (careful, no prices).
- ✓ Remind users about your weekly swap net.
- ✓ Solicit volunteers for an antenna work party.
- ✓ Tell users of the upcoming meteor shower.
- ✓ Provide the digipeater path for a new packet link.
- ✓ Provide info to users about a new FCC rules change.
- ✓ Give up-to-date info about the status of the brush fire.
- ✓ Thank the users who helped put up the new tower.
- ✓ Announce your repeater's new freq. when you change.
- ✓ Describe the equipment making up your repeater.
- ✓ Tell users of other repeaters sponsored by your group.
- ✓ Announce the presence of the new DVR on your repeater!

Features / Benefits

Direct digital recording - 64K bit/second PCM

- Outstanding audio quality, just like the original
- 3db bandwidth 150-3800 Hz, 1.5% distortion (highest quality mode)
- Selectable software data compression for extended recording time at reduced quality levels
- No vocabulary restrictions of synthesized speech

Direct interface to RC-850 and RC-85 Repeater Controllers

- Playback of various tracks specified with message editor allows use with IDs, tail messages, courtesy tones, Emergency Autodial responses, etc.
- Tracks may be joined together for messages - a track may be used in several messages increasing effective "playback" time

Up to three independent record/playback channels

- Supports up to three independent systems for cost effective operation
- Allows cross-directed voice mail
- Makes most efficient use of a common memory resource
- Permits simultaneous record/playback operations on all three channels

Uses industry standard 64K and 256K dynamic RAM chips

- Compatibility with 256K chips allows recording time extension
- Accomodates up to 1 megabyte memory (8 megabits)
- Recording time may be extended with "home computer" memory chips

Dynamic allocation of memory

- Recording takes only as much memory as required for no wasted memory
- No playback "dead time"
- 128 addressable "tracks" plus mailbox

Solid-state, fully electronic operation

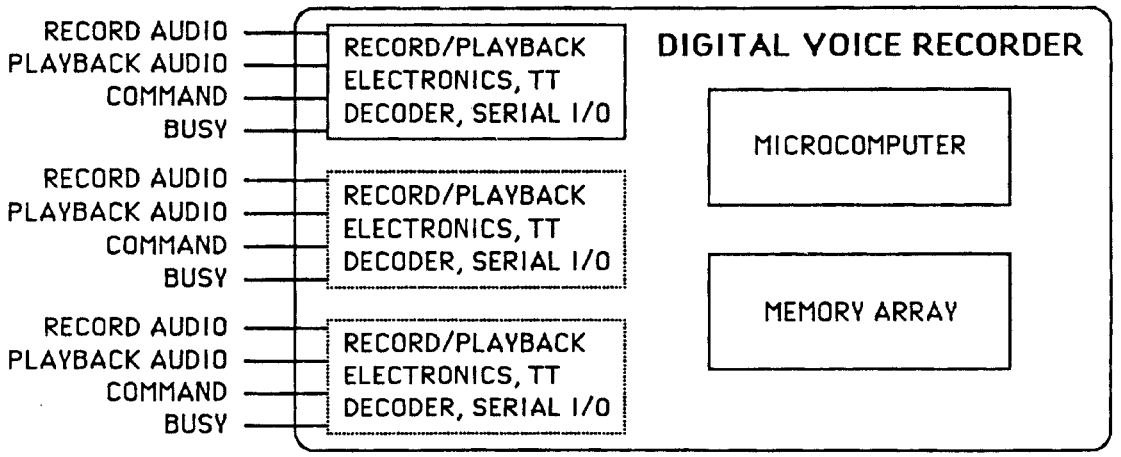
- High reliability in harsh environments

High reliability, low power design

- All ICs socketed in gold machine contact sockets
- Uses ALS and CMOS logic families for low current drain
- Easy to battery backup for audio storage during main power outage

Available in a variety of configurations

- Select the configuration you need and can afford
- Assembled/tested board only, or in rack mount enclosure
- Choice of memory size - may be upgraded with standard memory chips at any time
- Choice of one, two, or three audio channels; factory upgradeable



Specifications

Audio Quality

Frequency Response 150-3800 Hz
Distortion 1.5% (highest quality level)

Recording Time

Highest Quality Level - up to 130 seconds
Intermediate Quality Level - up to 260 seconds
Lowest Quality Level - up to approximately 360 seconds [(2-6 minutes depending on quality level of each track and memory installed]
Playback time is much larger since each track may each be used in many messages

Memory

Audio memory expandable from 64K byte to 1M byte
Four optional rows of memory chips, each row consisting of eight 4164 or 41256 type dynamic RAM chips*

Audio Tracks

128 variable length tracks (0-360 seconds each, total limited by memory)
Record operation initiated with Touch-Tone commands
Playback initiated with ASCII serial commands (supplied by RC-850 and RC-85 repeater controllers, or Touch-Tone commands

Voice Mailbox

User is voice prompted through the process of leaving mail
Touch-Tone activated entry and retrieval
Public and semi-private mailboxes
Public mailbox - two step entry process - say who the message is for, then say the message
Semi-private mailbox - specify one of 100 slots, then say the message
Easy message retrieval - ask who messages are stored for, then ask for your message
Remotely recordable prompting messages

Record Audio Inputs and Playback Audio Outputs

1, 2, or 3 (depending on number of channels); adjustable levels
Record operation - Touch-Tone (independent decoder per channel)
Playback operation - ASCII serial commands, Touch-Tone

Repeater Controller Interface

Five wires (record audio, playback audio, COS, command, busy)

Repeater Controller Supported Remotely Recordable Messages

ID Messages - 16 / scheduled (RC-850); 7 (RC-85)
Tail Messages - 13 / scheduled (RC-850); 3 (RC-85)
Emergency Autodial Responses - 10 (RC-850 and RC-85)
Bulletin Board Messages - 5 (RC-850); 2 (RC-85)
Alarm Messages - 4 (RC-850); 1 (RC-85)
Courtesy Tones - 12 (RC-850)
Scheduled Event Messages - 5 (RC-850)

Multichannel Option

Independent record/playback electronics, Touch-Tone command decoder, and serial interface port per channel

Power 13.8V ±10%, 1.5A max.; independent battery power input (rack mount version)

Board Size 8.5" x 12.25"

Cabinet Size 19" rack mount, 3.5" high

*The unit is designed to work with standard 200, 150, or 120 ns or faster 4164 and 41256 memory devices. The warranty applies to memory supplied by the factory.

Prices and specifications subject to change without notice.

Chapter 2
Installation

Overview

Installing the DVR into your system requires connection of ...

- ➡ Power
- ➡ Audio inputs and outputs
- ➡ Control signals

This chapter describes the connections to your DVR, DIP switch settings, and adjustments which need to be made. Since the DVR is available in both a 19" rack-mount cabinet and a board-only version, installation of both is described.

Connections

Power. The DVR operates from +12 volts dc and generates all the necessary internal operating voltages. The twelve volt supply may be in the range of 12.6 volts ±10% at 1.5 amps.

Two ground pins on the power connector must each be returned to the power supply ground through SEPARATE wires. These are separate logic and audio grounds which prevent digital noise from appearing in the audio. BOTH grounds MUST be connected to the power supply ground.

When power is lost to the DVR, audio information recorded in memory and remotely programmed command codes are lost. It may be desirable to supply a backup battery in installations where the main power is subject to interruption. Provisions for automatic switching to the backup battery are included in the rack-mount version. Battery charging provisions are not included.

Audio Inputs. Each channel of the DVR (one, two, or three) has its own audio input which may be supplied with audio from any source, such as a receiver or telephone line coupler. The audio inputs are capacitively coupled, with input impedance of 10 KΩ, and adjustment capability is provided for audio input levels ranging from 0.5 to 5 volts peak-to-peak.

Audio Outputs. Audio outputs supplied by the DVR are adjustable 0-5 volt peak-to-peak level, 10 KΩ source impedance, capactively coupled.

Control Signals. The control signals which connect to the DVR include:

- Touch-Tone audio entered at the audio inputs
- Serial Data ASCII control signals from the repeater controller
- COS (carrier-operated-switch) from the receiver
- Busy output to the controller indicating playback in progress

Touch-Tone audio. The DVR is controlled by Touch-Tone sequences entered along with audio to be recorded at the audio inputs, and also optionally by serial ASCII sequences entered at the logic connector. Each DVR channel has its own dedicated Touch-Tone decoder and serial I/O port.

Serial Data ASCII control signals. The ASCII control signals are supplied automatically by the RC-85 or RC-850 Repeater Controller whenever a message contains a DVR track. The ASCII input needs an external pullup resistor.

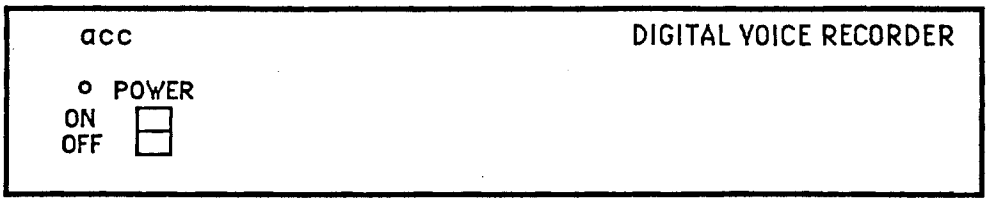
COS (carrier-operated-switch). If the audio source is a receiver, a COS logic signal should be connected from the receiver to the DVR to cause automatic Touch-Tone command evaluation after the user unkeys. The use of COS is not mandatory but is strongly suggested. The COS signals may be either low true (logic low when squelch open) or high true. A low should be between 0 and 0.8 volts, and a high should be between 2.4 and 15 volts. The COS logic sense (high or low true) for each channel is selected with DIP switch S2. The COS input presents a 10 KΩ load to ground.

Channel 1 may be subaudible tone protected, by supplying a PL logic signal to the DVR. Since Channel 2 would be connected to the phone in a typical installation, and its COS would not be used, the Channel 2 COS input optionally serves as Channel 1 PL input. DIP Switch S1 selects the function of the Channel 2 COS / Channel 1 PL input. A Control Operator level command selects carrier or PL access for Channel 1. *If the PL input option is used, both COS and PL must be supplied for Channel 1.*

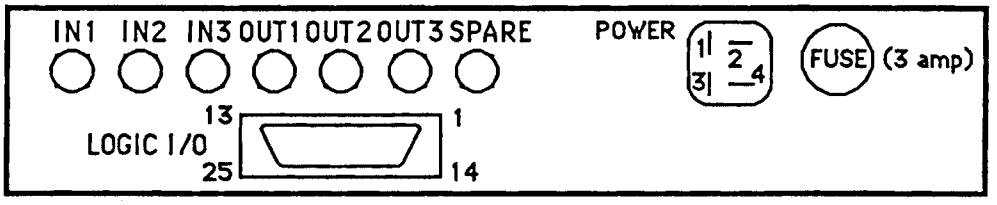
Busy output. A Busy logic signal from the DVR indicates that audio is being recorded or played back by the particular channel (Busy = TTL high). The signal is made available to the repeater control system. The RC-850 and RC-85 controllers use the Busy signal to delay the courtesy tone and hold up the transmitter during mailbox operations. The Busy signal also tells the controller when prerecorded IDs and other messages are being played back.

Rack-Mount Version

FRONT

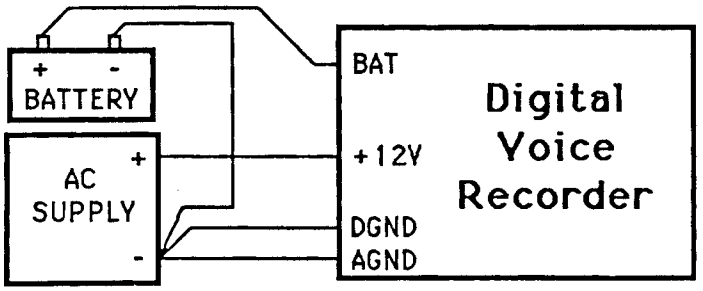


REAR

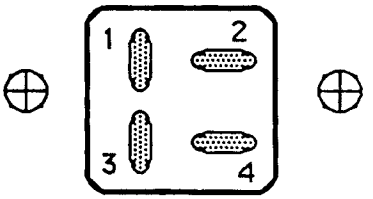


Power is applied through a 4 pin Jones type plug (supplied). The plug provides both grounds and two independent power inputs - one may be used for battery backup.

The Power switch controls *both primary and battery power* to the DVR. An LED indicates presence of power.



POWER CONNECTOR

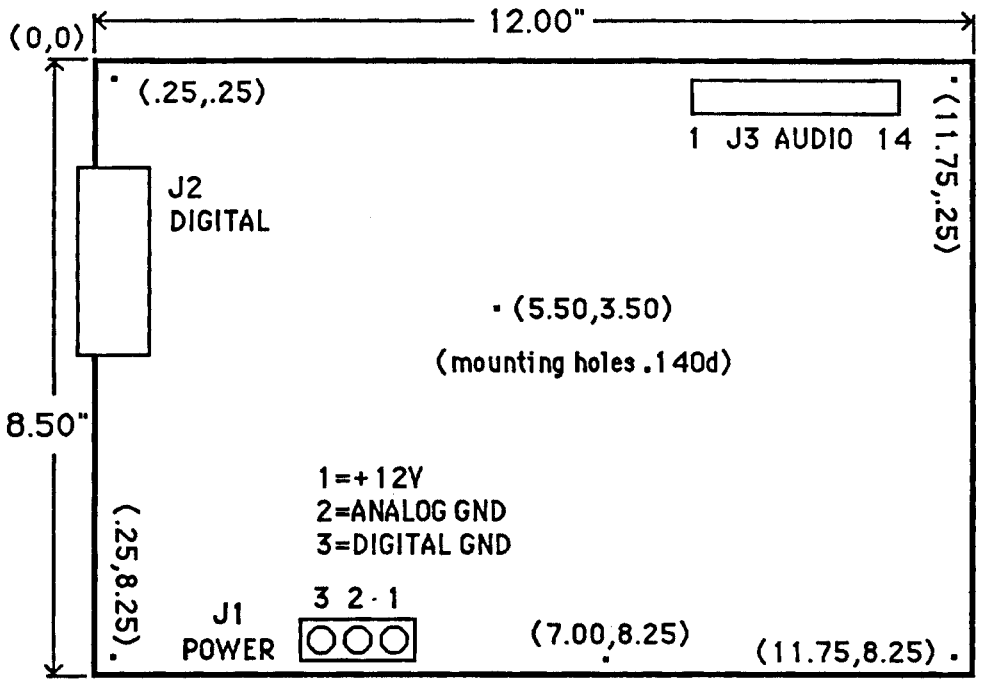


1 ANALOG GROUND
2 +12.6 VOLTS
3 DIGITAL GROUND
4 BATTERY

Audio inputs are supplied to the phono jacks on the rear panel. The jacks are labeled "IN 1", "IN 2", and "IN 3".

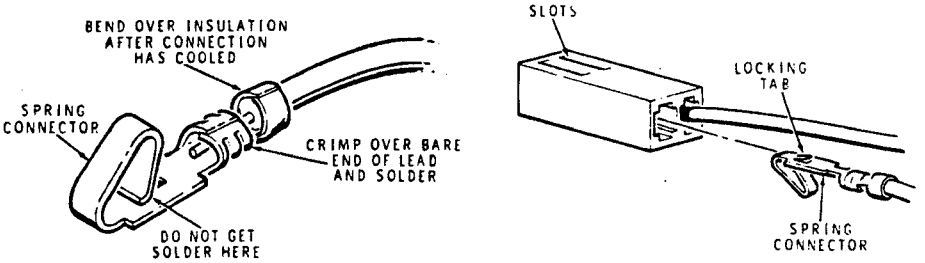
Audio outputs appear at the phono jacks on the rear panel labeled "OUT 1", "OUT 2", and "OUT 3".

Board-Only Version



There are 6 mounting holes indicated by the dots, with placement in inches from the upper left corner indicated in parenthesis.

Power is supplied to the board through a three pin Molex connector (supplied). The power wires should be crimped and soldered to the Molex pins as shown below.



Audio inputs and outputs appear at the 14 pin in-line connector using the supplied Molex pins and housing.

Channel 1 input - J3 Pin 12
Channel 1 output - J3 Pin 6
Channel 2 input - J3 Pin 10
Channel 2 output - J3 Pin 4
Channel 3 input - J3 Pin 8
Channel 3 output - J3 Pin 2
Audio ground - J3 Pins 1,3,5,7,9,11,13

Rack-Mount and Board-Only Versions

Serial ASCII signals are applied to the DB-25 Logic I/O connector on the back of the p.c. board or on the rear panel of the rack-mount DVR.

Channel 1 Serial Data In - Logic I/O Connector Pin 2
Channel 2 Serial Data In - Logic I/O Connector Pin 6
Channel 3 Serial Data In - Logic I/O Connector Pin 10

COS signals are applied to the DB-25 Logic I/O connector.

Channel 1 COS In - Pin 3
Channel 2 COS / Channel 1 PL In - Pin 7 (DIP switch selected)
Channel 3 COS In - Pin 11

Busy signals are available at the DB-25 Logic I/O connector.

Channel 1 BUSY Out - Pin 4
Channel 2 BUSY Out - Pin 8
Channel 3 BUSY Out - Pin 12

Logic grounds are available at the Logic I/O connector pins 14-25.

Connection to ACC's Repeater Controllers

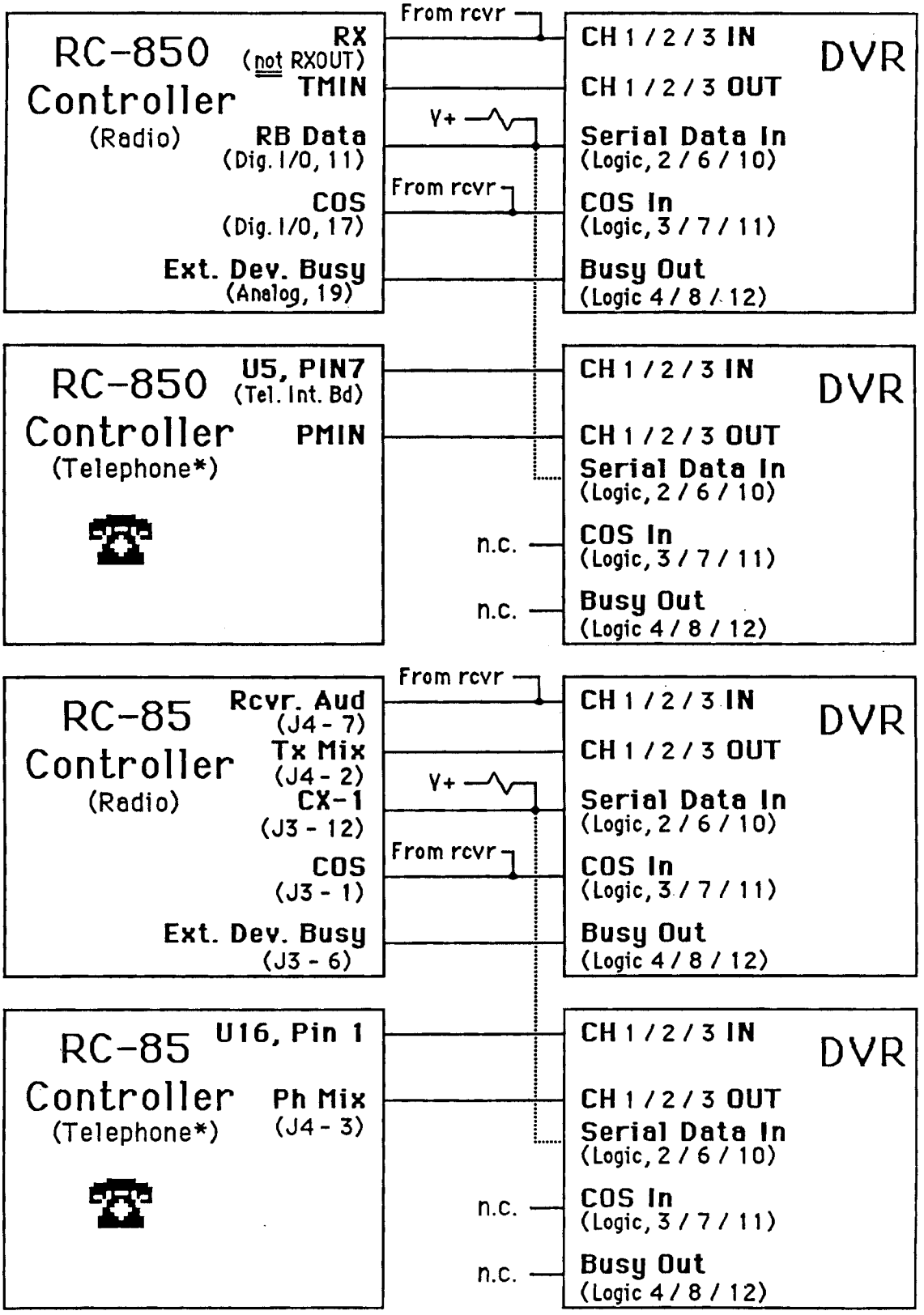
The DVR is designed for easy connection to the RC-850 and RC-85 Repeater Controllers. The interconnection of the DVR and the controllers is diagramed on the following page.

A pullup resistor is *required* from the DVR ASCII serial inputs to a supply voltage to set the logic 1 level. This permits the logic 1 level to be determined externally, for compatibility with your remote base frequency control logic, which shares the same output as the DVR ASCII data. If your repeater controller has a BCD synthesized remote base transceiver, there is probably already a pullup resistor on the RB Data output of the controller. The pullup resistor on the FC-1 board is 10 KΩ. Since the ASCII input to the DVR provides a 10 KΩ load to *ground*, it may be necessary to reduce the value of the pullup resistor to 1 KΩ or 2.2 KΩ to keep the logic high voltage sufficient to drive the remote base logic. If there is currently no pullup, add a 2.2 KΩ resistor.

The RB Data signal from the RC-850 controller or the CX1 signal from the RC-85 now serves two purposes. Along with RB Strobe or CX2, they supply BCD frequency information to the remote base transceiver. While RB Strobe or CX2 is held inactive, ASCII data is sent to the DVR.

With the *RC-85* controller, CX1 is not available for direct remote control, but it may be used to drive expanded UF remote control logic.

With the *RC-850* controller, program the Courtesy Tones "Delay to segment 1" longer than approximately 500 ms. This is necessary to ensure that the DVR has an opportunity to evaluate a DVR command and activate its Busy output before the RC-850 controller generates its courtesy tone. Otherwise, the DVR will not hold off the courtesy tone and will not keep the transmitter up during mailbox operations.



*Access from the phone is achieved by connecting a DVR channel to the telephone interface of the controller.

DIP Switch Settings

If a DVR channel is connected to a receiver, its COS logic input should be connected to the receiver's COS signal for proper operation. The logic sense (high / low true) for the COS logic input is selected using DIP Switch S2. The logic sense of the COS signal applies to both the controller and the DVR. In addition, the function of the Channel 2 COS / Channel 1 PL input is selected using DIP Switch S1.

	DIP Switch	
Channel 1	S2-1	HIGH TRUE = ON
Channel 2	S2-2	LOW TRUE = OFF
Channel 3	S2-3	
Logic I/O Conn. Pin 7	S1-1	Channel 2 COS = OFF Channel 1 PL = ON
PL Logic Sense	S1-2	HIGH TRUE = ON LOW TRUE = OFF

Adjustments

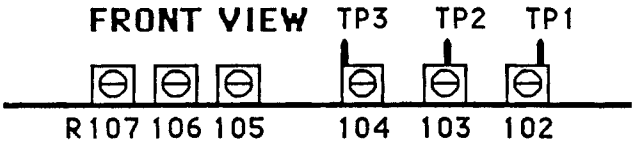
Input levels are adjusted by applying typical audio to the appropriate input and adjusting the pot indicated below for approximately ±2.7 volts peak, or 5.4 volts *peak-to-peak* at the appropriate test point *using an oscilloscope*. Occasional peaks may exceed ±2.7 volts.

If the input level adjustment is set too high, there will be excessive clipping, and the recorded audio will be distorted. If it's set too low, audio quality will suffer, particularly in quality levels B and C, since the full encoding range of the A/D converter will not be used. (Note that depending on your unit, turning the trimpots clockwise may increase *or* decrease level.)

Audio Channel	Pot	Test Point
Channel 1	R102	TP1
Channel 2	R103	TP2
Channel 3	R104	TP3

Output levels should be adjusted *after* adjusting the channel's audio input level to meet the requirements of the unit being driven by the DVR. Record a track and play it back to make the following adjustments. Reference Chapter 3 and Chapter 5 for Touch-Tone commands for recording and playing back tracks. (Note that, depending on your unit, the trimpots may increase level by turning CW or CCW. When the playback level is set too high, background noise should be audible from the audio output.)

Audio Channel	Pot
Channel 1	R105
Channel 2	R106
Channel 3	R107



Multiple Channels

The DVR is available from the factory configured for one, two, or three audio record/playback channels. It may be upgraded to its maximum of three at any time by returning the unit to the factory. Additional channels may not be installed in the field.

Memory Installation

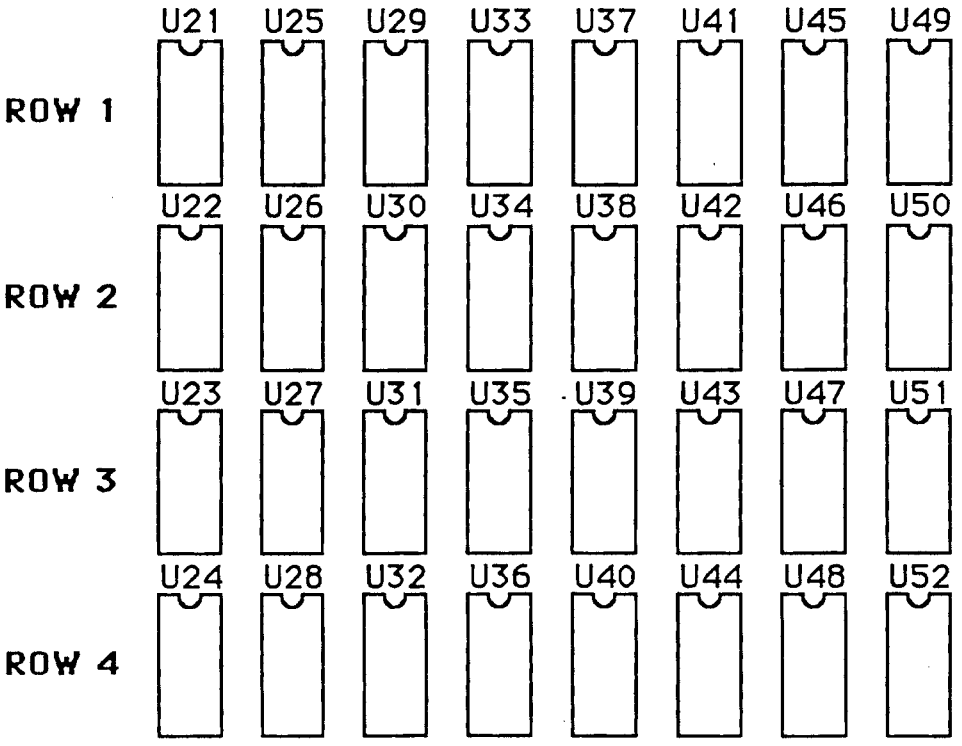
Audio recorded by the DVR is stored in solid-state dynamic memory. The more memory present, the longer the available recording time. The DVR is compatible with 64K bit and 256K bit industry standard RAM chips (200, 150, 120, 100 ns or faster). On powerup, the DVR automatically determines how much and what kind of memory is present. No jumper or DIP switch options are involved.

Memory is organized as one, two, three, or four "rows" of 8 RAM chips; i.e. 8, 16, 24, or 32 chips may be installed. Each row may consist of either 64K or 256K chips, *but all the chips in a row must be the same.*

The DVR is available from the factory in a variety of memory configurations. Memory may also be upgraded in the field by the user.

The total recording time available at the various quality levels is:

TIME (Quality Level A) = (number of 256K rows x 32) + (number of 64K rows x 8) seconds
or TIME (Quality Level B) = (number of 256K rows x 64) + (number of 64K rows x 16) seconds
or TIME (Quality Level C) = (number of 256K rows x 96) + (number of 64K rows x 24) seconds
or any combination.



CAUTION: RAM chips are static sensitive and should be installed at an antistatic workstation.

Chapter 3
Record and Playback

Overview

This chapter introduces the concept of the audio "track", which is the unit of storage in the DVR, then discusses recording quality levels and explains how to record and playback audio tracks. Generally, tracks are recorded under the supervision of the repeater system operator and are automatically played back as directed by the repeater controller. In addition, users may make brief recordings to hear how their audio sounds through the repeater. The voice mailbox is described in the next chapter.

The Audio Track

Audio stored in the DVR is organized by "track". Each track is a variable length portion of audio information which can be recorded, and then retrieved instantly, over and over without degradation. The track is only as long as necessary to store the audio recorded so that no memory is wasted. When a track is erased, its memory is freed up to be available for any future recordings of that or any other track. A track can be from a fraction of a second long to the full length of the memory storage available.

The DVR supports 256 separate tracks. Tracks 0-127 are available for direct recording and playback on request manually or automatically through the repeater controller. Tracks 128 and up are dedicated to the voice mailbox and are not available for manual record and playback.

The DVR's three channels share the same tracks and the same memory. Audio recorded from any channel into a track is available for playback through any of the three channels.

Example: Let's record Track 14 = "This is WA6AXX, Repeater". We may also like to record Track 15 = "Welcome to Silicon Valley", and Track 16 = "Press Touch-Tone 3 6 for information about the system". We can remotely program an ID message in our RC-85 or RC-850 Repeater Controller to consist of DVR tracks 14, 15, and 16.

The resulting ID playback is "Welcome to Silicon Valley, this is WA6AXX, Repeater. Press Touch-Tone 3 6 for information about the system."

We can also combine these tracks with others to form other messages including additional ID's, tail messages, etc.

14	This is WA6AXX, Repeater.
15	Welcome to Silicon Valley,
16	Press Touch-Tone 3 6 for information about the system.

Audio Quality Level

In its highest quality recording mode, the DVR is capable of recording and playing back audio with full repeater fidelity. This mode also uses the most memory for a given duration recording (similar to selectable speed audio or video tape recorders).

The highest quality level (A) may be used for recordings where you want to preserve the full fidelity of the original, such as frequently played tracks and celebrity or other "favorite" voices. If your DVR is loaded with the maximum amount of memory, two minutes and ten seconds of recording time are available in this mode, allowing most routine messages to be recorded with full fidelity.

In order to conserve memory, lower quality levels (B and C) are available for recording less important or longer tracks. The lower quality recording modes result in slightly "fuzzy" but fully intelligible and recognizable audio playback. Level B uses one-half, and Level C uses one-third the memory of the highest quality mode.

The commands which direct the DVR to record also specify the quality level of the track being recorded. A separate quality level for the mailbox may be selected by a special Control Operator level command.

Recording An Audio Track (With COS)

In order to record a track, it must first be empty. If there's already audio stored in a track, it must first be erased using the *erase* command. All tracks power up empty. The DVR is directed to record a track with a Touch-Tone command

[record prefix] 1 [track number]	(quality level A)
[record prefix] 2 [track number]	(quality level B)
[record prefix] 3 [track number]	(quality level C)

The Touch-Tone record command prefix is remotely programmable (1-7 digits). On powerup, it defaults to a predefined sequence, and can be changed remotely. If power is lost and restored, the prefix returns to the default sequence. The new command sequence you select should avoid conflict with repeater controller commands.

The next digit is a 1, 2, or 3, indicating the desired quality level of the recording. Finally, the track number indicates which track you wish to record. The track number may be represented by one, two, or three digits (0-127).

If the command is entered over a radio channel, with a COS signal supplied to the DVR, then the procedure to record a track would be to key down, enter the Touch-Tone command, unkey, key down again and talk, then unkey. The DVR captures the second transmission, and it chops off approximately 200 ms of the beginning and end of the transmission to remove any leading transient and trailing squelch tail.

Example: The Touch-Tone record prefix is A4793. To record track 14 at quality level A, key down on your transceiver, enter Touch-Tone "A4793 1 14", unkey, key down and say "This is WA6AXX, Repeater", and unkey. Track 14 is now recorded and available for playback.

Recording An Audio Track (Without COS)

A recording can be made from the phone or other audio source which does not provide a COS logic signal. When a COS signal is not available, Touch-Tone # indicates the end of a command sequence, and * and # bracket the recording. The recording procedure is to enter the record command prefix, quality level, and track number, followed by a Touch-Tone #. Then enter Touch-Tone * to start the recording. The recording begins after the * key is released, and continues until a # is received. When recording from the phone, use the repeater controller's Control Operator level *Timer Extend* command to keep the system from hanging up while recording.

Although the *# procedure must be used over the phone, it may also be used over the air to eliminate the need for unkeying during the recording process. For easy backup and uploading of prerecorded announcements, produce an audio tape of announcements to be stored in tracks and include the Touch-Tone commands which direct the DVR. To upload the audio into the DVR over the air, just let the tape roll.

Example: The Touch-Tone prefix is A4793. To record track 15 at quality level A, enter Touch-Tone "A4793 1 15 # *", say "Welcome to Silicon Valley", and enter Touch-Tone "#".

Playing Back An Audio Track

Audio is normally played back at the direction of the repeater control system, such as the RC-850 or RC-85 controller. Tracks may also be played back by Touch-Tone command to preview what is contained in each track.

Touch-Tone Activated Playback

Any audio track may be played back with the Touch-Tone command

[playback prefix] [track number]

This command assists in managing and documenting the audio information stored in each track. When entered from the phone, or if no COS signal is available, terminate the command with #.

RC-850 Messages

The message editor in Version 3 Firmware allows DVR tracks to be included in any programmable messages, along with synthesized speech, Morse code, paging tones, etc. Unlock the controller and select the message to be edited. When a point is reached in the

message where DVR tracks are to be included, change message type and specify the tracks with *55xyz^, where xyz is the track number (1, 2, or 3 digits indicating track number 0-127) and ^ means to unkey or to enter the command terminator #. Be sure to unkey (or enter # from the phone) after each "*55xyz" sequence. If the message is to continue in synthesized speech, Morse code, or other message types, change message type following the DVR tracks. Each DVR track takes up *two character slots* in a message.

Example: Construct a Pending ID1 message consisting of tracks 15, 14, and 16. Unlock the controller, select the message (*1104^), and enter "*5515^ *5514^ *5516^". Enter "*0" to write the new message into the controller's non-volatile memory.

Messages may be constructed using the message editor over the phone, however, since playback is directed by the repeater controller through its channel, audio is directed to the repeater instead of the phone. However, by driving both the repeater channel and the phone channel with the controller's ASCII signalling, playback can simultaneously occur on the phone as well as the repeater channel. See "Connection to ACC's Repeater Controllers" in Chapter 2 for hookup.

RC-85 Messages

The message editor in Version 2 Firmware allows DVR tracks to be included in any programmable messages. Several tracks may be combined in a message, but they may not be mixed with Morse code or synthesized speech within a message. After unlocking the controller, select the message to be edited with the command "*13xy", where "xy" is 00-24, specifying the desired message. Then enter the tracks desired in the format "P(channel number)".

Example: Construct a Pending ID 1 message consisting of tracks 15, 14, and 16. Unlock the controller, select the message with the command "*1303", and using the message editor representation of letters and numbers, enter "P15P14P16", as "71 01 05 71 01 04 71 01 06" (see RC-85 Repeater Controller Owner's Manual). You may unkey (or enter * from the phone) after one or more tracks, then continue. Finally, enter "*0" to write the new message into the controller's non-volatile memory.

Messages may be constructed using the message editor over the phone, however, since playback is directed by the repeater controller through its channel, audio is directed to the repeater instead of the phone. However, by driving both the repeater channel and the phone channel with the controller's ASCII signalling, playback can simultaneously occur on the phone as well as the repeater channel. See "Connection to ACC's Repeater Controllers" in Chapter 2 for hookup.

Erasing An Audio Track

An audio track may be erased and the memory allocated to that message becomes available for other messages. Tracks containing audio *must* be erased before rerecording. The *erase* command is

[erase prefix] [track number] * * *

All audio tracks above track number10 (11-119) may be erased simultaneously with the *block erase* command.

[erase prefix] [999] * * *

The *block erase* command does not affect mailbox prompting tracks (120-127) and tracks 0-10. Frequently used messages can be stored in low numbered tracks. The block erase command is useful for clearing out recordings which may have inadvertently been made and are taking up excessive memory, without the need to preview all the tracks in order to determine where the unintended recording is located. This command does not affect mail stored in the mailbox.

Checking User Audio

Users may make a brief recording for immediate playback to check the quality of their audio into the system. The recording is played back, then erased immediately. It is always made in quality level A. The recording may be as long as the total unused memory in the DVR. The command is

[mailbox command] * * *

This capability also offers a simple way to determine how much memory is available for recording. Perform this function, counting up in seconds to some number greater than the expected maximum storage available. When it plays back your count, it will stop at the count indicating the available recording time in quality level A. (Twice the time is available if new recordings are to be made in quality level B, three times in C.)

Example: Tom wants to hear how his new rig sounds. The mailbox command is "4". He enters "4***", unkeys, keys down and talks. When he unkeys, he hears his audio played back through the repeater.

Chapter 4
Mailbox

Overview

The DVR provides automatic management of audio tracks as a Touch-Tone accessible voice mailbox. Users may record voice mail for other users and retrieve voice mail left for them. The voice mailbox is fully independent of the audio record / playback capability for repeater controller generated messages. This chapter describes the operation of the voice mailbox.

There are actually two mailboxes available - a "public mailbox" and a "semi-private mailbox". The public mailbox is easiest to use, since everyone uses the same code to load and retrieve mail. The semi-private mailbox works like a Post Office Box and requires users to know their own two digit number to retrieve their mail and other's two digit numbers to load mail for them.

In a multichannel DVR, mail recorded from any channel may be retrieved from the same channel or from the other channels.

Public Mailbox

Public mailbox messages may be loaded by first saying the name of the person the mail is intended for and then saying the message. The DVR prompts the user with special dedicated tracks which may be remotely recorded.

Leaving a public mailbox message would proceed as follows. The user enters the *load public mail* command. The DVR responds by saying, "Who is your message for?". The user says the name of the person the message is for. The DVR then says, "Please record your message". The user then says the message. Finally, the DVR acknowledges the process by saying, "Thank you, your message is stored".

Public mail is checked by entering the *list public mail* command, and the DVR responds with the list of names for whom messages are stored. If the user's name is the n^{th} one listed, he enters the *retrieve public mail* command and the digit n, and his message is played back to him. Finally, mail just played back can be erased.

A summary of the public mailbox commands are

List public mailbox messages	[mailbox prefix]	
Retrieve n^{th} public mailbox message	[mailbox prefix] n	(n=1-9)
Load public mailbox message	[mailbox prefix] *	
Erase message just played	[mailbox prefix] * *	

Commands entered from the phone should be terminated with #. When loading a message from the phone, enter * to start recording and # to end.

Example: Record a message for Joe over the air. The mailbox command is "3". Key down, enter "3*". The DVR says, "Who is your message for?". Say, "Joe". When the DVR says, "Please record your message", say your message. The DVR then says, "Your message is stored."

Later, Joe asks if there are any messages in the public mailbox by entering "3". The DVR says, "Tom, Joe, Pete". Since Joe is the second person listed, he retrieves his mail by entering "32". He erases the message after listening to it by entering "3**". The DVR then says, "Your message is erased".

Joe can check for messages from the phone by calling the repeater and entering "3 #". When he hears that he has a message, he can retrieve it by entering "32 #" and erase it by entering "3** #".

Joe can load a public mailbox message from the phone by entering "3* #". When the DVR says, "Who is your message for?", he enters "*", says the name, and enters "#". The DVR then says, "Please record your message", and Joe enters "*", talks, and then enters "#". The DVR then says, "Your message is stored".

Semi-Private Mailbox

Semi-private mailbox messages may be loaded by entering the two digit slot the message is intended for and then saying the message. As with the public mailbox, the user is prompted through the process.

Leaving a semi-private mailbox message would proceed as follows: the user enters the *load semi-private mail* command, including the two digits telling which slot the message should be left in. The DVR responds by saying, "Please record your message". The user then says the message. Finally, the DVR acknowledges the process by saying, "Thank you, your message is stored".

Semi-private mail is checked by entering the *semi-private mail list* command. The DVR responds with all of the messages which have been stored in the slot specified. Finally, mail just played back can be erased.

Read semi-private messages	[mailbox prefix] [xx]	(xx=00-99)
Load semi-private message	[mailbox prefix] * [xx]	
Erase slot just played	[mailbox prefix] * *	

Example: Record a message for user number 73. The mailbox command prefix is "3". Key down and enter "3*73". When prompted, say the message.

User number 73 can check for any messages stored for him by entering "373". His mail is played back and may be erased by entering "3**".

From the phone, the commands are terminated with "#", and the recording is bracketed by * and #, as with the public mailbox.

Mailbox Erase, Autoerase, and Two Day Old Autoerase

Mailbox messages may be erased manually after being read. With the public mailbox, the *erase* command causes the last message heard (within the last minute) to be erased. Only one message will be erased. After retrieving a message, it can be erased. If several public maibox messages are to be retrieved and erased, the first should be played, then erased, then the second should be played, then erased, and so on. The *erase* command will have no effect if no mail has been played within the last minute.

With the semi-private mailbox, the *erase* command causes the messages in the last slot retrieved (within the last minute) to be erased. The messages in one slot will be erased. After retrieving the messages in a slot, they can be erased with the erase command.

Control Operator level commands are available for erasing all public mail and all semi-private mail. These commands allow the Control Operator to clean out the mailbox easily if necessary.

Erase all public messages	[erase prefix] 777 * * *
Erase all semi-private messages	[erase prefix] 888 * * *

The Autoerase Mode is an option which causes messages which have been played to be erased one minute after mailbox activity has ended. Unlike the manual procedure, in which an *erase* command only causes the last read message or slot to be erased, the Autoerase Mode causes all messages read during a period of mailbox activity to be erased. The delay to erasure allows messages to be played several times if necessary before they're silently erased. This mode can help reduce mailbox clutter, however, messages can be inadvertently erased if someone reads the wrong mail.

The Two Day Old Autoerase Mode further reduces mailbox clutter by erasing mail still present approximately 48 hours after having been loaded. Semi-private mailbox slots 78 and 79 are exempted from this mode to allow long term storage of mail, while all other mail is automatically cleaned out.

Mailbox Quality Level

The quality level used for mailbox recordings may be specified by the Control Operator, independent of the quality levels used for various tracks as described in the previous chapter. The Touch-Tone command is

[COP prefix] 6 1	(for quality level A)
[COP prefix] 6 2	(for quality level B)
[COP prefix] 6 3	(for quality level C)

Prompting Tracks

Several of the remotely recordable audio tracks are intended to guide the user through the process of loading, retrieving, and erasing mailbox messages. These tracks may be remotely recorded by your favorite "mailbox prompting voice". The track numbers and suggested contents are shown below. Remember that these tracks power up empty and *you* record them. They are recorded, previewed, and erased as described in the previous chapter.

123 "Your message is erased"
124 "Your message is stored"
125 "Sorry, no messages" (if there are none)
126 "Who is your message for?" (public mailbox only)
127 "Please record your message"

Run-Time Variable Tracks

Several special purpose tracks are availble for mailbox related use. These tracks may be included in repeater controller ID or tail messages to indicate when there are public mailbox messages present. When these tracks are directed to be played by the repeater controller and if there is mail present, they will be played. If there is no mail present, they will not play.

120 "There's public mail for" or "There's mail" if there is public mail present, or silent if there is none
121 List of names in public mailbox if there is public mail present, or silent if there is none (this is a "pseudo" track and is not available for recording)

Example: With our repeater controller message editor, we've constructed a tail message which says, "Good morning", Track 120, Track 121. If there is public mail present, the tail message would announce, "Good morning, there's mail for ... John, Pete, Joe." If there is no public mail present, the tail message would be, "Good morning".

"Oops" Track

Track 119 is a special track in that it will only playback if a user keys his mic while the RC-850 is playing any DVR track as a message. The DVR track ceases, and the message stored in track 119 plays.

Example: The RC-850 is programmed to play DVR track 32 as a tail message. A user keys his mic before the message is complete , so the RC-850 stops the playback of track 32 and plays track 119.

Track 119 can be loaded with such comments as, "Oops", "Excuuuuse me", or "Ouch!".

If the message being interrupted is a Pending ID, the controller will abort playback, play track 119, then revert to the Forced CW ID.

Chapter 5
Command Codes

Overview
The DVR is controlled by several command codes which direct record, playback, and mailbox operations. The unit powers up with predefined command code prefixes, but these may be changed remotely as outlined below. A power failure causes the default powerup codes to be restored.

Powerup Command Prefixes
The DVR powers up with the following command code prefixes:

Record	1
Playback	2
Erase	3
Mailbox	4
Control Operator	789

Changing Command Prefixes
The following "Control Operator level" (COP) commands are available to allow redefining the various command code prefixes after powerup.

Record command prefix	[COP prefix] 1 [string]
Playback command prefix	[COP prefix] 2 [string]
Erase command prefix	[COP prefix] 3 [string]
Mailbox command prefix	[COP prefix] 0 [string]
Control Op command prefix	[COP prefix] 7 [string]

The DVR acknowledges Control Operator level command entry by playing track 124 ("Your message is stored").

"String" refers to the Touch-Tone command digits which make up the new prefix and may be up to 7 digits long. Avoid using Touch-Tone * and #.

In selection of command prefixes, be careful to avoid potential code conflicts with the repeater controller. When a Touch-Tone command is sent during a transmission, upon unkeying, both the repeater controller and the DVR evaluate the command to see if they should act on it. If a particular sequence can be both a valid repeater controller command and a valid DVR command, both will act on it. This possibility should be avoided by careful command prefix selection.

Record and Playback Track Commands (see Chapter 3)

Record	[record prefix] [1(A),2(B),3(C)] [track number]	
Playback	[playback prefix] [track number]	
Erase	[erase prefix] [track number] * * *	
Block Erase	[erase prefix] 999 * * *	(erases tracks 11-119)
User check	[mailbox prefix] * * *	

Mailbox Commands (see Chapter 4)

List public mailbox messages	[mailbox prefix]	
Retrieve n^{th} public message	[mailbox prefix] n	(n=1-9)
Load public mailbox message	[mailbox prefix] *	
Erase message just played	[mailbox prefix] * *	
Read semi-private messages	[mailbox prefix] [xx]	(xx=00-99)
Load semi-private message	[mailbox prefix] * [xx]	
Erase slot just played	[mailbox prefix] * *	
Erase all public messages	[erase prefix] 777 * * *	
Erase all semi-private messages	[erase prefix] 888 * * *	

Mailbox Option Commands (see Chapter 4)

Several mailbox options are available and may be selected with Control Operator level commands. The following commands are available to change mailbox options.

Option	Command	Powerup
Message max. duration*	[COP prefix] 4 [seconds]	10 seconds
Mailbox quality level	[COP prefix] 6 [1=A,2=B,3=C]	A
Autoerase mode	[COP prefix] 8 [1=on, 0=off]	Off
Two Day Old Autoerase	[COP prefix] 5 [1=on, 0=off]	Off
Mailbox enabled/disabled (public and semiprivate)	[COP prefix] 9 [1=en, 0=dis]	Enabled

* Mailbox message duration limited by this command. The "Who for" part of public mailbox messages is limited to 2 seconds.

The DVR acknowledges Control Operator level command entry by playing track 124 ("Your message is stored").

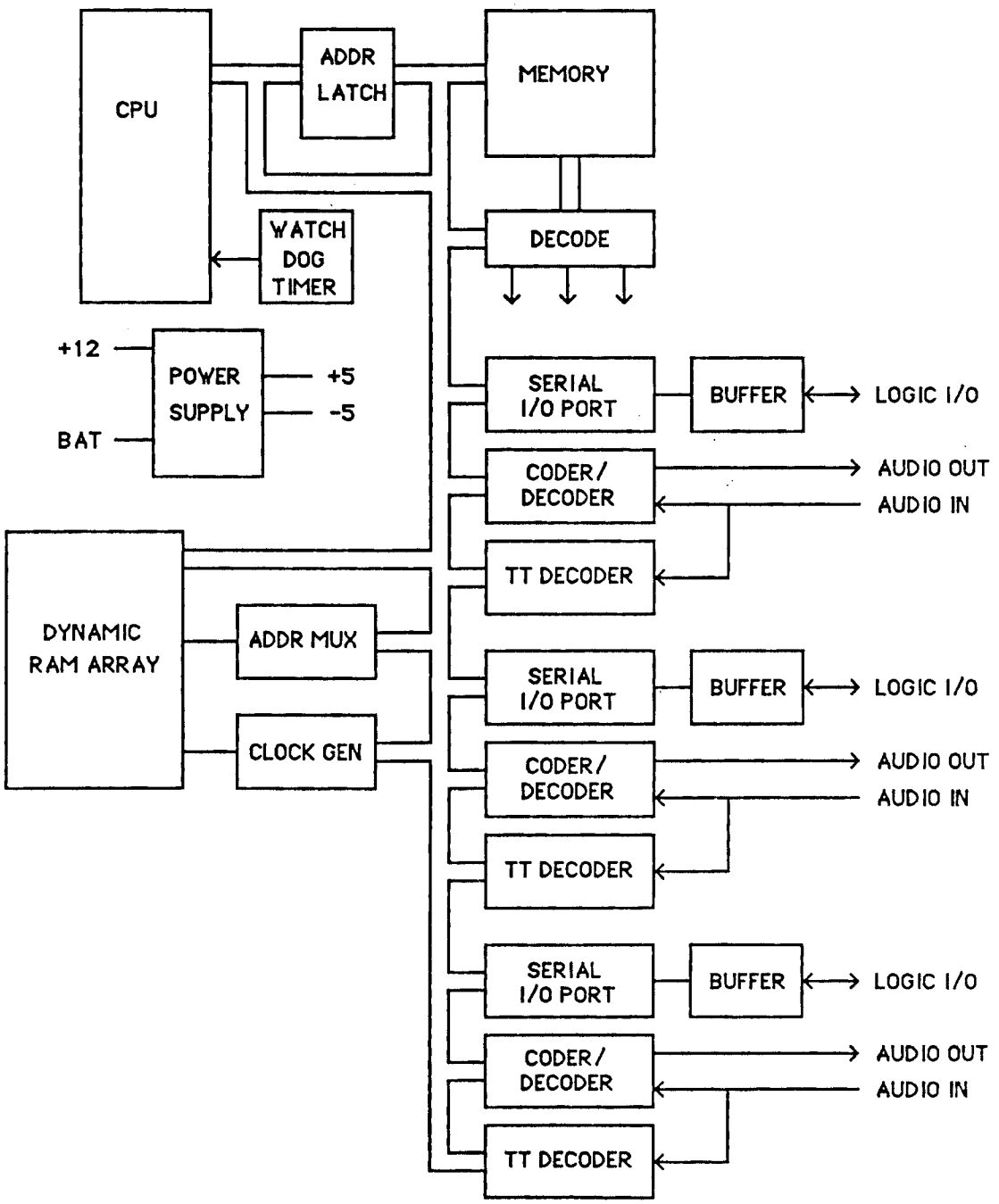
PL Option Commands (see Chapter 2)

Channel 1 may be operated in carrier or PL access and control. If the PL option is used, the PL logic signal should be connected to the Logic connector pin 7, and DIP switch S1 should be set as defined in Chapter 2. If the PL option is used for Channel 1, Channel 2 may not connect to a receiver, but may connect to a phone line, since its COS input will not be available.

Option	Command	Powerup
Ch. 1 Carrier/PL Access	[COP prefix] * [0=carrier,1=PL]	Carrier

Chapter 6
Principles of Operation

Block Diagram



Description

The DVR is entirely contained on a single printed circuit board. It contains the microcomputer with its CPU, ROM, RAM, I/O, fail-safe circuitry, audio A/D and D/A circuitry, Touch-Tone decoders, and various I/O and control circuitry.

The board is powered by a single external +12 volt supply, and the necessary +5 and -5 volts for the various circuitry are derived on-board. The supply voltage is filtered and transient suppressed to protect against spikes and transients from the 12 volt supply.

The CPU is an 8085. It provides the microcomputer's registers (including the accumulator), arithmetic logic unit (ALU), instruction decode, interrupt control, and timing and control circuitry.

The CPU uses a multiplexed data bus. The address is split between the 8 bit address bus and the 8 bit multiplexed data bus. An 8 bit latch demultiplexes the low order address information from the multiplexed data bus.

The address decoding circuitry generates chip select signals for the various memory and I/O devices in the microcomputer.

A watchdog timer is strobed periodically by the microcomputer software. If the watch-dog timer is allowed to time out, as if the CPU were to hang up, the CPU is reset, initializing program execution.

The CPU is capable of directly addressing up to 64 Kbytes of memory. The low 32 Kbytes of the address space is occupied by the program EPROM and scratchpad static RAM. The upper 32 Kbytes addresses up to 32 32 Kbyte pages of dynamic RAM. Page selection is performed by an output port allowing addressing of up to 1 Mbyte of dynamic memory. Architectural provisions are included to address up to 8 Mbyte.

The dynamic RAM array is supported by address multiplexing and clock generation circuitry. Proper refresh of the dynamic RAM is implemented as part of the program execution.

Three independent audio record/playback channels are available. Each channel has its own coder/decoder (CODEC) and support circuitry to allow the microcomputer to store digitized audio for recording and to supply digitized audio for playback.

Each channel also has its own Touch-Tone decoder and serial I/O port for communication with the repeater controller.

Chapter 7
Troubleshooting

Maintenance

The Digital Voice Recorder is designed conservatively with high quality, reliable components, and it is very unlikely that a component failure will take it out of service. No periodic maintenance is necessary to ensure long life. Simply follow common sense in installing the unit, such as avoiding locating it in extremely hot or dirty areas. Because of the high speed dynamic RAM and support circuitry, the unit does generate some heat, and adequate air flow should be allowed around the cabinet. The board-only version should be packaged with provisions for adequate air flow. You should expect your Digital Voice Recorder to run virtually forever.

Site Engineering

The DVR includes transient protection to minimize the possibility and extent of damage, and this protection should be supplemented with sound site engineering to minimize the impact of lightning on all equipment in the system. See ACC's application note, "Lightning Protection for Your Repeater System" for system design considerations.

Servicing

Since all ICs are socketed (in extremely reliable sockets), trouble-shooting and repair should be inexpensive. However, since the unit is very complex, servicing in the field is not recommended and factory service is available in the event of a failure.

In Case of Difficulty...

General Checklist

✓ Are all ICs firmly seated in their sockets?
✓ Do any RAM chips have pins *bent* underneath them?
✓ Are cable connectors installed properly?
✓ Are +12 volts and 2 grounds connected properly?
✓ Are DIP switches S1 and S2 set correctly and firmly?
✓ Are any components hot? (It's normal for the voltage regulators to run hot.)
✓ Are both grounds connected?

Trouble	Possible Cause	Remedy
Won't record and play back	Touch-Tone decoder not decoding (check decoder strobe - U84, U67, U72 pin 14 while supplying Touch-Tone audio)	Check TT encoding level in transceiver, repeater receiver pickoff point, etc.
	RC-850 controller audio taken from RXOUT	Tap audio from RX, not RXOUT
Doesn't evalute commands when unkey, but does using Touch-Tone # terminator	DIP switch not set properly	See p. 2-7
	Defective ULN2804A (U6,U7)	Replace
	Defective 8251A (U10,U11,U12)	Replace
Touch-Tone decoding unreliable	TT twist or distortion	Check TT encoding level in transceiver, repeater receiver pickoff point, etc.
Doesn't record as long as it should	Defective memory	Check for bent pins Isolate defective row by removing a row at a time and timing record period
White noise through repeater increases when connecting DVR	Audio levels set improperly	Set levels per Chapter 2
Connecting receiver to DVR COS input affects receiver squelch operation	DVR COS input loading down receiver's COS circuit	Obtain COS from lower impedence point Add pullup resistor to allow larger current sourcing
Courtesy tone not held off during mailbox operations	RC-850's External Busy input being shared as VOX input	Disconnect VOX circuitry and disable VOX mode; or RC-850 V3.5 and up allow re-assignment of VOX to a different input
	RC-850 signal conditioning board installed	Remove sig con U5, jumper sig con J1 pin 13 to J2 pin 13; this will disable VOX
	RC-850 courtesy tone "Delay to Segment 1" timer too short	Lengthen timer greater than 500 ms

RF Interference

The Digital Voice Recorder uses relatively high speed digital logic which results in signals with fast edges. The logic signals contain harmonic energy throughout the HF and VHF frequency ranges. Since a repeater system contains receivers sensitive to signals as low as tenths of a microvolt, it's possible for rf from the DVR to interfere with the repeater or remote base receiver.

In most installations, there is no difficulty, because the receiver equipment is typically well shielded (to prevent transmitter energy from affecting it), and the antennas are some distance from the unit. If rf interference is a problem, several simple steps should eliminate or reduce the effects.

If the receiver equipment is not well shielded, it should be. Signals entering and leaving the receiver should go through feedthrough capacitors. It may be desirable to add small chokes (about 10 μH), ferrite beads, or torroids in series with the signals where they reach the feedthrough capacitor, to improve the effectiveness of the filtering.

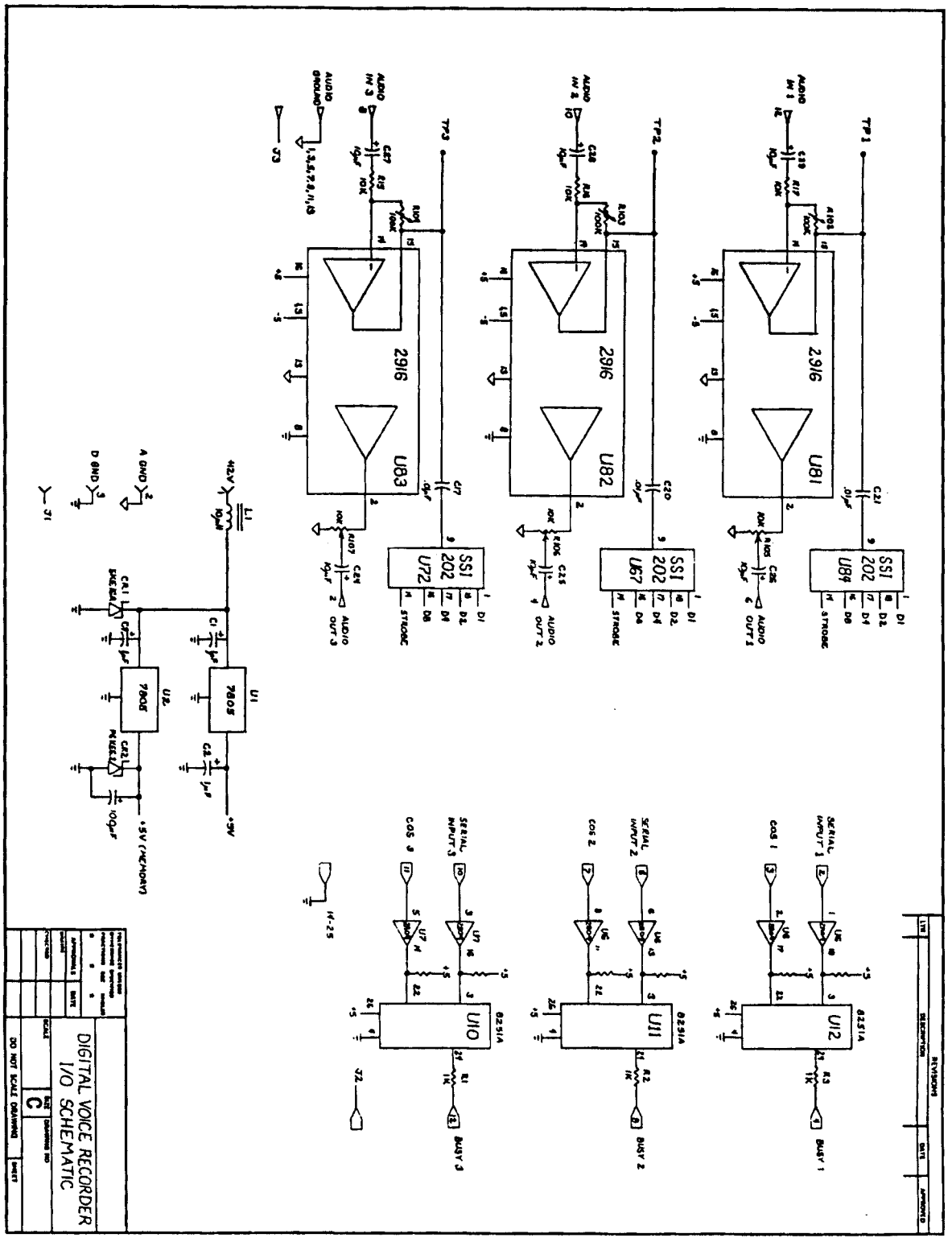
Signals from the DVR to external equipment may be filtered with small chokes or ferrite beads at its connectors, and cables may be shielded to eliminate radiation of rf energy.

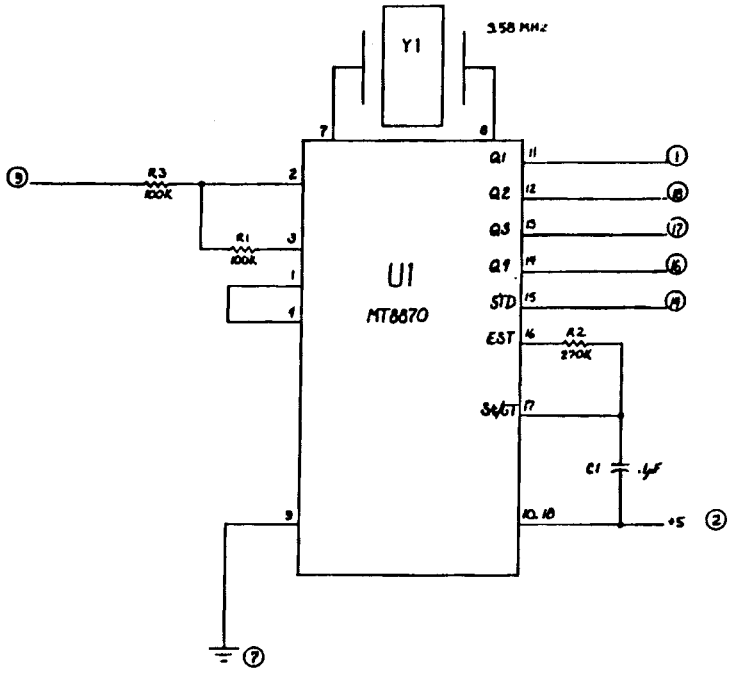
Try to determine if the rf enters the receiver through the antenna or through some other path - put the receiver on a dummy load to see. If it's entering from the antenna, see if it's possible to increase the separation. The antenna pattern is such that equipment located directly under the antenna is generally in a null, which reduces rf coupling. Shielding of wiring and cabling may be helpful when rf enters at the antenna. If the rf path is other than through the antenna, shielding and filtering of the interface cables should be improved. RF conducted along the cables can be filtered at the receiver with a series inductor of several uH connected to the receiver's feedthrough capacitor to act as a choke.

In general, the DVR is not susceptible to rf from repeater equipment, unless it is exposed to very strong local fields.

Input/Output Schematic

The partial schematic below details the input/output circuitry, and may be helpful should questions arise regarding proper interfacing to the DVR.





ADVANCED COMPUTER CONTROLS
DIGITAL VOICE RECORDER
TOUCH-TONE™ DECODER

Chapter 8
Programming Sheets

Command Code Prefixes

Prefixes may be 1-7 digits.
{ } indicates powerup prefix.

_____ COP Prefix {789}

_____ Record Prefix {1}

_____ Playback Prefix {2}

_____ Erase Prefix {3}

_____ Mailbox Prefix {4}

Options

{ } indicates powerup option.

_____ Message maximum duration (mailbox) {10 seconds}

_____ Mailbox quality level {A}

_____ Autoerase mode {off}

_____ Two Day Old Autoerase {off}

_____ Mailbox enabled/disabled {enabled}

_____ Ch. 1 Carrier/PL Access {carrier}

Track Contents

0 _____
1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____

(Tracks 11-119 are erased by the *Block Erase* command.)

11 _____
12 _____
13 _____
14 _____
15 _____
16 _____
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116 _____
117 _____
118 _____

119 _____ "Oops" or "Excuuuse me"
120 _____ "There's public mail (for ...)"
121 [not available, "pseudo track", lists names of who there's public mail for]
122 [not available, used for "checking user audio" and immediately erased]
123 _____ "Your message is erased"
124 _____ "Your message is stored"
125 _____ "Sorry, no messages"
126 _____ "Who is your message for?"
127 _____ "Please record your message"

Chapter 9
Questions & Answers

Multichannel

I have a three channel DVR. If I record a message on channel one, can it be played back from the other channels?

Yes. The entire memory array, i.e. all audio tracks and voice mail are equally accessible from each of the up to three channels.

When I expand memory, what channel can it be recorded from?

Again, since the entire memory array is equally accessible from all tracks, it's shared on an as needed basis for new recordings.

Memory

Can I leave the factory supplied 64K chips in my DVR and fill the remaining sockets with 256K chips?

Yes. Any unused rows may be filled with 64K or 256K chips. Just be sure that all the chips in a row are the same (either 64K or 256K). You can also remove any 64K chips and replace them with 256K chips to further extend the recording time. See page 2-8 for information about memory expansion.

Why can't I use 1 megabit RAM chips which are starting to appear?

The 1M chips aren't pin compatible with the smaller 64K and 256K chips. At the 1M bit level, the 16 pin package "ran out of pins", and so an 18 pin package is used, and signals are moved around somewhat making it unfeasible to lay out the board for both. The DVR's software and hardware architecture are compatible with a larger memory array. When pricing of 1M bit chips drops, we hope to support a plug-in piggyback board to support an array of 1M bit chips. This would extend recording time significantly.

Mailbox

Is there some way to erase all mailbox messages?

Yes. There's both a public mail erase and semi-private mail erase command. These commands "clean up" the mailbox by erasing all such mail. See page 5-2.

How do I know there are messages in the mailbox?

The semi-private mailbox should be interrogated by the particular user to find out.

The public mailbox provides two "run-time variable" tracks which may be included in controller messages, to automatically inform users that there is public mail stored, and even for whom it is intended. Track 120 plays back only if there is public mail, and track 121 is the name listing of public mail. Track 120, or track 120 *and* 121 may be included in tail messages, IDs, and other messages to automatically remind users of mail present.

The public mailbox may also be manually interrogated by any user.

Control Operator Commands

Do I need to enter the Control Operator commands in a particular order?

No. At any time after powerup, you may enter any Control Op command to make a change. Remember that if power is lost, the DVR powers up to the default state indicated on page 8-1, and all recorded audio is lost. If power is susceptible to interruption, battery backup is recommended.

Message Editing

How many tracks can I string together in a controller message?

You're limited only by the character storage allotted in the controller.

With the *RC-850 controller*, each DVR track uses up two character slots. Say a message is allotted 6 characters, meaning one less for non-synthesized speech messages, or 5. There would be room for two DVR tracks. Possible examples would be (1) Two DVR tracks; (2) A single slot speech character followed by two DVR tracks; (3) A DVR track followed by a Morse code change type and two Morse characters.

With the *RC-85 controller*, you're limited by the number of characters used to list the playback tracks. Say a message is allotted 4 characters. Possible examples would be (1) P 1 P 2 (play tracks 1 and 2); (2) P 1 5 (play track 15); (3) P 1 0 0 (play track 100).

Recording

When I try to rerecord a track, it doesn't work.

A track must first be empty to allow recording. Erase it, then try recording. Tracks *power up* empty.

From the Phone

Where do I hook up the busy and serial data signals to the channel which is dedicated to the phone?

The busy signal isn't used. The serial data signal can be left unconnected, but if you're editing messages from the phone and you preview the message as you're editing it (with *2 command inside the

message editor), the message will be played out the repeater, since it's being commanded to play back by the controller channel, not the phone channel.

You can tie the serial data input of the phone channel to the serial data input of the repeater channel, then playback will be both through the phone and the repeater. Now, in addition to being able to preview controller messages from the phone, the phone answer and hangup messages may consist of DVR tracks, although they will also be played out the repeater. Future controller software may address this drawback.

How do I keep the phone from hanging up when I call the controller?

You can extend the controller's safety timer from 15 seconds to two minutes by entering any valid Control Operator level command. This will allow you time to record and preview tracks.

A user calling in on the phone may perform his mailbox operation in the 15 seconds provided. If more time is needed, provide telephone users with a Control Op level command to extend the timer.

The RC-850 controller provides ten User Mapped Control Operator level commands. Map a command, such as the Telephone Channel Timer Extend command, to the user level, and provide users with this command for extending the timer.

When playing back a DVR track, the message aborts in the middle of the track. Why? And what can I do about it?

The RC-850's external device timer may be set to too short a time value. Enter a longer time value for the external device timer. For example, if you have the RC-850 use DVR track number 15 as part of a message, and track 15 is 20 seconds long and the external device timer is set at 10 seconds, the DVR track will abort at 10 seconds into the message. It would be best to set the external device timer to the length of time of your longest DVR track message, but not longer than 75 seconds as the RC-850's external device timer is fixed in firmware at 75 seconds. Try to break down long DVR messages into more than one track.