Got a question? Be sure and check the manual supplement, "Most Often Asked Questions and Answers".

Touch-Tone is a registered trademark of American Telephone and Telegraph Company.

Copyright (c) 1987 Advanced Computer Controls, Inc.
All rights reserved
Printed in U.S.A.

Specifications subject to change without notice

RC-850 Controller Software Copyright (c) 1983, 1984, 1985 ACC
RC-850 Controller Command Codes Copyright (c) 1983, 1984, 1985, 1987 ACC
Add...

**Individual User Access Code (IUAC) Enabled / Disabled**

<table>
<thead>
<tr>
<th>Root 1</th>
<th>Root 2</th>
<th>Root 3</th>
<th>Root 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled</td>
<td>277</td>
<td>467</td>
<td>747</td>
</tr>
<tr>
<td>Disabled</td>
<td>278</td>
<td>468</td>
<td>748</td>
</tr>
</tbody>
</table>

**Purpose**

When the IUAC is enabled, the user commands with the IUAC attribute set are protected by requiring IUAC (as in previous versions). When IUAC is disabled, protected commands are made available to users without the need to enter their IUAC code.

**Remarks**

The ability to disable IUAC permits the repeater owner to selectively guard certain functions based on the time of day and/or day of week. The IUAC enable/disable status can be stored in macro sets for automatic selection by the scheduler.

**Transmitter Turn On Delay Enabled / Disabled**

<table>
<thead>
<tr>
<th>Root 1</th>
<th>Root 2</th>
<th>Root 3</th>
<th>Root 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled</td>
<td>227</td>
<td>417</td>
<td>697</td>
</tr>
<tr>
<td>Disabled</td>
<td>228</td>
<td>418</td>
<td>698</td>
</tr>
</tbody>
</table>

**Purpose**

When the Transmitter Turn On Delay is enabled and the repeater transmitter is currently off, a new signal will activate the repeater after a brief delay determined by the Transmitter Turn On Timer (as in previous versions). When Transmitter Turn On Delay is disabled, a new signal will activate the repeater immediately.

**Remarks**

The ability to disable the Transmitter Turn On Delay permits the repeater owner to selectively protect against spurious signals based on the time of day and/or day of week. The Transmitter Turn On Delay status can be stored in macro sets for automatic selection by the scheduler.
About This Manual . . .

This manual provides reference information for the Control Operator level commands provided by the RC-850 Repeater Controller.

Chapter 1 provides a general description of Control Operator level commands.

Chapter 2 provides a detailed description of each Control Op command with remarks, examples, hints and warnings. Once you acquire a working knowledge of the controller, it shouldn't be necessary to refer to this section.

Chapter 3 is a compact summary of the Control Op level commands with the actual root codes and command responses provided by the controller.

Table of Contents

1 Introduction
   Control Op Commands ... 1-1
   Macro Sets ... 1-1
   Scheduler ... 1-1
   Command Channels ... 1-1
   Response Messages ... 1-2
   Control Op Prefix and Root Set ... 1-2
   User Mapped Control Op Commands ... 1-3
   Command Entry From the Telephone ... 1-3
   Format ... 1-3
   Command Categories ... 1-4

2 Control Operator Commands
   Access and Command Modes ... 2-1
   Alarm ... 2-6
   Control Operator Utilities ... 2-7
   Courtesy Tone Selection ... 2-12
   ID Selection and Preview ... 2-13
   Macro Sets ... 2-15
   Patch ... 2-16
   Remote Bases / Links ... 2-23
   Repeater Timers ... 2-23
   Scheduler ... 2-25
   Speech Synthesizer ... 2-26
   Tail Messages ... 2-27

3 Command Summary
Look for these symbols:

[Hint]

Provides miscellaneous trivia and notes of interest associated with the use of a command.

[Warning]

Alerts you to potential pitfalls or dangers associated with the use of a command.
Chapter 1

Introduction

This chapter provides an overview of Control Operator level commands and describes the format of the reference section in the following chapter.

Control Op Commands
The Control Op commands permit the repeater's Control Operators to enable and disable various repeater functions and to place the repeater into its various modes of operation. They permit the Control Ops to comply with FCC regulations regarding control and regulate the day-to-day usage of the repeater and its features.

A full complement of independent commands are provided with each function or mode controlled independently of other functions or modes. The Control Op commands are always available for modifying the state of the controller.

Macro Sets
There are over two hundred Control Op commands. To simplify day-to-day operation, the controller can store ten complete sets of Control Op setup information. These Macro Sets are stored by the repeater owner in non-volatile memory. They permit the Control Ops to, in effect, execute a set of commands with a single code.

Macro Set #0 is special because it is always selected by the controller on powerup. The repeater owner can define exactly how he'd like the repeater to power up in case power is lost to the system and no battery backup is provided.

Scheduler
In addition to manual selection of the Macro Sets by the Control Op, the repeater owner may define time and day-of-week changeovers to the different Macro Sets. This provides for fully automatic, scheduled operation of the repeater, simplifying the chores for the repeater's Control Ops and enhancing the service provided by the repeater system. See the Operation Manual for details on the Scheduler.

Command Channels
Control Op Touch-Tone commands may be entered from any of the repeater's command channels including the main repeater receiver, the link / remote base receivers, the telephone line, the control receiver, and the local microphone.

Command entry through the repeater receiver, the link receivers, the phone line, the auxiliary decoder, and the serial ports may be inhibited by the repeater owner to enhance security. Command entry through the repeater receiver may also require sub-audible tone (PL) to guard command access.
Response Messages
The controller responds to Control Op commands in one of three ways:

(1) It may provide a unique response message for each command, verifying that you’ve entered the command you intended.

(2) It may respond with a programmable “generic” message, acknowledging entry of a Control Op level command without identifying which command was entered. This mode enhances system security by providing no clues as to what your command accomplished.

(3) It may provide no response of any kind.

The response mode is selectable with one of three Control Op commands. The generic response message may be programmed by the repeater owner using the message editor (Programming Reference Manual).

The response is provided to one of several channels depending on the command input channel.

<table>
<thead>
<tr>
<th>Command Channel</th>
<th>Response Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeater receiver</td>
<td>Repeater transmitter</td>
</tr>
<tr>
<td>Link / Remote receivers</td>
<td>Repeater / link / remote transmitters</td>
</tr>
<tr>
<td>Control receiver</td>
<td>Repeater transmitter</td>
</tr>
<tr>
<td>Telephone</td>
<td>Telephone</td>
</tr>
<tr>
<td>Local microphone</td>
<td>Local speaker</td>
</tr>
<tr>
<td>Auxiliary decoder</td>
<td>Repeater transmitter</td>
</tr>
</tbody>
</table>

Control Op Prefix and Root Set
The Control Op command codes consist of a prefix, which is remotely programmable by the repeater owner, followed by three-digit root codes defined later in this manual. The prefix may be between one and seven digits long and can include Touch-Tone 0-9, *, and A-C. The Control Op commands therefore may be between four and ten digits long. The entire command is sent as one sequence, i.e., prefix-root. Long commands enhance security; short commands are easier to remember. The command code prefix and root set selection can be changed at any time by the repeater owner.

Four complete sets of root codes are available and one of the four is selected for use by the repeater owner. The ability to change to a different root set enhances security by allowing the repeater owner to completely change the command root codes. Of course, he can change the prefix at any time as well.
User Mapped Control Op Commands
The repeater owner may specify up to ten Control Op commands to be available as User level commands, with a separate command code prefix. This allows users, or another level of Control Operator, to access a small set of Control Op commands without the need to widely release the Control Op prefix and root codes. The User Mapped Control Op command is described in detail in the Programming Reference Manual.

Command Entry From the Telephone
When entering commands over the air, the controller knows you're done entering tones when it sees your carrier drop. It then evaluates the Touch-Tone command you've sent. When controlling over the phone, there's no "carrier" to drop. It therefore is necessary to terminate a Touch-Tone command with the # key, which serves as an "Enter" key. When the controller sees the #, it evaluates and acts on the command you've entered.

For example, if the Control Op command is 4932031, it should be entered over the telephone as "4932031#".

An alternate Control Op prefix can apply to control over the telephone. For example, it may be desirable to include fourth column keys for the "over the air" code prefix to enhance security. Since there is no fourth column on most Touch-Tone phones, however, you may want to stick to the 12 keys on a regular phone. The repeater owner can define the telephone Control Op prefix to be the same as the over-the-air code or to be different.

If you make a mistake when entering a command over the phone, simply wait a few seconds to allow the command decoder's interdigit timer to clear the command buffer before proceeding. The interdigit timer value is programmed by the repeater owner and is typically set at approximately five seconds.

Format
Chapter 2 of this manual follows the following format:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
<th>Remarks</th>
<th>See Also</th>
<th>Example</th>
<th>Hint</th>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shows the Control Op Command name.</td>
<td>Summarizes what the command does.</td>
<td>Describes how to use the command.</td>
<td>Cross-references to related sections of this and other manuals.</td>
<td>Gives sample situations that illustrate use of the command.</td>
<td>Provides misc. trivia associated with use of the command.</td>
<td>Alerts you to potential dangers associated with use of the command.</td>
</tr>
</tbody>
</table>

The actual Control Operator commands consist of

prefix + root code [ + terminator on phone line ]
For example, let's assume that the over-the-air Control Op prefix is **A943**, the telephone Control Op prefix is **4943**, and root set 3 is selected. These are all determined by the repeater owner with programming commands.

The command to enable the repeater system over any of the command channels *except the telephone* is

**A943501**

The command entered over the phone is

**4943501 #**

If the "Unique Response Message" Command Acknowledge mode is selected, the controller responds to the command with "**Repeater E**". In the "Generic Response" mode, it responds with the programmable Control Op Response Message, such as "**dit-dit**". If the "Response Off" mode is selected, there is no response to the command.

**Command Categories**
Commands are described in Chapter 2 in alphabetical order by major category, including

- Access and Command Modes
- Alarm
- Control Operator Utilities
- Courtesy Tone Selection
- ID Selection and Preview
- Macro Sets
- Patch (Autopatch, Autodialers, Reverse Patch)
- Remote Base / Links
- Repeater Timers
- Scheduler
- Speech Synthesizer
- Tail Messages

Chapter 3 provides a command summary with the actual root codes and response messages for each command.
Chapter 2
Control Operator Commands

Access and Command Modes
- Access Modes
- Kerchunk Filter
- Repeater Receiver Enable / Disable
- Repeater Transmitter Enable / Disable
- Repeater System Enable / Disable
- Touch-Tone Cover Tone
- Touch-Tone Muting
- User Command Enable / Disable
- VOX Mode

**Access Modes** [COP = Control Operator, TT = Touch-Tone, PL = PL Tone]
Mode A - Carrier Access and Carrier User/COP Command
Mode B - Carrier Access and User Command; PL Required For COP Commands
Mode C - Carrier Access, but PL Required For User and COP Commands
Mode D - PL Required for Access and User/COP Commands
Mode E - TT Up Required for Access and User/COP Commands
Mode F - TT Up Required for Access and User Commands;
TT Up and PL Required for COP Commands
Mode G - TT Up Required for Access; TT Up and PL Required for User
and COP Commands
Mode H - TT Up and PL Required for Access and User/COP Commands
Mode I - TT Up or PL Required for Access; PL Required for User/COP Commands
Mode J - TT Up or PL Required for Access and User Commands;
PL Required for COP Commands
Mode K - TT Up or PL Required for Access and User/COP Commands

**Purpose**
The Access and Control Mode commands cause the system to require a
combination of carrier, PL, and Touch-Tone “up” for access and control of the
repeater.

**Remarks**
The access modes are described in detail in the Operation Manual.

**See Also**
Operation Manual – “Access Modes”

**HINT**
When entering a command through the main repeater receiver to place the
repeater in a mode requiring PL for Control Op level commands, PL must be
present on your signal.
Kerchunk Filter
Kerchunk Filter Enable
Kerchunk Filter Disable

Purpose
To enable or disable the Kerchunk Filter.

Remarks
The Kerchunk Filter discourages users from “Kerchunking” the machine. When the repeater transmitter is off, a new user with a brief transmission (less than 750 ms) is retransmitted with zero hang time. Since the user doesn’t hear a carrier when he unkeys, he’s encouraged to make a longer transmission – long enough to ID while he’s at it.

Example
Our repeater transmitter has a vacuum tube final with relay switching. We don’t want to let the transmitter come up for just a fraction of a second at a time, so we operate with the Kerchunk Filter disabled. A brief signal at the repeater receiver input will bring up the transmitter for the full hang time.

Repeater Receiver Enable/Disable
Repeater Receiver Enable
Repeater Receiver Disable

Purpose
The Repeater Receiver Disable command effectively removes the repeater receiver from the system.

Remarks
The Repeater Receiver Disable command is useful during teleconference nets, Westlink bulletin transmissions, and other times when retransmitting signals from the repeater input frequency is not desired.

Hint

When the repeater receiver is disabled, User level commands entered on the receiver frequency are ignored. Control Op level commands may be entered, however, by preceeding and following the command with the Touch-Tone D key.

Warning

When the repeater receiver is disabled, be aware that users with emergency traffic cannot use the system.
Example
We'd like to transmit a Westlink bulletin through the command receiver input to the repeater. We can disable the repeater receiver to ensure there is no interference caused to the bulletin transmission through the repeater. We can re-enable the receiver on the receiver frequency with the Touch-Tone command “D [Repeater Receiver Enable Control Op command] D”.

Repeater Transmitter Enable/Disable
Repeater Transmitter Enable
Repeater Transmitter Disable

Purpose
The Repeater Transmitter Disable command effectively removes the repeater transmitter from the system.

Remarks
The Transmitter Disable command is useful when it's desirable to keep link or remote base transmitters enabled, but inhibit the main repeater transmitter.

Repeater System Enable/Disable
Repeater Enable
Repeater Disable

Purpose
The Repeater System Disable command inhibits all transmitters in the system. It also inhibits all User level command entry except from the local microphone.

Remarks
These commands are, in effect, the repeater’s “big switch”. Control Op and Programming commands will be accepted and carried out, but the repeater is effectively “off the air”.

Example
We'd like to completely shut down our repeater at night. We can do this with the Repeater Disable command.

Touch-Tone Cover Tone
Touch-Tone Cover Tone Enable
Touch-Tone Cover Tone Disable

Purpose
To enable or disable the cover tone which replaces a user's muted Touch-Tone command sequence.
Remarks
The Touch-Tone Cover Tone is available to indicate to users that someone is currently entering a Touch-Tone command and replaces the silence that would result from muted Touch-Tones.

The cover tone is a programmable message which may be a Morse code character (such as "dit-dit, dit-dit") or a sound effect (such as "tic-toc"). The message should be kept short, using one or two characters.

See Also
Touch-Tone Muting

Touch-Tone Muting
Mute Touch-Tone
Unmute Touch-Tone after Pound Key
Unmute Touch-Tone

Purpose
These commands determine if Touch-Tone commands entered at the repeater's main receiver are muted from passing through to the transmitters and phone line.

Remarks
The controller is capable of fully muting Touch-Tone through the system. Its audio delay line allows it to detect Touch-Tone before the delayed audio reaches the transmitter.

Muting Touch-Tone through the repeater makes listening more pleasant. At times, however, users may want to pass tones through to the phone line or through the remote base transmitters to control other repeaters or remote bases. The Unmute Touch-Tone After Pound mode normally causes tones to mute, but the user has the opportunity to pass tones through the system by hitting # as the first key of a tone sequence. The # is muted, but the following tones are unmuted and ignored by the controller.

The Unmute Touch-Tone command causes all Touch-Tones to be heard through the repeater; these tone sequences are evaluated by the controller for valid codes.

WARNING
If Touch-Tones can be unmuted, it is possible for users to pass tones directly through to the phone line, which can compromise the system's long distance protection.

See Also
Touch-Tone Cover Tone
User Command Enable / Disable
User Command Group A Enable
User Command Group A Disable
User Command Group B Enable
User Command Group B Disable
User Mapped Control Op Command Enable
User Mapped Control Op Command Disable
Touch-Tone Pad Test Enable
Touch-Tone Pad Test Disable
Spare Audio 1 Enable
Spare Audio 1 Disable

Purpose
These commands enable and disable various classes of User level commands.

Remarks
The various User level commands which do not have independent enable/disable capability may be assembled into two groups, using Command Code Attributes (see Programming Reference Manual). These groups may then be enabled and disabled as groups by a Control Op. In addition, several of the User commands may be enabled and disabled independently, such as the User Mapped Control Op commands, Touch-Tone Pad Test, Spare Audio 1 function, the Autopatch and Autodialers, and Remote Bases.

See Also
Patch (Autopatch, Autodialers, Reverse Patch)
Remote Base / Linking

Example
At night, we'd like to disable the mailbox, paging, and the remote control logic outputs. The repeater owner has grouped these functions into "Group B". The Control Op, or the Scheduler, can disable all of these functions by disabling Group B User commands.

HINT
User command functions without individual enable/disable capability may be grouped into Group A or Group B.

VOX Mode
VOX Mode Enable
VOX Mode Disable

Purpose
When the VOX Mode is enabled, the VOX logic input must be active before the repeater transmitter will turn on.
Remarks
The VOX Mode is independent of the Access/Control modes and its requirements are in addition to those defined by the selected mode.

When the VOX Mode is enabled, a new signal at the repeater receiver when the repeater transmitter is off requires the VOX logic input to be low (active) in order to bring up the transmitter. Holding the VOX logic input high (inactive) prevents the repeater transmitter from responding to the new signal, and commands which may be entered are ignored. The VOX logic input may connect to an external VOX detector, or other circuitry, to limit access or prevent keyups due to noise and intermod.

Alarms
Alarm 1 Enable / Clear
Alarm 2 Enable / Clear
Alarm 3 Enable / Clear
Alarm 4 Enable / Clear

Alarm 1 Disable / Clear
Alarm 2 Disable / Clear
Alarm 3 Disable / Clear
Alarm 4 Disable / Clear

Disable / Clear All Alarms

Purpose
The alarm commands allow enabling and disabling the alarm inputs and clearing current latched alarm conditions.

Remarks
The alarm functions are latching: once an alarm input is activated, the alarm condition remains even though the input which triggered it has been removed. The alarm condition may be cleared by entering either the Alarm Enable or Alarm Disable command. If the trigger input is still active when the condition is cleared, the input must return to the inactive state and then back to the active state in order to re-activate the alarm.

Alarms bring up the repeater transmitter to announce programmable alarm messages. The announcement occurs every ten seconds, for a period programmed by the repeater owner. If the programmed period elapses without entry of a clear command, the alarm message is left in the electronic mailbox, for Call Sign Slot 78, from Call Sign Slot 79.

Example
Alarm 1 is connected internally to the transmitter PA heat sink temperature sensor. The PA overheats and activates Alarm 1 with an over-the-air announcement, “power amp’s over temperature”. The Control Op can re-enable Alarm 1 to clear it and suggest that users standby to allow the transmitter to cool.
WARNING

Advanced Computer Controls, Inc., specifically disclaims any liability resulting from improper operation of the alarm functions. They should not be relied upon to warn of life or property threatening conditions.

Control Operator Utilities

- Clock Adjust
- Command Acknowledgement Mode
- Control Operator On-Air From Telephone
- Dummy
- Listen on Telephone
- Mailbox – Erase All Messages
- Manual Phone Patch
- Microcomputer Reset
- Power High / Low / Interrogate
- Readback Last Phone Number Dialed
- Retransmit Control Receiver
- Telemetry Min / Max Memory Clear
- Telephone Command Channel Timer Extend

Clock Adjust

Purpose
This command allows a Control Op to synchronize the time-of-day clock seconds to an accurate time source.

Remarks
If the “seconds hand” is at less than 30, this command resets seconds to zero. If it’s greater than 30, minutes are incremented by one and seconds set to zero.

The clock has a cumulative error due to finite accuracy and temperature drift in its time base. This command provides a simple way to periodically adjust the clock.

Example
We noticed that the clock is off by about 20 seconds. We can listen to WWV or another accurate time source and enter the Clock Adjust command “straight up”, or right on the minute to synchronize the internal clock.

Note
If the time is in error by more than 30 seconds, the clock must be set using the “Time of Day Set” Programming command.
Control Operator's Reference Manual

Command Acknowledgement Mode
Unique Response Message
Generic Response
Response Off

Purpose
To select the Control Op command acknowledgement mode.

Remarks
The controller can respond to each Control Op command with a unique acknowledgement to verify that the intended command was entered. Or, as an alternative, it can respond with a programmable "generic" message, such as a Morse "dit-dit", simply to acknowledge that a Control Op level command was accepted. The generic response is useful if you're concerned about someone trying to monitor your control activities. Finally, the response can be completely inhibited so there's no clue that a Control Op command was entered.

Control Operator On-Air From Telephone
Control Op On-Air
Phone Onhook (or User level Hangup command)

Purpose
To place the Control Op calling into the repeater phone on the air and to hang up.

Remarks
A Control Operator may call the repeater system on the phone and place himself/herself on the air. Once activated, the patch proceeds like a normal Autopatch, with Autopatch timers running. However, control is retained on the phone line, and the patch may be hung up either with the Control Op Phone Onhook command or the User level Hangup command.

Your Touch-Tone commands from the telephone aren't muted, so it's best to hang up with the User level Hangup command (followed, of course, by #) to keep your Control Op prefix secure. Be aware that you may have difficulty hanging up because receiver audio is mixed with your telephone audio. The Touch-Tone decoder cannot decode Touch-Tone in the presence of speech.

Example
You, a Control Op, receive a call on the repeater, but your HT can't get into the repeater from your location. You may call the repeater on the phone and place yourself on the air to talk with the other user.

Dummy

Purpose
A Control Op level command available for clearing out User Mapped Control Op slots.
Listen on Phone
Listen on Phone On
Listen on Phone Off

Purpose
To allow a Control Op to listen-only to the repeater receiver from the phone.

Remarks
These commands are useful when you want to listen to the repeater but you're out of range, or in diagnosing possible intermod and "grunge" by allowing you to listen to the receiver with the repeater transmitter off.

Example
We're having an intermod problem but we're not sure if it's caused by our repeater transmitter. A Control Op can call the repeater, disable the repeater transmitter or the repeater system, and listen for junk on the receiver.

HINT
The Control Op timer runs during this mode, so it's necessary to enter a valid Control Op command at least every two minutes to prevent the controller from hanging up. This timer is there for your protection: without it, if you got disconnected, you'd have to go up to the hill to reset the machine! When you hang up or the timer times out, the Listen on Phone mode is cancelled.

WARNING
Audio from the receiver also gets to the Touch-Tone decoder. That means that if there is continuous receiver activity, it may be difficult to work in Touch-Tone commands because of the receiver audio mixed with your Touch-Tones.

Mailbox - Erase All Messages

Purpose
This command allows a Control Operator to erase all mailbox messages currently loaded in memory.

Remarks
Users may load and erase individual messages in the controller's electronic mailbox. In addition, the system itself may leave messages for users and Control Ops. All messages may be erased with this one command.

Example
The mailbox has become cluttered. It's late, and everyone has probably already gotten their mail. We can clear out the mailbox with this one command.
Manual Phone Patch
Phone Offhook (pick up the phone)
Phone Onhook (hang up the phone)

Purpose
These commands allow a Control Op to manually “pick up” or hang up the phone.

Remarks
Most patch activity is supervised by the controller. However, a Control Op has the ability using these commands to manually go offhook and then pass Touch-Tone digits directly through to the phone line to place a call. The Autopatch timers do apply to a call initiated in this way. The call is directed to Local Phone Line #1.

The Phone Onhook command may also be used to hang up the patch in case a user selected a Custom Hangup Code but forgot the code that he selected.

WARNING
No long distance protection applies to calls placed in this way.

Microcomputer Reset

Purpose
This command causes the controller’s microcomputer to perform a “warm start”, which is similar to pushing the reset button.

Remarks
The controller resets to Macro Set #0. Unlike a power-up reset, time, mailbox, and meter channel high/low information are preserved. The reset command is seldom used, but is available in case you’re confused about the state the controller is in.

Power High / Low / Interrogate
High Power
Low Power
Power Interrogate

Purpose
These commands operate the Power Amp control output from the controller.

Remarks
The Power Amp control output may be wired to circuitry to place an rf amp in or out of the transmitter path.

The “high power” state results in the PA logic output to be on (logic low).
Example
We like to normally operate our repeater in high power. But during the day our transmitter mixes with another at the site and sometimes interferes with a construction company commercial repeater, so we turn off the PA during the day to eliminate the problem.

Readback Last Phone Number Dialed

Purpose
This command allows the Control Op to read the last telephone number dialed through the autopatch.

Remarks
The last number dialed through the patch is stored by the controller for this readback purpose and also for "Last Number Redial" purposes. It is cleared approximately fifteen minutes after the call.

Retransmit Control Receiver
Control Receiver Retransmit On
Control Receiver Retransmit Off

Purpose
These commands determine whether control receiver activity is retransmitted over the main repeater transmitter.

Remarks
The control receiver is normally used as an over-the-air command channel for Control Ops. It wouldn't be desirable for command activity to be retransmitted. At times, however, the control receiver can be a useful audio input channel to the repeater, such as for overriding audio from the repeater receiver.

Example
Our main repeater receiver blew up. A Control Op would like to inform users of what happened. He can do this by turning the Control Receiver Retransmit on and then giving the information through the control receiver.

Telemetry Min / Max Memory Clear
Clear Telemetry Channel xx (xx = channel 33-80)

Purpose
This command clears the memory which stores a running high or low measurement for a particular telemetry channel.

Remarks
The controller periodically measures each telemetry channel and stores the minimum and maximum measurement for each channel, tagged with the time and date of the measurement.
The memories might typically be cleared periodically and may be done manually with the Control Operator level command, and by scheduler events.

Channels 33-64 store the high values of measurement channels 1-32 (high memory = channel + 32). Channels 65-80 store the low values of channels 1-16 (low memory = channel + 64). Internal telemetry channels 25-29 may be cleared by specifying channels 57-61 respectively.

**Telephone Command Channel Timer Extend**

**Purpose**
To extend the safety timer by two minutes when controlling from the telephone.

**Remarks**
The telephone timer is automatically extended by any valid Control Op level command. This command is also available specifically for that purpose.

The timer protects a Control Op from being accidentally disconnected from the controller, which would otherwise require someone to press the controller's reset button.

**Example**
You've called the repeater on the telephone and are listening to the repeater receiver. Periodically, you enter the Timer Extend command to prevent the controller from hanging up.

**Courtesy Tone Selection**

Select Courtesy Tone #1
Select Courtesy Tone #2
Select Courtesy Tone #3
Select Courtesy Tone #4
Select Courtesy Tone #5
Select Courtesy Tone #6
Select Courtesy Tone #7
Select Courtesy Tone #8
Deselect Courtesy Tone

**Purpose**
These commands affect which Courtesy Tone is generated at the end of each user transmission. The Control Op selection is merged with UT hardware input to determine which tone set is actually used.
Remarks
The Courtesy Tone indicates to users that the repeater's timeout timer has been reset and that the next user may begin to transmit. In addition to these functions, the actual tone generated may convey information to users, such as status of the repeater.

Courtesy Tone selection is prioritized – the highest selected tone is the one which is generated. Tones are selected by Control Op command shown above or by UT hardware inputs to the controller. For example, if tone 1 is selected by the UT inputs and tone 7 by the Control Op, tone 7 will be generated at the end of the user's transmission.

Example
We have received word of a weather emergency and we'd like to indicate the situation to users through the Courtesy Tone. CT7 has been predefined by the repeater owner as Morse code "WX". We can select Courtesy Tone #7 with the command above. Since it is a high priority tone, it will be generated unless tone 8 (an even higher priority tone) is selected by the UT inputs.

See Also
Operation Manual – "Courtesy Tones"

ID Selection and Preview

ID Selection
Select Pending ID 1
Select Pending ID 2
Select Pending ID 3
Select Special ID
Select Rotate PID 1-2-3
Select Rotate PID 1-2-3 - Special ID

Purpose
These commands allow selection of the ID messages to be generated at the Pending ID times.

Remarks
One ID of four may be selected (Pending ID's 1-3 or the Special ID) or the ID's may rotate among the three or four IDs for variety.

Example
Our Special ID may be a "net reminder" message which we want to use for a few hours before our weekly net. Selecting "Rotate PID1-2-3 - Special ID" causes that ID to be announced periodically at Pending ID times.
The above commands are mutually exclusive; that is, only one is in effect at any given time. The Pending ID 3 message varies with the currently selected Macro Set as determined by the Scheduler or Control Operator Macro Set command.

**WARNING**

The controller assumes that any ID selected for use actually contains a valid call sign identification announcement, and the ID timers are therefore reset after each announcement. Failure to include actual call sign information in ID messages selected will result in the repeater not properly ID'ing. If, however, the ID message is **empty**, the controller reverts to the Forced CW ID Message.

### Periodic ID Enable / Disable

Periodic “QST” ID Disable  
Periodic “QST” ID Enable

**Purpose**

The Periodic ID Enable command causes the repeater to ID at fixed intervals when there is no repeater activity.

**Remarks**

The Periodic Repeater “QST” ID is generated when the repeater has not been in use for some time. It operates as follows: after repeater usage ceases, a “cleanup” Pending ID is generated followed by periodic generation of the QST ID.

**Example**

Our repeater operates in PL access because of noise generated at the repeater site. Since it is an open repeater, we’d like to inform potential users of the repeater’s status and PL frequency. With the Periodic ID enabled, and when the repeater is not in use, it will periodically announce a message such as “This is WA6AXX Repeater, an open system, PL access 100 Hz”. This capability is turned off at night when Control Operators go to bed.

**WARNING**

The Periodic ID should only be enabled when a Control Operator is on duty at a local or remote control point of the repeater since automatic control of bulletin transmissions is not authorized on repeater output frequencies by Part 97.
Control Operator's Reference Manual

**Preview ID Messages**
Preview Initial ID Message (1 of 3 Initial IDs randomly selected)
Preview Forced CW ID Message
Preview Anxious ID Message
Preview Pending ID #1 Message
Preview Pending ID #2 Message
Preview Pending ID #3 Message (Pending ID #3A-3E for current Macro Set)
Preview Special ID Message
Preview Periodic QST ID
Preview Touch-Tone Access Down ID
Preview Auxiliary Transmitter Pager ID
Preview Auxiliary Transmitter Phone ID

**Purpose**
These commands allow a Control Operator to preview the ID messages currently stored in memory.

**Remarks**
The ID message is generated over the main repeater transmitter. It is considered a valid ID and resets ID timers.

**Macro Sets**

**Macro Set Selection**
Select Macro Set #0 through #9

**Purpose**
These commands allow manual selection of one of the ten stored Macro Sets.

**Remarks**
Macro Sets may be selected manually by a Control Operator using these commands, and they may also be selected automatically at predefined times and days of the week by the Scheduler.

The Macro Sets contain the entire Control Operator setup information for the controller plus remote base and remote control logic output states as programmed by the repeater owner. Manually selecting a Macro Set loads all the stored information. (The scheduler can load selected portions of the Macro Set as defined by changeover “attributes”.)

**Example**
We just learned of a weather emergency. A Control Operator may manually select Macro Set 7, which the repeater owner has defined for just such an emergency. The set includes a unique courtesy tone, a “Weather alert!” tail message and ID, and it turns off the Scheduler. The selected state will remain in effect until the Scheduler is turned back on, or another Macro Set is selected, after the weather emergency.
Macro Set Interrogate
Interrogate Current Macro Set

Purpose
This command allows a Control Operator to determine which Macro Set, selected either manually or by the Scheduler, is currently in force and if any Control Op level changes have been made since the set was selected.

Remarks
The Control Op may at times want to determine which Macro Set is currently selected. For example, after programming the Scheduler, he may check that it is operating the way he expects by periodically checking the current set.

Example
In the weather emergency situation described above, the new Control Op coming on duty wants to be sure the proper Macro Set is selected and determine if any changes have been made since the Macro Set was selected.

Patch (Autopatch, Autodialers, Reverse Patch)

- Custom Hangup Code
- Dial Without Click
- Full-Duplex
- Long Distance
- Mute / Hear Dial Tone and Signalling
- Patch Cover Tone
- Patch Enable / Disable
- Patch Timers
- Phone Number and Autodial Location Readback
- Reverse Patch Mode, “Don’t Answer Next Time”
- User Loadable Autodialer Lock / Unlock

Custom Hangup Code
Custom Hangup Code Enable
Custom Hangup Code Disable

Purpose
These commands enable or disable the user selectable Custom Hangup Code function.

Remarks
The Custom Hangup Code allows the user to define his own three-digit hangup code just prior to making a patch in order to prevent someone from maliciously hanging up the patch on him.
Dial Without Click
Dial Without Click Enable
Dial Without Click Disable

Purpose
These commands determine whether the user must "click" his microphone button to initiate dialing of Autopatch and User Loadable Autodialer calls.

Remarks
Activating the Autopatch and User Loadable Autodialer can require the user to click his microphone switch at a pause in the controller's readback of his command. This allows the user to select whether the controller reads back the autodial location and phone number. It provides a degree of security in access to the patch since it isn't obvious to the uninitiated how to activate the patch.

Full-Duplex Mode
Full-Duplex Enable
Full-Duplex Always On

Purpose
These commands cause the patch to be user selectable as full-duplex or to always operate full-duplex.

Remarks
Telephone audio during a patch normally is muted while the mobile is transmitting (half-duplex). This allows the mobile to immediately block inappropriate remarks made by the party on the phone by simply keying his microphone.

In the Full-Duplex Mode, however, phone audio is not muted while the mobile transmits. This allows users with a full-duplex radio or a pair of ordinary transceivers to make patches allowing them to talk and listen at the same time.

The activity timer is disabled in the Full-Duplex Mode.

When Full-Duplex Always On is selected, the user may specify half-duplex for a particular call, by entering the User level "Duplex" command. Following that call, the controller returns to Full-Duplex Mode for future calls.

Long Distance
Primary Autopatch Long Distance Enable/Disable
Secondary Autopatch Long Distance Enable/Disable
Tertiary Autopatch Long Distance Enable/Disable

(Access and Command Modes) 2 - 17
Purpose
These commands permit or prevent long distance telephone calls from being placed through the Autopatch.

Remarks
The controller has a sophisticated toll-restrict, or long distance protect capability, described in the Operation Manual. These commands enable or disable long distance dialed through the Autopatch.

Example
We would like our Primary Autopatch to be toll restricted since the command code is widely distributed. We provide a non-restricted Secondary Autopatch command to selected users.

See Also
Operation Manual - "Telephone Interconnect" / Toll Restrict

⚠️ WARNING
The long distance protection does not apply to the Emergency Autodialer or User Loadable Autodialers, nor does it affect calls placed manually using the Control Op Offhook Command.

Mute / Hear Dial Tone and Signalling
Mute Patch Dial Tone and Signalling
Hear Patch Dial Tone and Signalling

Purpose
To allow the burst of dial tone and DTMF signalling to be heard when the patch is activated or to keep it muted.

Remarks
The Autopatch and Autodialers operate in a store and forward fashion. After the command is entered, the repeater automatically takes the phone offhook and dials the phone number for the user.

Allowing the user to hear the signalling may help to determine the cause of any improper operation (such as dial tone not present or not enough digits in the phone number). Some systems may prefer the signalling to be muted.

💡 HINT
When accessing a remote phone line through the links, the controller automatically passes DTMF signalling down the link regardless of this selection.
**Patch Cover Tone**

Patch Cover Tone Disable
Patch Cover Tone Enable
Patch Cover Tone Always On

**Purpose**

These commands determine whether the Patch Cover Tone is available to users automatically, on request, or not at all.

**Remarks**

The Patch Cover Tone is a programmable tone or sound effect which replaces the mobile audio through the repeater during a patch. It offers semi-privacy to the user since only the telephone side of the conversation is heard over the repeater transmitter.

The cover tone may be disabled by a Control Op, or it may be optionally available to users when they specifically enter the Patch Cover Tone User command, or it may be enabled by a Control Operator for all calls.

**Example**

The Cover Tone could be enabled evenings and weekends to allow semi-private personal calls, but disabled on weekdays when there may be temptation to use it to hide inappropriate (i.e., business) patch traffic.

![WARNING]

The Control Operator on duty during a patch should ensure that the Cover Tone is not used to hide a business or other inappropriate call in the Amateur service.

![HINT]

If Full-Duplex Always is selected, or during a user selected full-duplex call, activating the Cover Tone places the patch in the half-duplex mode so that the user is effectively covered.

**Patch Enable / Disable**

Primary Autopatch Command Enable
Primary Autopatch Command Disable
Secondary Autopatch Command Enable
Secondary Autopatch Command Disable
Tertiary Autopatch Command Enable
Tertiary Autopatch Command Disable
User Loadable Autodialer Bank 0 Command Enable
User Loadable Autodialer Bank 0 Command Disable
User Loadable Autodialer Bank 1 Command Enable
User Loadable Autodialer Bank 1 Command Disable
User Loadable Autodialer Bank 2 Command Enable
User Loadable Autodialer Bank 2 Command Disable
Primary Emergency Autodialer Command Enable
Primary Emergency Autodialer Command Disable
Secondary Emergency Autodialer Command Enable
Secondary Emergency Autodialer Command Disable
Reverse Patch Enable
Reverse Patch Disable

**Purpose**
These commands allow enabling and disabling the patch-related capabilities of the controller.

**Remarks**
The Autopatch has three access commands (Primary, Secondary, and Tertiary), and the Emergency Autodialer has two access commands which may be enabled or disabled independently. This allows, for example, assigning an "open" and "closed" set of codes for these functions. The three User Loadable Autodialer command pairs refer to the three separate banks of stored autodial numbers.

**Example**
We can shut off the open Autopatch, open Emergency Autodialer, and Reverse Patch at night while leaving enabled a closed Autopatch and Emergency Autodialer along with the User Loadable Autodialer.

**Patch Timers**
Patch Timer Enable
Patch Timer Disable

**Purpose**
The Patch Timer commands enable and disable the patch timeout and activity timers for the Autopatch, Autodialers, and Reverse Patch.

**Remarks**
The timer may be disabled before or during a patch to prevent a timeout.

**WARNING**
Disabling the patch timers for normal operation is discouraged. If you would prefer not to limit overall patch durations, you may effectively disable the appropriate overall timer by programming its value to zero (see Programming (Access and Command Modes))
Reference Manual). The Patch Timers may then be left Control Op enabled so that the Patch Activity Timer will protect against an "orphan" patch due to a user driving out of range and therefore being unable to terminate the call.

**Phone Number and Autodial Location Readback**

- Optional Autopatch Phone Number Readback
- Forced Autopatch Phone Number Readback

- Optional User Loadable Autodialer Phone Number Readback
- Disable User Loadable Autodialer Phone Number Readback

- Enable User Loadable Autodialer Location Readback
- Disable User Loadable Autodialer Location Readback

- Female Voice Phone Number Readback
- Male Voice Phone Number Readback
- Morse Code Phone Number Readback

**Purpose**

These commands determine if and how Autopatch and User Loadable Autodial phone numbers and User Loadable Autodial locations are read back to the user when activating the patch.

**Remarks**

When activating the Autopatch, the phone number entered may be read back as confirmation either as a user option or mandated. Readback of phone numbers, in addition to helping prevent wrong numbers, allows a Control Operator to keep tabs on what number is being called. However, it may be desirable to inhibit readback because in some areas readback of phone numbers over the air may be an invitation for abusive calls. User Loadable Autodialer locations and phone numbers may or may not be confirmed for similar reasons.

The phone number readback may be in the male or female voice or in Morse code to enhance security.

**Example**

We may want Autopatch phone numbers read back during the day when the "open" Autopatch is up but leave it as a user option at night when only the "closed" Autopatch is up.

**Reverse Patch Mode**

- Select Reverse Patch Mode 0
- Select Reverse Patch Mode 1
- Select Reverse Patch Mode 2

Don't Answer Next Time
Purpose
These commands select the mode of operation of the reverse patch and phone line control.

Remarks
Mode 0 causes the controller to auto-answer the phone and requires the Reverse Patch User level command to activate the reverse patch.

Mode 1 causes the controller to auto-answer, and if a valid command is not received within five seconds, automatically initiates a general reverse patch ringout.

Mode 2 causes the controller to automatically ring out when the phone rings without answering the phone unless a user answers the reverse patch.

The “Don’t Answer Next Time” command instructs the controller not to answer the phone the next time it rings. This permits an auto-answer modem sharing the same phone line to answer and allow remote computer access to the controller. The “don’t answer” request will time out in two minutes – after two minutes, the controller will again answer the phone normally.

⚠️ WARNING

One or more Reverse Patch modes may not be legal in the Amateur Service.

User Loadable Autodialer Unlock / Lock
User Loadable Autodialer Bank 0 Unlock
User Loadable Autodialer Bank 0 Lock
User Loadable Autodialer Bank 1 Unlock
User Loadable Autodialer Bank 1 Lock
User Loadable Autodialer Bank 2 Unlock
User Loadable Autodialer Bank 2 Lock

Purpose
These commands permit or prevent changes to telephone numbers stored in the User Loadable Autodialer.

Remarks
Telephone numbers in the User Loadable Autodialer may be loaded and erased by repeater users or by any class of user given the Load/Erase command codes. The Autodialer banks can be locked to prevent modification to the numbers stored.

Each bank of numbers can be locked independently.
Example
Bank 0 autodial numbers may be assigned to additional public service agencies, Control Operator home phone numbers, etc. Banks 1 and 2 may be openly available to users for storage of numbers of their choice. Bank 0 could be normally kept locked, while Banks 1 and 2 might be left unlocked.

Remote Bases / Links

Remote Base Enable / Disable
Remote Base / Link 1 Enable
Remote Base / Link 1 Disable
Remote Base / Link 2 Enable
Remote Base / Link 2 Disable
Remote Base / Link 3 Enable
Remote Base / Link 3 Disable
Remote Base / Link 4 Enable
Remote Base / Link 4 Disable

Purpose
These commands enable and disable the controller's Remote Base and Link User level commands.

Remarks
The remote base and link transceivers can be controlled by User commands. Users can activate the remotes and links in Receive Only or Receive/Transmit modes and can change frequencies of the remotes. A Control Operator can disable the remotes and links with these commands.

When disabled, command entry from the links is disabled.

These commands do not disable the link transmitters for remote phone line access and paging.

Example
We can disable the remotes at night with these commands.

Repeater Timers

- Repeater Activity Timer Enable / Disable
- Timeout Timer Clear
- Timeout Timer Enable / Disable
- Timeout Timer Select

Repeater Activity Timer Enable/Disable
Repeater Activity Timer Enable
Purpose
To enable or disable the Repeater Activity Timer.

Remarks
The Repeater Activity Timer may automatically reload the currently selected Macro Set following a period of inactivity on the repeater receiver channel. It effectively "undoes" any User or Control Op activated changes to the currently selected Macro Set. It may be desirable for this function to be enabled or disabled under different circumstances.

Example
We’ve found that during the day, users bring up the ten meter remote and tend to forget to take it back down. We can keep the Repeater Activity Timer enabled to automatically bring the remote back down if no one is using the repeater.

Timeout Timer Clear

Purpose
If the timeout timer is about to time out, or has timed out, it may be reset, restarting the timeout cycle.

Remarks
The controller times out when a transmission on the main receiver input exceeds a programmable duration. The timer is normally reset between user transmissions. If allowed to time out, the repeater system transmitters are inhibited until the signal at the receiver's input goes away.

This command is useful if a Control Operator, wishing to prevent a timeout, can override the signal timing out the repeater and enter the Timeout Timer Clear command. The command can also be entered over the control receiver or telephone line.

[HINT]

If attempting to enter the command on top of the carrier timing out the repeater, use the "D" key to force a command evaluation.

The timeout timer automatically clears when the signal which timed it out goes away. This command is not normally needed when the repeater is timed out.

Timeout Timer Enable / Disable

Repeater Timer Enable
Repeater Timer Disable

Purpose
To enable or disable the repeater's timeout timer.
Remarks
When the timeout timer is disabled, a continuous signal on the receiver input will not time out the repeater. The timeout timer only limits the duration of signals on the main repeater receiver, not the link or remote base receivers.

**Timeout Timer Select**
Select Long Timeout Timer
Select Short Timeout Timer

**Purpose**
These commands allow a Control Operator to select one of two timeout timers programmed by the repeater owner.

**Remarks**
Different timeout timer values may be appropriate for different operating conditions. For example, during busy commute hours, a shorter timer encourages brief transmissions, allowing everyone a turn. At other times, a longer timeout timer may be preferable.

**See Also**
Patch – Patch Timers

**Scheduler**

- **Inhibit Next Scheduler Changeover**
- **Scheduler On / Off**

**Inhibit Next Scheduler Changeover**

**Purpose**
To command the controller to cancel the next scheduled changeover.

**Remarks**
Only the next scheduled changeover is affected. Scheduled events are not affected by this command.

**Example**
Tonight's net was cancelled because of a holiday. The next scheduled changeover is this afternoon at 4 pm, which activates a "Net tonight" tail message. At any time before 4 pm and after the previously scheduled changeover, we can enter this command to cancel the 4 o'clock changeover.

**Scheduler On / Off**
Scheduler On
Scheduler Off
Interrogate On/Off
Purpose
Turn the Scheduler on and off and to interrogate current status.

Remarks
When on, the Scheduler automatically changes over to new Macro Sets and executes events at predefined times and days of the week. Turning off the Scheduler inhibits any changeovers or events until it is turned on again.

Example
Because of emergency related repeater activity, we don’t want the repeater to change its operating modes until further notice. We can inhibit Scheduler changeovers and events by turning off the Scheduler.

See Also
Macro Sets
Operation Manual – “The Scheduler”

Speech Synthesizer

- Speech Enable / Disable
- Speech Interrupt / Override

Speech Enable / Disable

Purpose
To enable or disable the speech synthesizer.

Remarks
When the synthesizer is disabled, messages are generated in Morse code. ID’s revert to the Forced CW ID and other messages do the best they can in Morse code.

A hardware fault can cause the synthesizer to be disabled by the firmware. For example, if the supply voltage is too low for the synthesizer to operate, it is automatically disabled. It must be re-enabled by a Control Operator.

Example
We’d like to turn off speech messages at night to avoid waking up Control Op’s who keep their receivers on.

HINT

The Speech Enable command should be tried whenever the controller generates its responses in Morse code for an unknown reason. Examples of possible causes are a supply voltage dip or inclusion of invalid “custom” vocabulary in messages.
Speech Interrupt / Override
Speech Interrupted by Carrier
Speech Overrides Carrier

Purpose
These commands determine whether many synthesized speech messages are allowed to "talk over" a user's signal or convert to Morse code or abort.

Remarks
The folks inside the controller attempt to be polite in general by not talking over repeater users whenever possible. At times, however, it may be desirable to ensure that speech messages are allowed to complete even if a signal does appear at the repeater receiver.

Example
An unknown user gets his jollies by interrupting the speech ID message whenever he hears it, causing it to convert to Morse code. Placing the controller in the "Speech Overrides Carrier" mode will cause the controller to complete the ID message in speech.

HINT
Speech ID messages which are interrupted switch to the Forced CW ID Message. Some responses, such as tail messages and mailbox messages, abort when interrupted. Others, such as meter readings, will continue regardless of the mode.

Tail Messages

- Tail Message Frequency Selection
- Tail Message Selection

Tail Message Frequency Selection
Tail Message Each Tail
Tail Message Every 4 Tails
Tail Message Timer Period

Purpose
To select how frequently the Tail Message is generated when the repeater is in use.

Remarks
If the Tail Message function is on, the message may be generated at every tail, at every fourth tail, or no more frequently than the Tail Message timer value defined by the repeater owner. For example, if the Tail Message Timer Period command is chosen, and the Tail Message Timer is set to 10 minutes by the repeater owner, then the Tail Message will not be generated more frequently than every ten minutes regardless of how frequently the repeater carrier is allowed to drop.
These commands are mutually exclusive – i.e., only one is in effect at a time.

See Also
Operation Manual – “Tail Messages”

Tail Message Selection
Select Tail Message #1
Select Tail Message #2
Select Tail Message #3
Select Tail Message #4
Tail Message Off

Purpose
These commands select one of four tail messages to be generated at the end of the repeater hang time or turn off the tail message function.

Remarks
One of four Tail Messages may be selected, or the function may be turned off. Tail Messages are generated just prior to the repeater transmitter carrier dropping, at the end of the hang time, and may convey information to users.

The above commands are mutually exclusive – one is in effect at a time.

Note that Tail Message #4 is actually one of ten messages, determined by the current Macro Set in force, selected either by the Scheduler or by a Control Op Macro Set selection command.
Chapter 3

Command Summary

This chapter provides a condensed listing of Control Operator level commands, including the actual root codes.

Along with each command listed, four separate three digit root codes are supplied, corresponding to root set 1, 2, 3, and 4. Only one of the four sets (columns) applies at one time to your controller. The desired set is selected by the repeater owner with a programming command.

Remember that the actual Control Op commands consist of the Control Op prefix, followed by the three digit root. A separate prefix applies to Touch-Tone Control Op commands entered from the phone, as opposed to commands entered from other command channels.

If entered as Touch-Tone from the phone, commands should be terminated with a #.

**Hint**

Most of the Control Operator level selections are stored in Macro Sets for automatic scheduling and manual macro selection. Those Control Op commands which are not stored in Macro Sets are indicated with (†).
## Access and Control Modes

**Access/Control Modes**

<table>
<thead>
<tr>
<th>Access/Control Modes</th>
<th>[COP = Control Operator, TT = Touch-Tone, PL = PL Tone]</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA 041 231 511</td>
<td>Mode A - Carrier Access and Cmd</td>
</tr>
<tr>
<td>AMB 042 232 512</td>
<td>Mode B - Carrier Access and User Cmd; but PL Req. for COP Cmd</td>
</tr>
<tr>
<td>AMC 043 233 513</td>
<td>Mode C - Carrier Access; but PL Req. For User and COP Cmd</td>
</tr>
<tr>
<td>AMD 044 234 514</td>
<td>Mode D - PL Access and User/COP Cmd</td>
</tr>
<tr>
<td>AME 045 235 515</td>
<td>Mode E - TT Up Req. for Access and User/COP Cmd</td>
</tr>
<tr>
<td>AMF 191 381 661</td>
<td>Mode F - TT Up Req. for Access and User Cmd; TT Up and PL Req. for COP Cmd</td>
</tr>
<tr>
<td>AMG 192 382 662</td>
<td>Mode G - TT Up Req. for Access; TT Up and PL Req. for User and COP Cmd</td>
</tr>
<tr>
<td>AMH 193 383 663</td>
<td>Mode H - TT Up and PL Req. for Access and User/COP Cmd</td>
</tr>
<tr>
<td>AMI 194 384 664</td>
<td>Mode I - TT Up or PL Req. for Access; PL Req. for User/COP Cmd</td>
</tr>
<tr>
<td>AMJ 195 385 665</td>
<td>Mode J - TT Up or PL Req. for Access and User Cmd; PL Req. for COP Cmd</td>
</tr>
<tr>
<td>AMK 196 386 666</td>
<td>Mode K - TT Up or PL Req. for Access and User/COP Cmd</td>
</tr>
</tbody>
</table>

**Kerchunk Filter**

- KERE 162 352 632 892 Kerchunk Filter Enable
- KERD 163 353 633 893 Kerchunk Filter Disable

**Repeater Receiver Enable/Disable**

- RRXE 237 427 707 967 Repeater Receiver Enable
- RRXD 238 428 708 968 Repeater Receiver Disable

**Repeater Transmitter Enable/Disable**

- RTXE 235 425 705 965 Repeater Transmitter Enable
- RTXD 235 426 706 966 Repeater Transmitter Disable

**Repeater System Enable/Disable**

- rptr E 031 221 501 761 Repeater Enable
- rptr D 032 222 502 762 Repeater Disable

**Touch-Tone Cover Tone**

- TTCTE 173 363 643 903 Touch-Tone Cover Tone Enable
- TTCTD 174 364 644 904 Touch-Tone Cover Tone Disable

**Touch-Tone Muting**

- TTM 062 252 532 792 Mute Touch-Tone
- TTP 061 251 531 791 Unmute Touch-Tone after # Key
- TTO 063 253 533 793 Unmute Touch-Tone

**User Command Enable / Disable**

- UCCE 047 237 517 777 User Command Group A Enable
- UCDA 048 238 518 778 User Command Group A Disable
- UCBE 197 387 667 927 User Command Group B Enable
- UCBD 198 388 668 928 User Command Group B Disable

- UMCE 247 437 717 977 User Mapped Control Op Command Enable
- UMCD 248 438 718 978 User Mapped Control Op Command Disable

**Pad Test**

- PTE 064 254 534 794 Touch-Tone Pad Test Enable
- PTD 065 255 535 795 Touch-Tone Pad Test Disable

**Spare Audio 1**

- SP1E 055 245 525 785 Spare Audio 1 Enable
- SPD 056 246 526 786 Spare Audio 1 Disable

**VOX Mode**

- VOXE 171 361 641 901 VOX Mode Enable
- VOXD 172 362 642 902 VOX Mode Disable
<table>
<thead>
<tr>
<th>Alarm</th>
<th>AL1E 221 411 691 951</th>
<th>Alarm 1 Enable / Clear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AL2E 222 412 692 952</td>
<td>Alarm 2 Enable / Clear</td>
</tr>
<tr>
<td></td>
<td>AL3E 223 413 693 953</td>
<td>Alarm 3 Enable / Clear</td>
</tr>
<tr>
<td></td>
<td>AL4E 224 414 694 954</td>
<td>Alarm 4 Enable / Clear</td>
</tr>
<tr>
<td></td>
<td>AL1D 225 415 695 955</td>
<td>Alarm 1 Disable / Clear</td>
</tr>
<tr>
<td></td>
<td>AL2D 226 416 696 956</td>
<td>Alarm 2 Disable / Clear</td>
</tr>
<tr>
<td></td>
<td>AL3D 227 417 697 957</td>
<td>Alarm 3 Disable / Clear</td>
</tr>
<tr>
<td></td>
<td>AL4D 228 418 698 958</td>
<td>Alarm 4 Disable / Clear</td>
</tr>
<tr>
<td></td>
<td>ALD 058 248 528 788</td>
<td>Disable / Clear All Alarms</td>
</tr>
</tbody>
</table>

**Control Operator Utilities**

**Clock Adjust**

seconds 154 344 624 884 ♦ Clock Adjust

**Command Acknowledgement Mode**

CMA 181 371 651 911 Unique Response Message
CMG 182 372 652 912 Generic Response
CM off 183 373 653 913 Response Off

**Control Operator On-Air From Telephone Line**

--- 107 297 577 837 ♦ Control Op On-Air
(hangup) 108 298 578 838 ♦ Phone Onhook (or User level Hangup command)

**Dummy**

--- 231 - - - ♦ Dummy (for blanking out User Mapped COP)

**Listen on Phone**

RX on 157 347 627 887 ♦ Listen on Phone On
RX off 158 348 628 888 ♦ Listen on Phone Off

**Mailbox - Erase All Messages**

msgs cancel 188 378 658 918 ♦ Erase All Messages

**Manual Phone Patch**

--- 107 297 577 837 ♦ Phone Offhook (pick up the phone)
(hangup) 108 298 578 838 ♦ Phone Onhook (hang up the phone)

**Microcomputer Reset**

(signon) 068 258 538 798 ♦ Microcomputer Reset

**Power High / Low / Interrogate**

hi pwr 152 342 622 882 High Power
lo pwr 151 341 621 881 Low Power
hf pwr 153 343 623 883 ♦ Power Interrogate

**Readback Last Phone Number Dialed**

(number) 088 278 558 818 ♦ Readback (within last 15 minutes)

**Retransmit Control Receiver**

CR on 155 345 625 885 Control Receiver Retransmit On
CR off 156 346 626 886 Control Receiver Retransmit Off

**Telemetry Min / Max Memory Clear**

clear *xx *xx *xx *xx ♦ Clear Telemetry Channel xx (xx=33-80)

**Telephone Command Channel Timer Extend**

timer X 038 228 508 768 ♦ Timer Extend
## Courtesy Tone Selection

| CT1 | 141 331 611 871 Select Courtesy Tone #1 |
| CT2 | 142 332 612 872 Select Courtesy Tone #2 |
| CT3 | 143 333 613 873 Select Courtesy Tone #3 |
| CT4 | 144 334 614 874 Select Courtesy Tone #4 |
| CT5 | 145 335 615 875 Select Courtesy Tone #5 |
| CT6 | 146 336 616 876 Select Courtesy Tone #6 |
| CT7 | 147 337 617 877 Select Courtesy Tone #7 |
| CT8 | 148 338 618 878 Select Courtesy Tone #8 |
| CTD | 057 247 527 787 Deselect Courtesy Tone (hw and logical input select only) |

## ID's

### ID Selection

| PID1 | 101 291 571 831 Select Pending ID 1 |
| PID2 | 102 292 572 832 Select Pending ID 2 |
| PID3 | 103 293 573 833 Select Pending ID 3 |
| SPID | 104 294 574 834 Select Special ID |
| RPID | 105 295 575 835 Select Rotate PID 1-2-3 |
| RSPID | 106 296 576 836 Select Rotate PID 1-2-3 - Special ID |

### Periodic ID Enable / Disable

| QSTD | 177 367 647 907 Periodic "QST" ID Disable |
| QSTE | 178 368 648 908 Periodic "QST" ID Enable |

## Preview ID Messages

| (ID) | 121 311 591 851 Preview Initial ID Message (1 of 3 Initial IDs randomly selected) |
| (ID) | 122 312 592 852 Preview Forced CW ID Message |
| (ID) | 123 313 593 853 Preview Anxious ID Message |
| (ID) | 124 314 594 854 Preview Pending ID #1 Message |
| (ID) | 125 315 595 855 Preview Pending ID #2 Message |
| (ID) | 126 316 596 856 Preview Pending ID #3 Message (Pending ID #3 for current Macro Set) |
| (ID) | 127 317 597 857 Preview Special ID Message |
| (ID) | 128 318 598 858 Preview Touch-Tone Access Down ID |
| (ID) | 129 319 599 859 Preview Aux. Transmitter Pager ID |
| (ID) | 12* 31* 59* 85* Preview Aux. Transmitter Phone ID |

## Macro Sets

### Macro Set Selection

| C(changeover) | 130 320 600 860 Select Macro Set #0 |
| C(changeover) | 131 321 601 861 Select Macro Set #1 |
| C(changeover) | 132 322 602 862 Select Macro Set #2 |
| C(changeover) | 133 323 603 863 Select Macro Set #3 |
| C(changeover) | 134 324 604 864 Select Macro Set #4 |
| C(changeover) | 135 325 605 865 Select Macro Set #5 |
| C(changeover) | 136 326 606 866 Select Macro Set #6 |
| C(changeover) | 137 327 607 867 Select Macro Set #7 |
| C(changeover) | 138 328 608 868 Select Macro Set #8 |
| C(changeover) | 139 329 609 869 Select Macro Set #9 |

### Macro Set Interrogate

| 0-9 | 187 377 657 917 Interrogate Current Macro Set |
## Patch (Autopatch, Autodialers, Reverse Patch)

### Custom Hangup Code

<table>
<thead>
<tr>
<th>Code</th>
<th>Custom Hangup Code Enable</th>
<th>Custom Hangup Code Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHUE</td>
<td>097 287 567 827</td>
<td></td>
</tr>
<tr>
<td>CHUD</td>
<td>098 288 568 828</td>
<td></td>
</tr>
</tbody>
</table>

### Dial Without Click

<table>
<thead>
<tr>
<th>Code</th>
<th>Dial Without Click Enable</th>
<th>Dial Without Click Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWOCE</td>
<td>167 357 637 897</td>
<td></td>
</tr>
<tr>
<td>DWOCID</td>
<td>168 358 638 898</td>
<td></td>
</tr>
</tbody>
</table>

### Full-Duplex Mode

<table>
<thead>
<tr>
<th>Code</th>
<th>Full-Duplex Enable (user selectable)</th>
<th>Full-Duplex Always On</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDE</td>
<td>241 431 711 971</td>
<td></td>
</tr>
<tr>
<td>FD on</td>
<td>242 432 712 972</td>
<td></td>
</tr>
</tbody>
</table>

### Long Distance

<table>
<thead>
<tr>
<th>Code</th>
<th>Long Distance Enable/Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLDE</td>
<td>083 273 553 813</td>
</tr>
<tr>
<td>PLDD</td>
<td>084 274 554 814</td>
</tr>
<tr>
<td>SLDE</td>
<td>261 451 731 991</td>
</tr>
<tr>
<td>SLDD</td>
<td>262 452 732 992</td>
</tr>
<tr>
<td>TLDE</td>
<td>263 453 733 993</td>
</tr>
<tr>
<td>TLDD</td>
<td>264 454 734 994</td>
</tr>
</tbody>
</table>

### Mute / Hear Dial Tone and Signalling

<table>
<thead>
<tr>
<th>Code</th>
<th>Mute/Hear Dial Tone and Signalling</th>
</tr>
</thead>
<tbody>
<tr>
<td>APMD</td>
<td>095 285 565 825</td>
</tr>
<tr>
<td>APHD</td>
<td>096 286 566 826</td>
</tr>
</tbody>
</table>

### Patch Cover Tone

<table>
<thead>
<tr>
<th>Code</th>
<th>Patch Cover Tone Enable/Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>patch CTD</td>
<td>085 275 555 815</td>
</tr>
<tr>
<td>patch CTE</td>
<td>086 276 556 816</td>
</tr>
<tr>
<td>patch CT on</td>
<td>087 277 557 817</td>
</tr>
</tbody>
</table>

### Patch Enable / Disable

<table>
<thead>
<tr>
<th>Code</th>
<th>Patch Enable/Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPE</td>
<td>071 261 541 801</td>
</tr>
<tr>
<td>PAPD</td>
<td>072 262 542 802</td>
</tr>
<tr>
<td>SAPE</td>
<td>211 401 681 941</td>
</tr>
<tr>
<td>SAPD</td>
<td>212 402 682 942</td>
</tr>
<tr>
<td>TAPE</td>
<td>213 403 683 943</td>
</tr>
<tr>
<td>TAPD</td>
<td>214 404 684 944</td>
</tr>
<tr>
<td>ADUOE</td>
<td>073 263 543 803</td>
</tr>
<tr>
<td>ADUOD</td>
<td>074 264 544 804</td>
</tr>
<tr>
<td>ADU1E</td>
<td>217 407 687 947</td>
</tr>
<tr>
<td>ADU1D</td>
<td>218 408 688 948</td>
</tr>
<tr>
<td>ADU2E</td>
<td>267 457 737 997</td>
</tr>
<tr>
<td>ADU2D</td>
<td>268 458 738 998</td>
</tr>
<tr>
<td>PADEE</td>
<td>075 265 545 805</td>
</tr>
<tr>
<td>PADED</td>
<td>076 266 546 806</td>
</tr>
<tr>
<td>SADEE</td>
<td>215 405 685 945</td>
</tr>
<tr>
<td>SADED</td>
<td>216 406 686 946</td>
</tr>
<tr>
<td>RPE</td>
<td>091 281 561 821</td>
</tr>
<tr>
<td>RPD</td>
<td>092 282 562 822</td>
</tr>
</tbody>
</table>

### Patch Timers

<table>
<thead>
<tr>
<th>Code</th>
<th>Patch Timer Enable/Disable</th>
</tr>
</thead>
<tbody>
<tr>
<td>patch timer E</td>
<td>081 271 551 811</td>
</tr>
<tr>
<td>patch timer D</td>
<td>082 272 552 812</td>
</tr>
</tbody>
</table>
### Control Operator’s Reference Manual

#### Phone Number and Autodial Location Readback

<table>
<thead>
<tr>
<th>Code</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>APORB</td>
<td>093</td>
<td>283</td>
<td>563</td>
<td>823</td>
</tr>
<tr>
<td>APRB</td>
<td>094</td>
<td>284</td>
<td>564</td>
<td>824</td>
</tr>
<tr>
<td>ADORB</td>
<td>164</td>
<td>354</td>
<td>634</td>
<td>894</td>
</tr>
<tr>
<td>ADRBD</td>
<td>161</td>
<td>351</td>
<td>631</td>
<td>891</td>
</tr>
<tr>
<td>ADLRE</td>
<td>166</td>
<td>356</td>
<td>636</td>
<td>896</td>
</tr>
<tr>
<td>ADLRD</td>
<td>165</td>
<td>355</td>
<td>635</td>
<td>895</td>
</tr>
<tr>
<td>RF</td>
<td>233</td>
<td>423</td>
<td>703</td>
<td>963</td>
</tr>
<tr>
<td>RM</td>
<td>232</td>
<td>422</td>
<td>702</td>
<td>962</td>
</tr>
<tr>
<td>RCW</td>
<td>234</td>
<td>424</td>
<td>704</td>
<td>964</td>
</tr>
</tbody>
</table>

#### Reverse Patch / Answer Mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP0</td>
<td>251</td>
<td>441</td>
<td>721</td>
<td>981</td>
</tr>
<tr>
<td>RP1</td>
<td>252</td>
<td>442</td>
<td>722</td>
<td>982</td>
</tr>
<tr>
<td>RP2</td>
<td>253</td>
<td>443</td>
<td>723</td>
<td>983</td>
</tr>
<tr>
<td>RPE</td>
<td>091</td>
<td>281</td>
<td>561</td>
<td>821</td>
</tr>
<tr>
<td>RPD</td>
<td>092</td>
<td>282</td>
<td>562</td>
<td>822</td>
</tr>
<tr>
<td>NA</td>
<td>254</td>
<td>444</td>
<td>724</td>
<td>984</td>
</tr>
</tbody>
</table>

#### User Loadable Autodialer Unlock / Lock

<table>
<thead>
<tr>
<th>Bank</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADU</td>
<td>077</td>
<td>267</td>
<td>547</td>
<td>807</td>
</tr>
<tr>
<td>ADL</td>
<td>078</td>
<td>268</td>
<td>548</td>
<td>808</td>
</tr>
<tr>
<td>AD1U</td>
<td>243</td>
<td>433</td>
<td>713</td>
<td>973</td>
</tr>
<tr>
<td>AD1L</td>
<td>244</td>
<td>434</td>
<td>714</td>
<td>974</td>
</tr>
<tr>
<td>AD2U</td>
<td>265</td>
<td>455</td>
<td>735</td>
<td>995</td>
</tr>
<tr>
<td>AD2L</td>
<td>266</td>
<td>456</td>
<td>736</td>
<td>996</td>
</tr>
</tbody>
</table>

#### Remote Bases / Links

<table>
<thead>
<tr>
<th>Base</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1E</td>
<td>051</td>
<td>241</td>
<td>521</td>
<td>781</td>
</tr>
<tr>
<td>L1D</td>
<td>052</td>
<td>242</td>
<td>522</td>
<td>782</td>
</tr>
<tr>
<td>L2E</td>
<td>053</td>
<td>243</td>
<td>523</td>
<td>783</td>
</tr>
<tr>
<td>L2D</td>
<td>054</td>
<td>244</td>
<td>524</td>
<td>784</td>
</tr>
<tr>
<td>L3E</td>
<td>255</td>
<td>445</td>
<td>725</td>
<td>985</td>
</tr>
<tr>
<td>L3D</td>
<td>256</td>
<td>446</td>
<td>726</td>
<td>986</td>
</tr>
<tr>
<td>L4E</td>
<td>257</td>
<td>447</td>
<td>727</td>
<td>987</td>
</tr>
<tr>
<td>L4D</td>
<td>258</td>
<td>448</td>
<td>728</td>
<td>988</td>
</tr>
</tbody>
</table>

#### Repeater Timers

<table>
<thead>
<tr>
<th>Timer</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATE</td>
<td>245</td>
<td>435</td>
<td>715</td>
<td>975</td>
</tr>
<tr>
<td>RATD</td>
<td>246</td>
<td>436</td>
<td>716</td>
<td>976</td>
</tr>
</tbody>
</table>

#### Timeout Timer Clear

<table>
<thead>
<tr>
<th>Mode</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>timer clear</td>
<td>037</td>
<td>227</td>
<td>507</td>
<td>767</td>
</tr>
</tbody>
</table>

#### Timeout Timer Enable / Disable

<table>
<thead>
<tr>
<th>Timer</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>rptr timer on</td>
<td>033</td>
<td>223</td>
<td>503</td>
<td>763</td>
</tr>
<tr>
<td>rptr timer off</td>
<td>034</td>
<td>224</td>
<td>504</td>
<td>764</td>
</tr>
</tbody>
</table>

#### Timeout Timer Select

<table>
<thead>
<tr>
<th>Mode</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>timer L</td>
<td>035</td>
<td>225</td>
<td>505</td>
<td>765</td>
</tr>
<tr>
<td>timer s</td>
<td>036</td>
<td>226</td>
<td>506</td>
<td>766</td>
</tr>
</tbody>
</table>

3 - 6  8/87 V3
Scheduler
Inhibit Next Scheduler Changeover
SKI 186 376 656 916 †Inhibit Changeover

Scheduler On / Off
SK on 184 374 654 914 Scheduler On
SK off 185 375 655 915 Scheduler Off
SK on/off 046 236 516 776 †Interrogate On/Off

Speech Synthesizer
Speech Enable / Disable
SPE 066 256 536 796 Speech Enable
SPD 067 257 537 797 Speech Disable

Speech Interrupt / Override
SPINT 175 365 645 905 Speech Interrupted by Carrier
SPOVER 176 366 646 906 Speech Overrides Carrier

Tail Messages
Tail Message Frequency Selection
TMS1 116 306 586 846 Tail Message Each Tail
TMS4 117 307 587 847 Tail Message Every 4 Tails
TM timer 118 308 588 848 Tail Message Timer Period

Tail Message Selection
TM1 111 301 581 841 Select Tail Message #1
TM2 112 302 582 842 Select Tail Message #2
TM3 113 303 583 843 Select Tail Message #3
TM4 114 304 584 844 Select Tail Message #4
TM off 115 305 585 845 Tail Message Off