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Binder 2 of 2

RC-850 Repeater Controller

Control Operator's Reference Manual

Firmware Version 3

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

Specifications subject to change without notice

8/87 Rev 3

Control Operator's Reference Manual
V3.8 Errata

Add...

Individual User Access Code (IUAC) Enabled / Disabled

	Root 1	Root 2	Root 3	Root 4
Enabled	277	467	747	007
Disabled	278	468	748	008

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

	Root 1	Root 2	Root 3	Root 4
Enabled	227	417	697	957
Disabled	228	418	698	958

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

Look for these symbols:

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

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.

Command Channel ---->	**Response Channel**
Repeater receiver	Repeater transmitter
Link / Remote receivers	Repeater / link / remote transmitters
Control receiver	Repeater transmitter
Telephone	Telephone
Local microphone	Local speaker
Auxiliary decoder	Repeater transmitter

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 owne and is typically set at approximately five seconds.

Format

Chapter 2 of this manual follows the following format:

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

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

A 9 4 3 5 0 1

The command entered over the phone is

4 9 4 3 5 0 1 #

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.

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.

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.

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.

HINT

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.

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 forc 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

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.

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

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 interupting 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.

HINT

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.

HINT

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 #.

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					[COP = Control Operator, TT = Touch-Tone, PL = PL Tone]
AMA	041	231	511	771	Mode A - Carrier Access and Cmd
AMB	042	232	512	772	Mode B - Carrier Access and User Cmd; but PL Req. For COP Cmd
AMC	043	233	513	773	Mode C - Carrier Access; but PL Req. For User and COP Cmd
AMD	044	234	514	774	Mode D - PL Access and User/COP Cmd
AME	045	235	515	775	Mode E - TT Up Req. for Access and User/COP Cmd
AMF	191	381	661	921	Mode F - TT Up Req. for Access and User Cmd; TT Up and PL Req. for COP Cmd
AMG	192	382	662	922	Mode G - TT Up Req. for Access; TT Up and PL Req. for User and COP Cmd
AMH	193	383	663	923	Mode H - TT Up and PL Req. for Access and User/COP Cmd
AMI	194	384	664	924	Mode I - TT Up or PL Req. for Access; PL Req. for User/COP Cmd
AMJ	195	385	665	925	Mode J - TT Up or PL Req. for Access and User Cmd; PL Req. for COP Cmd
AMK	196	386	666	926	Mode K - TT Up or PL Req. for Access and User/COP Cmd
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	236	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
TTU	063	253	533	793	Unmute Touch-Tone
User Command Enable / Disable					
UCAE	047	237	517	777	User Command Group A Enable
UCAD	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
PTE	064	254	534	794	Touch-Tone Pad Test Enable
PTD	065	255	535	795	Touch-Tone Pad Test Disable
SP1E	055	245	525	785	Spare Audio 1 Enable
SP1D	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

Alarm

AL1E	221	411	691	951	Alarm 1 Enable / Clear
AL2E	222	412	692	952	Alarm 2 Enable / Clear
AL3E	223	413	693	953	Alarm 3 Enable / Clear
AL4E	224	414	694	954	Alarm 4 Enable / Clear
AL1D	225	415	695	955	Alarm 1 Disable / Clear
AL2D	226	416	696	956	Alarm 2 Disable / Clear
AL3D	227	417	697	957	Alarm 3 Disable / Clear
AL4D	228	418	698	958	Alarm 4 Disable / Clear
ALD	058	248	528	788	Disable / Clear All Alarms

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
h/l 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)	120	310	590	850	†Preview Periodic QST ID
(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

CHUE	097	287	567	827	Custom Hangup Code Enable
CHUD	098	288	568	828	Custom Hangup Code Disable

Dial Without Click

DWOCE	167	357	637	897	Dial Without Click Enable
DWOCD	168	358	638	898	Dial Without Click Disable

Full-Duplex Mode

FDE	241	431	711	971	Full-Duplex Enable (user selectable)
FD on	242	432	712	972	Full-Duplex Always On

Long Distance

PLDE	083	273	553	813	Primary Autopatch Long Distance Enable
PLDD	084	274	554	814	Primary Autopatch Long Distance Disable
SLDE	261	451	731	991	Secondary Autopatch Long Distance Enable
SLDD	262	452	732	992	Secondary Autopatch Long Distance Disable
TLDE	263	453	733	993	Tertiary Autopatch Long Distance Enable
TLDD	264	454	734	994	Tertiary Autopatch Long Distance Disable

Mute / Hear Dial Tone and Signalling

APMD	095	285	565	825	Mute Patch Dial Tone and Signalling
APHD	096	286	566	826	Hear Patch Dial Tone and Signalling

Patch Cover Tone

patch CTD	085	275	555	815	Patch Cover Tone Disable
patch CTE	086	276	556	816	Patch Cover Tone Enable (user selectable)
patch CT on	087	277	557	817	Patch Cover Tone Always On

Patch Enable / Disable

PAPE	071	261	541	801	Primary Autopatch Command Enable
PAPD	072	262	542	802	Primary Autopatch Command Disable
SAPE	211	401	681	941	Secondary Autopatch Command Enable
SAPD	212	402	682	942	Secondary Autopatch Command Disable
TAPE	213	403	683	943	Tertiary Autopatch Command Enable
TAPD	214	404	684	944	Tertiary Autopatch Command Disable
ADU0E	073	263	543	803	User Loadable Autodialer Bank 0 Command Enable
ADU0D	074	264	544	804	User Loadable Autodialer Bank 0 Command Disable
ADU1E	217	407	687	947	User Loadable Autodialer Bank 1 Command Enable
ADU1D	218	408	688	948	User Loadable Autodialer Bank 1 Command Disable
ADU2E	267	457	737	997	User Loadable Autodialer Bank 2 Command Enable
ADU2D	268	458	738	998	User Loadable Autodialer Bank 2 Command Disable
PADEE	075	265	545	805	Primary Emergency Autodialer Command Enable
PADED	076	266	546	806	Primary Emergency Autodialer Command Disable
SADEE	215	405	685	945	Secondary Emergency Autodialer Command Enable
SADED	216	406	686	946	Secondary Emergency Autodialer Command Disable
RPE	091	281	561	821	Reverse Patch Enable
RPD	092	282	562	822	Reverse Patch Disable

Patch Timers

patch timer E	081	271	551	811	Patch Timer Enable
patch timer D	082	272	552	812	Patch Timer Disable

Phone Number and Autodial Location Readback

APORB	093	283	563	823	Optional Autopatch Phone Number Readback
APRB	094	284	564	824	Forced Autopatch Phone Number Readback
ADORB	164	354	634	894	Optional User Loadable Autodialer Phone Number Readback
ADRBD	161	351	631	891	Disable User Loadable Autodialer Phone Number Readback
ADLRE	166	356	636	896	Enable User Loadable Autodialer Location Readback
ADLRD	165	355	635	895	Disable User Loadable Autodialer Location Readback
RF	233	423	703	963	Female Voice Phone Number Readback
RM	232	422	702	962	Male Voice Phone Number Readback
RCW	234	424	704	964	Morse Code Phone Number Readback

Reverse Patch / Answer Mode

RP0	251	441	721	981	Select Reverse Patch Mode 0
RP1	252	442	722	982	Select Reverse Patch Mode 1
RP2	253	443	723	983	Select Reverse Patch Mode 2
RPE	091	281	561	821	Reverse Patch Enable
RPD	092	282	562	822	Reverse Patch Disable
NA	254	444	724	984	†Don't Answer Next Time

User Loadable Autodialer Unlock / Lock

AD0U	077	267	547	807	User Loadable Autodialer Bank 0 Unlock
AD0L	078	268	548	808	User Loadable Autodialer Bank 0 Lock
AD1U	243	433	713	973	User Loadable Autodialer Bank 1 Unlock
AD1L	244	434	714	974	User Loadable Autodialer Bank 1 Lock
AD2U	265	455	735	995	User Loadable Autodialer Bank 2 Unlock
AD2L	266	456	736	996	User Loadable Autodialer Bank 2 Lock

Remote Bases / Links

Remote Base Enable / Disable

L1E	051	241	521	781	Remote Base / Link 1 Enable
L1D	052	242	522	782	Remote Base / Link 1 Disable
L2E	053	243	523	783	Remote Base / Link 2 Enable
L2D	054	244	524	784	Remote Base / Link 2 Disable
L3E	255	445	725	985	Remote Base / Link 3 Enable
L3D	256	446	726	986	Remote Base / Link 3 Disable
L4E	257	447	727	987	Remote Base / Link 4 Enable
L4D	258	448	728	988	Remote Base / Link 4 Disable

Repeater Timers

Repeater Activity Timer Enable / Disable

RATE	245	435	715	975	Repeater Activity Timer Enable
RATD	246	436	716	976	Repeater Activity Timer Disable

Timeout Timer Clear

timer clear	037	227	507	767	†Timer Clear

Timeout Timer Enable / Disable

rptr timer on	033	223	503	763	Repeater Timer Enable
rptr timer off	034	224	504	764	Repeater Timer Disable

Timeout Timer Select

timer L	035	225	505	765	Select Long Timeout Timer
timer s	036	226	506	766	Select Short Timeout Timer

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