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**Model 8200**

**Repeater Controller  
&  
Full Duplex Interconnect**

**USER'S INSTRUCTION MANUAL**

Made in U.S.A.

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rev. C

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## GENERAL DESCRIPTION

The Model 8200 **FULL DUPLEX INTERCONNECT** by Connect Systems Inc. is a sophisticated repeater controller with built-in semi or full duplex radio-telephone interconnect terminal. A built-in keyboard and digital display allow the user to obtain the maximum power from the on board microprocessor. All features are user programmable and/or selectable. There are six modes of operation to choose from...

### 1. Full or Semi-Duplex Base Station Interconnect

Adds interconnect to any duplex base station.

### 2. Full or Semi-Duplex Repeater Interconnect

Adds interconnect to any existing repeater system. Optional ANI validation allows shared use and includes deadbeat disable.

### 3. Repeater Controller with Duplex Interconnect

Converts any receiver and transmitter into a full featured repeater.

### 4. Dial Access Remote Base

Dispatch and have full use of your radio system from any telephone. Operates in any mode selected above.

### 5. Dial Access Paging Terminal

Beep Pagers and/or selectively call mobiles with or without two way voice from any telephone.

### 6. Talk-Back Paging Terminal

Beep pagers or mobiles followed with a one way voice message from any telephone.

And, powerful built-in standard features such as... 90 number speed dialer, last number redial, remote hook-flash, remotely controllable relay, automatic disconnect on busy signals and dialtone, fully regenerated tone or pulse dialing, etc. make the 8200 the most powerful repeater controller/full duplex interconnect product available today!

Made and designed in the U.S.A.

## **INSTALLATION AND ADJUSTMENTS**

The 8200 contains both a noise squelch and COS circuits with COS input. This gives the 8200 a great deal of interface flexibility. The audio takeoff point can be anywhere from the discriminator (pre-emphasized audio) to the volume control (de-emphasized or flat audio). If connection is made to the discriminator, only three connections are required to most radios. When connecting past the discriminator, a fourth COS connection must be made. Use shielded wires with the shields at both ends connected to chassis ground. (The rear panel barrier strip terminals labelled "GND" are chassis ground). We recommend using spade type crimp-on connectors for ease and reliability. Connect the center wires as follows:

**AUDIO IN:** The audio input terminal may be connected directly to the discriminator output, or to the high end of the volume control.

If connecting to the discriminator...

1. A COS connection to the receiver is not required.
2. The de-emphasis strap JP-5 must not be cut.
3. The COS polarity strap JP-1 must not be strapped.
4. The noise control P2 must be adjusted to illuminate the front panel noise LED. See "P2 NOISE" below for further explanation.

If connecting to the volume control high side...

1. A COS connection must be made.
2. Cut JP-5 to eliminate built-in de-emphasis.
3. JP-1 must be strapped for the appropriate COS polarity.
4. The noise control must be set at minimum. (fully CCW).
5. The COS threshold control P7 must be set to match the level of the COS takeoff point.

See the appropriate sections below for detailed directions.

**COS:** NOTE: The COS input is normally not used if the AUDIO IN is connected directly to the discriminator.

The COS input can be connected to the noise squelch for carrier operation, or to the DPL/CTCSS squelch if you want the radios' built-in decoder to provide private operation.

Noise Squelch Connection: Connect to a point that has considerable voltage swing when the squelch is opened/closed. The best point to connect is to the collector of the transistor that controls the busy light (if the radio has one). Otherwise, connect to the output of the noise rectifier.

DPL/CTCSS Squelch: The receiver's DPL or CTCSS decoder will have a logic output that goes high or low when a properly encoded signal is received. Connect this point to the COS input.

If the point selected goes more positive (voltage increases) when a signal is received, strap JP-1 center to the + side. If the point goes to a lower voltage, strap JP-1 from center to the - side.

When the COS threshold control P7 has been properly adjusted (described below), and JP-1 properly strapped, the front panel noise LED will go out when a signal is received. This condition must be achieved for proper operation of the interconnect.

**AUDIO OUT:** Connect to the Mic high line. If Mic loading occurs install a resistor in series with the Audio Out lead, and cut JP-3. The resistor should be large enough to prevent Mic loading but small enough to achieve adequate land to mobile audio. Try 100K as a first cut.

**PTT:** Connect to the transmitter PTT line.

NOTE: Some radios will need the Aux. Relay connected to the hookswitch before the transmitter can be activated. Others may require positive keying. See 'Auxiliary Relay' page 33 for details.

**TONE** The TONE output is used to inject signaling tones separately from the voice audio and is normally only

connected if options TSU-32P or 8203 are installed. However options 8202 and 8204 can also use this output if desired. Connect the TONE output past the instantaneous deviation control (IDC) circuit in the transmitter. Preferably directly to the modulator.

The 8200 can send the signalling tones from options 8202, 8203 or 8204 out the AUDIO OUT port or out the TONE port. We recommend sending CTCSS audio from the 8203 out the TONE port, and signalling audio from the 8202 or 8204 out the AUDIO OUT port.

If you want signalling tones (from 8202, 8203 or, 8204) to go out the AUDIO OUT port, remove resistor R-99.

If you prefer to inject these tones directly into the modulator via the TONE port, remove resistor R-48 instead.

If the TSU-32P option is not installed and you want your signalling tones to come out the AUDIO OUT port, there is no need to remove R-48 or R-99.

R-48 is near the Tone Signalling pot. R-99 is near IC U-25.

**POWER:** Connect to a source of 12-14 VDC that can supply up to 300 MA. The 8200 is reverse polarity protected, so a polarity mistake will not damage your 8200.

##### **WARNING** #####

The 8200 contains a power supply sensing circuit that continuously monitors the input supply voltage. An instantaneous drop below 10 VDC will cause a microcomputer reset. If the power supply has poor regulation, erratic operation may result.

The purpose of the input voltage sensor is to protect the non-volatile EE memory during power up and power down.

If erratic operation such as losing calls occurs, be suspicious of poor regulation from the power supply.

#####

**ADJUSTMENTS**

**Initial settings:** Set P1, P2 and P7, fully counterclockwise.  
Set P3, P4, P5, P6, P8, and P10 to mid rotation.

**POT    PCB Name                    Function**

**P1 M->L:**                    **Mobile to land level:** Initially adjust until mobile DTMF decodes as indicated on front panel DTMF LED. Later, adjust for proper mobile level as heard on telephone.

Note: This setting also affects the RPT level. Always re-adjust the RPT (P3) control after setting the M->L level.

Note: DTMF will not decode unless the noise LED is out indicating that a signal is being received.

**P2 NOISE: Noise (squelch) control:** This control must be set to minimum (fully CCW) if a COS connection is made. If the audio input was connected to the discriminator, advance clockwise to a point just beyond where the front panel noise LED lights without any sign of flickering.

Note: If the noise light will not come on when the noise control is advanced, you are not connected to the discriminator. Only the direct discriminator output has sufficient noise bandwidth to operate the internal noise squelch.

**P3 RPT: Repeat audio level:** Set for correct repeat audio level if repeater controller mode is selected. (0.1.) The repeat audio level must be reset if the M-L> control has been adjusted.

**P4 DTMF: Patch to mobile DTMF level:** Sets the DTMF transmitter modulation level of land to mobile DTMF and Semi-Duplex privacy beeps.

**P5 BEEPS/CW ID: Status beeps & CW ID level:** Adjust for desired modulation level of status beeps or CW ID.

**P6 TONE SIGNALLING: Tone signalling level to mobile:** Adjusts modulation level of optional signalling tones. Not functional unless option 8202, 8203 or 8204 has been installed.

**P7 COS**

**COS Threshold level:** This control is only adjusted if you are using the COS input and JP-1 has been strapped. Measure the voltage at TP-1 with no signal. Then measure the voltage again with a signal applied. Adjust P-7 until the voltage reading at TP-2 is approximately midway between the two readings previously obtained at TP-1.

For example: If TP-1 read 2 volts with no signal, and 4 volts with a signal applied to the receiver, TP-2 would be set to read 3 volts.

If JP-1 is properly strapped and P7 properly adjusted, the Noise LED will be illuminated when there's no signal. The noise LED should go out when a signal is received.

**P8 Hybrid Balance:** See discussion next page.

**P10 L->M**

**Land to mobile level:** Press the C/D (Connect/Disconnect) switch so that a dialtone is heard. Adjust P10 until the dialtone produces about 3-4 Khz. of modulation deviation. Cut JP-3 if required.

### **JUMPER STRAP OPTIONS**

**JP-1** This strap should not be installed if AUDIO IN has been connected to the discriminator. Strapping JP-1 enables COS operation and selects the required COS polarity. If the selected COS takeoff point goes high when a signal is received, connect the center pad to the + pad. If the COS input goes low when a signal is received, connect the center pad to the - pad. When P7 (COS threshold) is properly adjusted, the noise LED will be illuminated when there's no signal, and go out when a signal is received. A strap is not factory installed.

**JP-2** Factory installed. Should only be cut if option 8202, 8203, or 8204 has been installed.

- JP-3** Audio output range strap. Strap in = low level (0-1 V). Strap removed = high level (0-5 V). Strap factory installed.
- JP-4** Factory installed. Should only be removed if CTCSS option TSU-32P is installed. Note: See page 35 for TSU-32P installation information.
- JP-5** Factory installed. Removal eliminates the built-in de-emphasis network. Cut only if receiver audio is taken past de-emphasis.
- JP-6** Selects whether the Aux. Relay output is normally open (NO) or, normally closed (NC). JP-6 is factory strapped for NO. For NC operation, connect the center pad to the NC pad. It may be necessary to remove the rear panel to make this modification.
- JP-7** JP-7 is used to enable / disable the line in use detection sensor. The 8200 is delivered with the line in use detection sensor disabled (JP-7 not strapped). To enable the line in use detection sensor remove the plastic push-on clip from one of the JP-7 legs and re-install on both of JP-7's legs.

Note: User programming line 1.2. must be programmed 0 (disabled) if JP-7 is not strapped. Otherwise the 8200 will always think the line is in use and will give you the line is busy alert when you attempt to make a call.

#### **WHAT IS A HYBRID?**

Every telephone has a hybrid (sometimes called a network). The purpose of the hybrid is to attenuate the level at which you hear yourself speaking, without affecting your level at the other end or vice-versa.

Various noises in mobile radio communications systems demand that the hybrid in a full duplex terminal should have significantly better performance than a telephone hybrid. Otherwise the duplex mobile would hear excessive return trip audio (echo) and noise. To achieve optimum trans-hybrid isolation, resistive and capacitive nulling (balance) adjustments are required.

When the hybrid is adjusted to produce minimum return trip audio (optimum adjustment) very little of the residual mobile audio will be heard on the repeater output in comparison to the telephone party audio. But of course the mobile and the telephone party hear each other perfectly.

If semi duplex mode is selected, there is no need to balance the hybrid at all.

**HYBRID ALIGNMENT PROCEEDURE**

The alignment must take place on the phone line the 8200 will normally be connected to.

Have a mobile place a call through the 8200 into a commonly called area. The party answering the called phone should leave the phone off hook during the alignment proceedure.

Monitor the transmitter output with a service monitor or connect an oscilloscope to the 'audio out' terminal on the rear of the 8200. Place all four "HYB comp" dip switches in the off position. See Figure 1.

Have the mobile simultaneously press digits 3 and 6 on his touch tone keyboard. This will result in the transmission of a single 1477 HZ tone. (The front panel DTMF led must not be illuminated during alignment.)

Adjust the "HYB BAL" potentiometer (P8) to produce the least audio output. Switch the "HYB comp" dip switches to the next higher capacitance (see Figure 1) and re-null P8. Repeat this proceedure until maximum rejection of the 1477 HZ tone is obtained.

Changes made within the telephone company or re-routing of telephone lines could occasionally require re-adjustment of the hybrid.

	<b>HYB COMP SWITCHES</b>				<b>COMPENSATION</b>	
	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>CAPACITANCE</b>	
Initial Setting	0	0	0	0	0	uF (min)
	0	0	0	1	.010	
	0	0	1	0	.022	
	0	0	1	1	.032	
increase	0	1	0	0	.050	

until	0	1	0	1	.060
optimum	0	1	1	0	.072
null	0	1	1	1	.082
is	1	0	0	0	.100
achieved	1	0	0	1	.110
	1	0	1	0	.122
	1	0	1	1	.132
	1	1	0	0	.150
	1	1	0	1	.160
V	1	1	1	0	.172
Maximum Setting	1	1	1	1	.182 uF (max)

0 = OFF  
1 = Off

**FIGURE 1**

Table of hybrid compensation settings.

\*\*\*\*\*

**PHONE LINE CONNECTION**

The 8200 is equipped with a standard RJ-11 modular phone jack and may be connected to standard ring-tip loopstart CO lines. The following information must be given to the telephone company prior to connecting:

RINGER EQUIVALANCE: 0.6B

In U.S.A.

FCC REG. NUMBER : 2CAUSA - 73145 - OT - T

In Canada

DOC REG. NUMBER : 1755 4686 A

This equipment may not be connected to coin or party lines. Be sure to notify the phone company when discontinuing use. The line in use feature may not be enabled on lines requiring FCC part 68 or DOC registered apparatus. (See JP-7 page 8 and user programming line number 1.2. page 14). Please refer to Appendix A at the rear of this manual for additional information.

**PROGRAMMING THE 8200**

The 8200 has four easy-access programming areas: 1. Operating Parameters, 2. CW ID, 3. Auto-Dial Phone Numbers, and 4. ANI

Access Codes. To enter one of the programming areas, turn the power off, press and hold the corresponding programming area button (No. 1 for Operating Parameters, No. 2 for CW ID, No. 3 for Speed-Dial Numbers or No. 4 for ANI Access Codes) and simultaneously turn on the power. The display will show **0.x.**, where x is the number of the programming button that is being pressed. Release the button, and programming may begin.

Each programming area has the following features in common:

- 1) Programming line numbers are displayed with the dots illuminated on the displays. e.g. **0.1.**, **4.5.** etc.
- 2) Data values are displayed without the dots illuminated. e.g. **00**, **30**, etc.
- 3) Data is entered at a line number by pressing the desired digits followed by the '**P**' key. Consider the '**P**' key as the enter key.
- 4) The GOTO **Any Address** line is displayed as **A.A.** This line is used to branch to any line number in the current programming area. For example, the current line is **A.A.** and you wish to goto line 30. Enter 3 0 P on the keypad and the display will read **3.0**.
- 5) Pressing only **P** at the **A.A.** line will advance the line to **0.1**. Pressing only **P** at any other line will advance to the next available programming line. NOTE: In CW ID, Auto-Dial Phone Number programming, and ANI Access Codes, the next line will be the next numeric line number. In Operating Parameters programming the next line is not necessarily the next numeric line (see the 'Programming the Operating Mode and Parameters' section).
- 6) To view the stored data at a given line number, briefly press **C** on the keypad and then release it. The display will then show the data for a few seconds and then re-display the current line number. Consider '**C**' the 'see' data key.
- 7) At any point during programming, you may return to the **A.A.** line by holding down the **C** key until **A.A.** appears on the display (approximately three seconds).

## **PROGRAMMING THE OPERATING MODE AND PARAMETERS**

(Programming Area No. 1)

To enter the parameter programming mode, press and hold button No. 1 on the internal keypad and then simultaneously turn on the power switch. At this point, the display will read 0.1. When you release the No. 1 button, you will see **A.A.**

### **A.A. (GOTO Any Address)**

Press 'P' to start at line 0.1., or enter the line number you wish to go to and then press 'P'. All line numbers and their associated parameters are listed below starting with REPEATER CONTROLLER PARAMETERS.

### **Viewing or Changing Parameter Values**

A quick tap on 'C' will reveal (for a moment) the currently selected parameter of the displayed program line. If the parameter is acceptable, press 'P' to advance to the next program line, or, enter a new parameter and press 'P' to advance to the next program line.

### **Parameter Checking**

If an out of range parameter is entered (eg. 6 on line 0.1.) pressing 'P' will not cause an advance to the next program line. This prevents you from accidentally entering an unuseable choice.

### **Returning to A.A.**

Programming is finished when you arrive back at A.A. If necessary, you can return to a previously programmed line by holding down 'C' for several seconds. This will return you to A.A. Now enter the line number you wish to return to and press 'P'. Line sequential programming will always flow forward from the current line.

Line numbers shown in braces e.g. [0.8.] indicates where programming will continue after a selection.

When you finish programming, simply turn the power off, and then back on to return to the operate mode.

**REPEATER CONTROLLER PARAMETERS**

**[Branch to]**

### **0.1. Repeater Controller**

1 = Enable [0.2.]  
0 = Disable [0.8.]  
DEFAULT: 0 = Disable

1 - Enable use of the Repeater controller.  
0 - Disables the use of the Repeater controller.

#### 0.2. Repeater On/Off Control Code

Enter any three digits: xxx  
protocol: #xxx = ON  
          ##xxx = OFF  
DEFAULT: 456

Select any three digits as an over the air repeater on/off control code. Press # plus the three digits to turn on the repeater. Press ## plus the three digits to turn off the repeater.

#### 0.3. Repeater Mode CW ID Interval

0 = Disable  
Select 1-99 (.1-9.9 minutes)  
.1 min increments per step  
DEFAULT: 30 = 3 minutes

Choose the CW ID interval that you prefer for repeater mode. Or, disable repeater mode CW ID by pressing 0. The CW ID interval is equal to .1 minutes times the number entered

#### 0.4. Repeater Hang Time

Select 5-99 (.5-9.9 seconds)  
Or, Enter 0 for instant dropout. (No courtesy beep)  
.1 sec increments per step

DEFAULT: 30 = 3.0 seconds  
Selects the time in seconds that the repeater remains on the air after the input signal drops. The time is equal to .1 second times the number entered.

#### 0.5. Repeater Activity Timer

0 = Disable  
Select 1-99 (.1 - 9.9 minutes)  
.1 minute increments per step  
DEFAULT: 5 = .5 minutes

Any single continuous mobile transmission exceeding the repeater activity timer limit puts the repeater off the air. The activity time in minutes is equal to the number entered divided by ten. Pressing 0 disables the activity timer.

#### 0.6. Courtesy Beep

1 = Enable [0.7.]

0 = Disable [0.8.]  
DEFAULT: 1 = Enable

If enabled, the courtesy beep sounds each time a mobile is finished talking. This lets the other mobile know for sure that you have finished and that it's time to respond.

### 0.7. Courtesy Beep Character

Select 0-37  
DEFAULT: 17 = "R"

This choice allows selecting any morse code character from Table 1 (page 21) as the courtesy beep. The default is 17 which sends "R" for roger. If a short beep is desired enter a 4. For a long beep enter 19.

## INTERCONNECT OPERATING PARAMETERS

### 0.8. Interconnect Operating Mode

1 = Semi-Duplex [0.9.]  
2 = Full Duplex [1.0.]  
0 = Disable [A.A.]  
DEFAULT: 2 = Full Duplex

### 0.9. Semi-Duplex Privacy Mode

1 = Enable  
0 = Disable  
DEFAULT: 0 = Disable

In privacy mode, the mobile side of the conversation is not re-transmitted. Thus eavesdroppers only hear one half of the conversation. Thus providing a good measure of security.

### 1.0. ANI Remote Programming Code

xxxx = User selectable ANI remote programming code  
Protocol: ###xxxx (Enters Remote Programming Mode)  
DEFAULT: 9876

Selects the code which is used to enter the remote programming mode. The remote programming mode permits the remote selection or changing of the interconnect access code(s). See ANI Access Code Programming page 23 for more detail.

### 1.1. Disconnect Code

0 = # Down  
1 = # Plus Connect Code  
DEFAULT: 0 = # Down

Choose the patch disconnect code. Enter 0 to select # down in most applications. Or enter 1 to select # plus the connect code digits.

### 1.2. Line in Use Detect

1 = Enable  
0 = Disable  
DEFAULT: 1 = Enable

**NOTE:** Do not enable unless JP-7 is strapped. See page 8.

When enabled, mobiles are prevented from cutting in on calls that are already in progress on the same line.

### 1.3. Five PTT speed-dial

1 = Enable  
0 = Disable  
DEFAULT: 0 = Disable

If enabled, five presses of the mobile Mic button (at a rate of approximately one push per second) will automatically dial the phone number stored in speed dialer memory location No.1. Five subsequent presses will cause a disconnect.

### 1.4. Dialing Mode

1 = Tone  
0 = Pulse  
DEFAULT: 1 = Tone

Select how the 8200 will dial your phone calls. Note that tone is much faster if you are in a touchtone telephone exchange.

### 1.5. Access Delay

Select 1-9 (1-9 seconds)  
1 sec increments per step  
DEFAULT: 2 = 2 secs

Access delay is a user selectable delay to compensate for DTMF-PTT delay built into your mobile microphone. Select a value that allows you to hear all of the CW ID and/or dialtone without clipping.

### 1.6. Manual Dialing

1 = Enable [1.7.]  
0 = Disable [2.2.]  
DEFAULT: 1 = Enable

Select disable if dialing should only be allowed from the speed dialer memory.

### 1.7. Toll Restrict Digit Counting

1 = Enable

0 = Disable  
DEFAULT: 0 = Disable

Enables/disables toll restrict digit counting. If enabled, a number exceeding ten digits cannot be dialed.

### **1.8. Prefix Restrict A**

0000 = None (display reads ' -')  
x - xxxx = Multi Digit Prefix Restriction  
DEFAULT: 1 = 'One' Digit Prefix Restriction (Long Distance)

A 'one' may only be set on this line in order for toll override 1-800 dialing to operate.

### **1.9. Prefix Restrict B**

0000 = None (display reads ' -')  
x - xxxx = Multi Digit Prefix Restriction  
DEFAULT: 0 = 'Zero' Digit Prefix Restriction (Operator)

### **2.0. Prefix Restrict C**

0000 = None (display reads ' -')  
x - xxxx = Multi Digit Prefix Restriction (e.g. 976)  
DEFAULT: - = None

### **2.1. Prefix Restrict D**

0000 = None  
x - xxxx = Multi Digit Prefix Restriction (e.g. 411)  
DEFAULT: - = None

Lines 1.8., 1.9., 2.0., and 2.1. allow selecting any four single digit or multi-digit sequences as restricted. Four digits in sequence maximum. eg. to restrict 0 (operator), 1 (long distance), 976 and 411 enter 1 on line 1.8., enter 0 on line 1.9., enter 976 on line 2.0. and enter 411 on line 2.1.

### **2.2. Activity Timer**

0 = Defeat  
Select 10-99 (10-99 seconds)  
1 sec increments per step  
DEFAULT: 30 = 30 secs

Enter the patch activity timer time directly in seconds or press 0 to defeat. The activity timer is reset by pressing the Mic button at any time.

### **2.3. Timeout Timer**

0 = Defeat  
Select 1-99 (.5-49.5 minutes)

.5 minute increments per step  
DEFAULT: 6 = 3 minutes

Select the maximum call limit time. The time is equal to .5 minutes (30 seconds) times the number you enter.

#### **2.4. CW ID**

1 = CW ID at connect and disconnect.  
0 = CW ID at disconnect only.  
DEFAULT: 0 = At disconnect only.

After accessing, manual dialing and auto-dialing are delayed until the CW ID is finished if you enter 1.

#### **2.5. Automatic Busy Signal Disconnect**

1 = Enable  
0 = Disable  
DEFAULT: 1 = Enable

#### **2.6. Automatic Dialtone Disconnect**

1 = Enable  
0 = Disable  
DEFAULT: 1 = Enable

#### **2.7. Aux. Relay**

0 = Connect [2.9.]  
1 = Monitor [2.9.]  
2 = Key [2.9.]  
3 = Remote Function [2.8.]  
DEFAULT: 0 = Connect

0. In connect mode, the relay is on whenever the patch is in connect.
1. In monitor mode, the relay can only be functioned when using Remote Base mode from a touchphone. Pressing 0 turns on the relay. Pressing \* turns it back off. The relay returns to off automatically when Remote base operation is completed. This function is normally used to remotely disable CTCSS so the channel can be monitored prior to initiating dispatch from a phone.
2. In key mode, the relay is on whenever the PTT is activated.
3. Remote Function provides a remotely controllable contact closure/opening which can be used for any purpose.

**NOTE:** Option 8205 (Aux. Relay) is required for the above.

#### **2.8. Remote Function Access Code**

xxx = Any three digits

Protocol: #xxx relay ON  
          ##xxx relay OFF  
DEFAULT: 789

Sets the control code for the Aux. Relay Remote Function. Enter any three digits. To turn on the relay press #xxx. To turn off the relay press ##xxx. This functions only if you entered 3 on line 2.7. Note: Do not operate the remote function while the 8200 is in connect.

## **INCOMING CALLS**

### **2.9. Busy Channel Monitor**

1 = Enable  
0 = Disable  
DEFAULT: 0 = Disable

Determines whether the 8200 will ringout or auto-answer if the channel is busy (Enter 0). Or only when the channel is clear (Enter 1).

### **3.0. Ringout on Ring Number**

0 = Disable [3.4.]  
Select 1-9 (1-9 ring) [3.1.]  
DEFAULT: 1 = First Ring

Selects which incoming ring starts the ringout alert. Enter 1-9 or enter 0 to disable ringout. Ringout is used for receiving ordinary phone calls.

### **3.1. Ringout Alert**

1 = Ring Tone  
0 = CW ID  
DEFAULT: 1 = Ring Tone

Select whether the ringout alert will consist of a Ring Tone or CW ID. The Ring Tone is similar to a telephone ring. You may also include a DTMF sequence by programming line 3.2.

### **3.2. Ringout DTMF Sequence**

000000 = None (display reads ' -')  
x-xxxxxx = DTMF Sequence  
DEFAULT : - = None

Enter a 1-6 digit DTMF sequence to be sent during the ringout alert interval. For no DTMF sequence enter 000000.

### **3.3. Ringout Once or On Alternate Rings**

1 = Once  
0 = Alternate

DEFAULT: 1 = Once

Only a single ringout alert is allowed in most business radio applications.

### 3.4. Auto-Answer Ring Number

0 = Disable [A.A.]  
Select 1-9 (1-9 ring) [3.5.]  
DEFAULT: 0 = Disable

Selects which incoming ring initiates auto-answer. Enter 1-9 or enter 0 to disable. If auto-answer is set to a greater number of rings than ringout, you can have ordinary ringout alerts until auto-answer occurs. After auto-answer, remote base, selective calling or talk back paging can be initiated from any telephone.

### 3.5. Telephone Remote Base

0 = Disable [3.6.] **NOTE:** Enter "0"  
1 = Automatic on Auto-answer [3.8.] if tone signaling  
2 = Access Code Required [3.8.] is to be used  
with  
DEFAULT: 0 = Disable remote base mode.

Enter 0 if remote base operation is not desired or if selective calling or talk-back paging is to be used. Enter 1 if remote base operation should automatically occur after auto answer. Enter 2 if an access code should be required from the initiating phone after the auto-answer beep. (Same access code used by mobiles)

### 3.6. Selective Calling or Talk-Back Paging

1 = Selective Call Mode [3.8.]  
0 = Talk back Page Mode [3.7.]  
DEFAULT: 1 = Selective Call Mode

If talk back paging is selected the 8200 will only deliver a one way voice message to a pager.

### 3.7. Talk Back Time

Select 1-9 (3-27 seconds)  
DEFAULT: 8 = 24 secs

Sets the talk time for talk back paging. Talk time is equal to three seconds times the number entered.

**NOTE:** If CTCSS is used as a talk-back paging tone, resistor R8 must be removed. Simply lift or cut one end.

## TONE SIGNALLING PARAMETERS

- 3.8. Mobile to Mobile Signalling** Note: DTMF signalling does not operate if one of the optional tone formats has been installed.
- 1 = Enable  
0 = Disable  
DEFAULT: 0 = Disable

When enabled, the 8200 can convert a mobile initiated DTMF sequence into any of the optional tone formats. For example: DTMF to Two Tone signalling. Mobile to mobile signaling is only functional if option 8202, 8203 or 8204 is installed. See page 29 for details.

Branching:

DTMF to: [A.A.] if no tone option is installed.  
CTCSS to: [3.9.] if option 8203 is installed.  
TWO TONE to: [4.0.] if option 8202 is installed.  
5/6 TONE to: [4.1.] if option 8204 is installed.

- 3.9. CTCSS Beep Alert** (Option 8203 required)

Select 3-9 (3-9 beeps)

DEFAULT: 6 = 6 Beeps

Select the number of alerting beeps that accompany the selected CTCSS tone for selective calling. See Table 2 for CTCSS selective call codes.

- 4.0. Two Tone Group Call or Diagonal Tone** (Option 8202 required)

1 = Group Call [A.A.]  
0 = Diagonal [A.A.]

DEFAULT: 1 = Group Call

**NOTE:** See Table 3 for Two Tone selective call codes.

- 4.1. Five Tone Preamble** (Option 8204 required)

1 = Enable [4.2.]  
0 = Disable [4.3.]

DEFAULT: 0 = Disable

Select the selective call code and all appropriate 5/6 tone parameters from Table 4.

- 4.2. Preamble Tone**

Select tone 0-9

DEFAULT: 0 = Tone 0

- 4.3. First Tone Select**

Select tone 0-9

DEFAULT: 0 = Tone 0

- 4.4. Second Tone Select**

Select tone 0-9  
DEFAULT: 0 = Tone 0

#### 4.5. Repeat Sequence

Select 1-9 (Repeat 1-9 times)  
DEFAULT: 1 = Once

#### 4.6. Duration of Tones

Select 1-99 (1-99 ms)  
DEFAULT: 33 = 33 ms

#### 4.7. Tone Group Select

1 = EIA	[A.A.]
2 = ZVEI1	[A.A.]
3 = CCIR/EEA	[A.A.]
4 = CCIT	[A.A.]
5 = EURO	[A.A.]

DEFAULT: 1 = EIA (See Table 4)

### PROGRAMMING THE CW ID (Programming Area No. 2)

To enter the CW ID programming mode, press and hold button No. 2 on the internal keypad and then simultaneously turn on the power switch. At this point, the display will read 0.2. When you release the No. 2 button, you will see **A.A.**

#### A.A. (GOTO Any Address)

Press 'P' to start at character position 0.1., or enter the character position number you wish to go to and then press 'P'.

#### Viewing or Changing Character Codes

A quick tap on 'C' will reveal (for a moment) the currently selected character code for the displayed character position. If the character code is acceptable, press 'P' to advance to the next character position, or, enter a new character code and press 'P' to advance to the next character position.

#### Character Code Range Checking

If a number greater than 38 is entered, pressing 'P' will not cause an advance to the next character position. This prevents you from accidentally entering an unuseable choice.

### **Returning to A.A.**

If desired, you can return to a previously programmed character position by holding down 'C' for several seconds. This will return you to A.A. Now enter the character position (line number) you wish to return to and press 'P'.

### **PROGRAMMING**

The CW ID message sent from the 8200 may consist of up to 15 characters. To program the message, enter the desired character codes (from Table 1) starting at character position **0.1.** thru the length of the string. If the message is less than 15 characters, it must be terminated with code 38 (Message End). For example, to program the CW ID message 'CSI':

- 0) Enter CW ID Programming Mode as explained above  
(Hold down key No. 2 and switch on the power)
- 1) From the **A.A.** line hit 'P'
- 2) From **0.1.** enter: ' 2 P' for the character "C"
- 3) From **0.2.** enter: '18 P' for the character "S"
- 4) From **0.3.** enter: ' 8 P' for the character "I"
- 5) From **0.4.** enter: '38 P' to end the message.
- 6) Turn off the power, and then back on, to return to operate mode with the newly programmed CW ID message.

**TABLE 1**  
**CW ID CHARACTER CODES**

## **SPEED DIAL PHONE NUMBER PROGRAMMING**

(Programming Area No. 3)

To enter the speed dial phone number programming mode, press and hold button No. 3 on the internal keypad and then simultaneously turn on the power switch. At this point, the display will read 0.3. When you release the No. 3 button, you will see A.A.

### **A.A. (GOTO Any Address)**

Press 'P' to start at speed dialer location 0.1., or enter the speed dialer location you wish to go to, then press 'P'.

### **Viewing or Changing Phone Numbers**

A quick tap on 'C' will reveal the phone number stored at the currently displayed memory location. The phone number is displayed digit by digit until all digits in the number have been shown. If the phone number is acceptable, press 'P' to advance to the next location. Or, enter a new phone number and press 'P' to advance to the next location. Any memory can be erased by entering three zeros. (000P).

**NOTE:** If there is no number at the current location, pressing 'C' will flash the current location number once instead of showing a phone number.

### **Programming \*, Pause or #**

The No. 1, 2 and 3 keys on the keypad are used as dual input keys. To program a phone number which contains any of these digits, briefly press the key and continue with the number, as you would with any other digit. To program a \*, press the No. 1 key until a single bar '|' is added to the display (approx. 3 seconds) then release the key. To program a pause, press the No. 2 key until a dash '-' is added to the display. To program a #, hold down the No. 3 key until a double bar '||' is added to the display.

### **Phone Number Length Checking**

A maximum of 16 digits may be entered in speed dial locations 1 through 16. A maximum of 8 digits may be entered in speed dial locations 17 through 90. If too many digits are entered, the display will revert back to showing the current location number. At this point, re-enter a shorter phone number.

### **Returning to A.A.**

If desired, you can return to a previously programmed auto-dial location by holding down 'C' for several seconds until A.A. shows on the display. Now enter the speed dial location you wish to return to and press 'P'.

## Returning to Operate

To return to normal operation, switch off the power and then back on. You can now use your newly programmed speed dial numbers!

## ANI (Access Code) Programming

(Programming Area No. 4)

Two separate 1-6 digit interconnect access codes can be programmed from the keyboard or over the air remotely. \* up is the default access code. We suggest not changing this code until you have the 8200 fully up and running.

The codes selected can be any combination of digits, six maximum. Codes beginning with odd numbers have toll override capability. Codes beginning with even numbers must abide by the toll parameters programmed on lines 1.7.- 2.1.

When accessing the 8200 from the mobile, the selected code(s) must be preceded by \*. To disconnect, press #, or # plus the connect code digits if a 1 was entered on line 1.1.

Examples of connect codes:

*657	Regular Access Code
*2	Regular Access Code
*7214	Toll Override Access Code
*313	Toll Override Access Code

**NOTE:** If option 8201 is installed, a total of 50 1-6 digit ANI (access codes) can be programmed remotely or from the keyboard.

## Programming Access Codes From The Keyboard

Programming access codes from the keyboard is very similar to programming phone numbers into the Auto Dialer memory.

The access code residing at any particular line number can be changed by advancing to that line and entering the new code followed by 'P'. An access code can be erased by advancing to the line where the undesired code resides and entering three zeros (000) followed by 'P'.

The 8200 can only be returned to simple \* up operation by programming a 0 on ANI programming line 0.1. (If a 0 is programmed in any other line it will be interpreted as being the access code \*0.)

To enter the ANI (access code) programming mode, press and hold button No. 4 on the internal keypad and then simultaneously turn on the power switch. At this point, the display will read 0.4. When you release the No. 4 button, you will see A.A.

#### **A.A. (GOTO Any Address)**

Press 'P' to start at ANI code line 0.1., or enter the ANI code line you wish to go to and then press 'P'.

#### **Viewing or Changing ANI (Access Codes)**

A quick tap on 'C' will reveal the ANI (access code) previously entered at the currently displayed line number. The ANI (access code) is displayed digit by digit until all digits in the code have been shown. If the ANI (access code) is acceptable, press 'P' to advance to the next line number or, enter a new ANI (access code) and press 'P' to advance to the next line number.

**NOTE:** If there is no ANI (access code) number at the current location, pressing 'C' will flash the current location number once instead of showing an ANI code number.

#### **Returning to A.A.**

If desired, you can return to a previously programmed ANI (access code) location by holding down 'C' for several seconds until A.A. shows on the display. Now enter the line number you wish to return to and press 'P'.

#### **Returning to Operate**

To return to normal operation, switch off the power and then back on. You can now access the interconnect using your newly programmed ANI (access code) numbers!

#### **Programming ANI (Access Codes) Over The Air**

Access codes can be added or deleted over the air. (Hereafter called editing).

To edit an ANI (access code) you must follow three steps...

1. Enter the remote programming mode by pressing # three times followed by the remote programming code selected on line 1.0. For example: ###9876
2. Enter a 1-6 digit ANI (access code) followed by \* to enable a code. To delete a code, enter the ANI you wish to disable followed by #. Repeat this sequence for as many codes as desired. You can add and delete codes in any order.

3. Exit the ANI (access code) programming mode by pressing # three times (###).

Example: You wish to enable two new ANI codes (3805 and 2879), and delete a previously programmed code (34906). Enter in this order; ###9876 3805\* 2879\* 34906# ###.

**NOTE:** If a code other than 9876 was entered on line 1.0., use that code to enter the remote programming mode instead of 9876 as used in the example.

### **Location of ANI Codes**

Codes entered from the keyboard begin at line 0.1. and continue on sequential line numbers until the required number of codes have been programmed. Codes programmed over the air begin at line 5.0. and decrement downwards. (5.0.,4.9.,4.8. etc.) If you wish to keyboard edit ANI codes that were programmed over the air, look for those ANI codes in the high line numbers.

### **OPERATION**

The 8200 will display all DTMF digits on the internal display as they are decoded. This is a useful feature to make sure the Audio In connection is made properly.

**NOTE:** The DTMF digits \* and # are shown on the internal display as a '| ' and '||' respectively (same as 'p' and 'c'on the internal keypad). This is because the displays used can not display the \* and # symbols.

### **PLACING OUTGOING CALLS**

**DIALING A CALL MANUALLY:** From the mobile press \*, or \* plus the ANI (access code) that was selected in programming area 4. If the access delay on line 1.5. is properly set, you will hear dialtone or CW ID start without clipping or delay. You may dial as soon as dialtone is heard.

After dialing, the next thing heard will either be ringing or a busy signal. The 8200 will automatically disconnect if the number that was called is busy. (2.5.).

**TOLL RESTRICT:** Four sets of restricted leading digit sequences can be set to restrict dialing to certain numbers and/or prefixes. These selections are made on user programming lines 1.8. - 2.1.

Remember, that access codes beginning with odd numbers have toll override capability and can dial any number. While access codes beginning with even numbers are restricted per your programming.

**1-800 DIALING:** The 8200 will allow dialing to toll free 1-800 numbers even if 1 is set as a restricted first digit. However, if you are going to restrict 1, you must restrict it on programming line number 1.8.

**CALL WAITING:** If line in use detection has been enabled, (JP-7 strapped and 1.2. set to 1) the 8200 checks to see if the line is in use when a mobile attempts access. If the line is free the mobile will hear dialtone and can proceed with his call. If the line was in use, the 8200 will send a special busy signal to the mobile and revert to the stand-by condition. At the same time, Call Waiting beeps let those using the line know that a mobile unit would like to use the line. When the telephone users hang-up, beeps let the mobile know that the line is now free to use.

The mobile can cut-in on the call if desired by using a toll override access code after hearing the line in use busy signal. A three way conversation can now take place.

**PROGRAMMING THE SPEED DIALER FROM THE MOBILE:** Writing a phone number into the speed dialer memory from the mobile is accomplished with a slight variation on ordinary manual dialing. Before you enter your access code, send 9 followed by the desired memory location number. e.g. You wish to place a call to 277-1463 and simultaneously add the number to speed dial memory location 6. From the mobile, enter 9 6 then the access code. When the dialtone is heard, dial 277-1463 just as you would in ordinary manual dialing. You will never have to manually dial 277-1463 again!

**NOTE:** The 9 as used above means **WRITE** the phone number to be dialed into the memory location specified immediately following the 9.

You can program a \*, pause or # as part of an speed dial sequence if desired. The digits 1,2 and 3 are interpreted as \*, pause and # if held down for 4-5 seconds during the dialing process.

For example: you wish to program; 8 pause 472-8197 into memory location No. 3. Enter in order; 9 3 then your access code. Then after dialtone enter 8, long 2, 472-8197. The number you have dialed is now properly loaded into memory location No. 3. However the long 2 will cause a misdial of the immediate call. When a \*, pause or # has been used, do not let the call go through. Send the disconnect command after the number has been dialed and call back using the speed dialer. The call will now dial properly.

**NOTE:** Memory locations 1-16 can store phone number sequences of up to sixteen digits. This is where you will store your long distance numbers that include area codes. Locations 17-90 are limited to eight digits and should be used for your local numbers.

**PLACING A CALL WITH THE SPEED DIALER:** Once a phone number has been stored, calling back is a snap! Simply precede the access code with the appropriate memory location number. Soon, your intended number will be ringing. Example: Your access code has been set as \* only. You wish to call a friend whose phone number has been previously stored in location 24. Simply enter 24 \* on your mobile keypad. Another example: Your access code is \*391, and you wish to speed dial the number in memory location No. 7. Enter 7\*391, that's all there is to it!

**NOTE:** If you attempt to speed dial from a memory location that has not been previously loaded, MicroPatch will send an error message consisting of a string of eight beeps, and then return to the stand-by condition.

**LAST NUMBER REDIAL:** The last phone number called is always automatically stored at speed dial memory location NO. 0. To redial the last number called, simply precede the access code with 0. Similar to using the speed dialer. e.g. 0\*, 0\*391 etc.

**HOOK FLASH:** The 8200 has a built-in precise 570 MS hook flash to operate certain phone company provided features such as call waiting. To flash, simply press \* three times (\*\*\*) .

**NOTE:** The 570 ms. on-hook flash can cause a disconnect on some phone lines.

**ACTIVITY TIMER:** Once your number has been dialed, the activity timer starts operating. A warning beep is heard every two seconds during the second half of the programmed timeout interval. Beeps warn of impending timeout.

The activity timer is constantly reset while the mobile is transmitting, and starts timing when the mobile stops transmitting. Upon hearing timeout warning beeps, a brief press of the mobile Mic button resets the activity timer. Failure to reset will result in a disconnect.

Note: when using in full duplex (mobile constantly transmitting) the mobile activity timer is always reset and the timeout beeps will not be heard. However the activity timer will cause automatic disconnect if the mobile forgets to send the disconnect code when finished, or if the mobile drives out of range.

**TIMEOUT TIMER:** Calls will automatically disconnect at the end of the time you selected on line 2.3. Two quick beeps heard in succession every two seconds during the final twenty seconds warn that time out is imminent. The timeout timer can be reset by the mobile by pressing \*.

**DISCONNECTING WHEN THROUGH:** If a "0" was entered on line 1.1. simply press # to disconnect. If a "1" was entered, press # plus the connect digits that were used to connect.

**FIVE PRESS AUTO DIAL:** If a "1" was entered on line 1.3., the phone number residing in memory location No. 1 can be automatically dialed by pressing the mobile Mic button five times in succession. When the call is finished, five more presses will cause disconnect.

If you press too fast or too slow the 8200 will not respond. The correct rate is about one press per second. This timing is required to keep rapid mobile fading and normal on channel Mic button pressing from falsing the patch on and/or off.

## **INCOMING CALLS**

**RINGOUT:** Lines 2.9. through 3.3. allow you to customize ringout for your application. Ringout is how the 8200 alerts you to the presence of an incoming call.

When a call comes in, the 8200 first checks to see if the channel is in use (2.9.). The incoming rings are counted (3.0). before a mobile alert is sent. The alert can consist of a Ring Tone that sounds like a telephone ringing or a CW ID (3.1.) The alert can also be prefaced by a sequential DTMF sequence (3.2.) The user programmable DTMF sequence (3.2.) can be used to operate attention getters such as a horn honker. The type of alert selected can be set to occur only once or on alternate rings (3.3.) of the incoming call.

To answer your call from the mobile, simply enter your access code. When you complete your call, send the disconnect code.

**AUTO ANSWER:** The 8200 must be set to automatically answer (3.4.) incoming calls if you wish to use the Remote Base, Selective Call or Talk Back Paging modes.

**NOTE:** If ringout is set to occur earlier in the ring cycle (3.0.) than auto answer (3.4.), it is possible to receive ordinary incoming calls plus use the modes which require an auto answer.

**TELEPHONE REMOTE BASE:** You can dispatch and have full use of your system from any telephone by entering a 1 or 2 on (3.5.)...

Enter 1 if you would like to access your radio system from any phone without the need to enter the system access code. Or, if you wish to dispatch from dial pulse phones.

Enter 2 if you would like the additional security of having to enter the system access code (1.4.) after the auto-answer beep.

You can call any mobile or portable on the system. Whether they are equipped with DTMF or not.

When your dispatch is finished, send the disconnect code before you hang-up. If you forget, built-in safe-guards such as call progress tone detection will keep the 8200 in control. Fully automatically!

**SELECTIVE CALLING/TALK BACK PAGING:** The 8200 can be set to provide either selective calling or Talk Back paging (3.6.)

**NOTE:** Selective calling can be used from dial pulse telephones if the optional 8207 Dial Click Detector has been installed.

**SIGNALLING TONES AVAILABLE:**

TYPE OF TONE	NO. OF CALLS	COMMENT
DTMF (standard)	Infinite	Fully Regenerated.
* CTCSS	38	See table 2
* Two Tone Sequential	1000	See table 3
* 5/6 Tone Sequential	1000	See table 4

\* These tone formats are optional and must be installed at the factory.

**TALK BACK PAGING:** A 3-27 second (3.7.) one way voice message can be delivered to any pager or mobile from any touchphone. After the auto-answer beep, enter the appropriate selective call digits followed by \*.

For example: DTMF XXXXX\* (x's any length, any sequence), CTCSS XX\* (x's from table 2), Two Tone XXX\* (X's from table 3) and 5/6 tone XXX\* (X's from table 4)

**SELECTIVE CALLING:** Any mobile or portable radio equipped with an appropriate tone decoder can be selectively called (3.6.) from any touchphone. After the auto-answer beep, enter the appropriate selective call digits followed by \*.

For example: DTMF XXXXX\* (x's any length, any sequence), CTCSS XX\* (x's from table 2), Two Tone XXX\* (X's from table 3) and 5/6 tone XXX\* (X's from table 4)

The 8200 will hold the auto answered call for thirty seconds giving the mobile time to respond. To answer a call and activate two way voice capability, the mobile must send the connect code. When the call is completed, the mobile should send the disconnect code.

**REMOTE BASE WITH SELECTIVE CALLING:** Remote Base with selective calling can be accessed by entering the connect code after the auto-answer beep. You can then send any selective call code by entering the appropriate digits followed by \*. (Remote base mode 3.5. must be set to 0 if selective calling is to be used).

Example: You've selected \*7 as your access code and you wish to send the selective call code 639. After the auto answer beep enter \*7 639\*.

**MOBILE TO MOBILE SIGNALLING:** The 8200 will cross mobile DTMF to CTCSS, Two Tone or 5/6 Tone for the purpose of "waking up" another mobile or portable. (Option 8202, 8203 or 8204 required).

If mobile to mobile signalling has been enabled (3.8.) simply send the same mobile selective call code that would be used from a phone. Except that the code must end with # rather than \*.

If you wish to perform mobile to mobile signalling during a phone call you must end the selective call sequence with a \*.

For example:

Patch idle: XX# for CTCSS, XXX# for 5/6 or 2 Tone.

Phone call in progress: XX\* for CTCSS, XXX\* for 5/6 or 2 Tone.

### **CALL PROGRESS TONE DETECTION**

The 8200 incorporates very sophisticated software algorithms that automatically sense the presence of dialtone and/or busy signals. The method used will function with any tone frequencies. There is nothing to adjust or maintain, it's completely automatic!

Note: On lines 2.5. and 2.6. you can selectively enable or disable busy signal disconnect and dialtone disconnect for special applications.

### **CTCSS SELECTIVE CALLING**

(option 8203)

The CTCSS selective call code digits (10-47) define all 38 EIA standard CTCSS tones. To find the call code for a specific CTCSS frequency, locate the frequency in Table 2. The two digit call code is then found adjacent in the select column.

Example: The call code required to signal 131.8 Hz. is: 29\*

**TABLE 2**

**CTCSS SELECTIVE CALL CODES**

- NOTES:**
1. 8203 CTCSS is an option and will not function unless factory installed.
  2. The CTCSS selective calling tone lasts until a disconnect occurs.
  3. See 'Incoming Calls' in the Operation section to determine the proper use of the selective call codes determined from this table.
  4. Resistor R8 must be removed if option 8203 is installed. Simply cut out or lift one end. (R8 is the 10K 1/4 watt resistor (brown black orange))

immediately adjacent and directly in line with the top of the RPT level pot.)

### **TWO TONE SEQUENTIAL SELECTIVE CALLING**

(Option 8202)

A 1000 call two tone sequential sequence consists of three digits. The first digit selects the group. The second and third digits select tone A and tone B from that group.

For example: The selective call code required to generate tone A = 296.5 and tone B = 1006.9 would be: 327. (Since these frequencies fall under Motorola Group No. 3).

- NOTES:**
1. 8202 Two tone sequential is an option and will not function unless factory installed.
  2. Select group call or diagonal tone for multiple alerting (4.0.)
  3. Tone duration: Tone A = 1 sec, tone B = 3 sec.
  4. See 'Incoming Calls' in the Operation section to determine the proper use of the selective call codes determined from this table.

**TABLE 3**  
**TWO TONE SEQUENTIAL CALL CODES**

**5/6 TONE SEQUENTIAL SELECTIVE CALLING**  
(Option 8204)

Select one of the five tone groups from the table above and enter on (4.7.)

The first two tones of a 1000 call five tone sequence are selected from the appropriate group and entered on (4.3.) and (4.4.) These two tones will automatically be sent with each page.

The third, fourth and fifth tones of the five tone sequence become the selective call code and are selected under the chosen operating group.

Example: A pager sequence of 1023, 1305, 1587, 741 and 1446 HZ is required. Enter 1 (EIA) on line 4.7. Enter 3 on line 4.3. Enter 5 on line 4.4. The three digit selective call code is then = 716.

To increase the probability of successful signalling, the five tones can be automatically repeated up to nine times (4.5.).

A sixth preamble tone can be enabled (4.1.) and selected (4.2.) if required.

The desired tone duration can also be selected (4.6.)

- NOTES:**
1. 8204 5/6 tone signalling is an option and will not function unless factory installed.
  2. See 'Incoming Calls' in the Operation section to determine the proper use of the selective call codes determined from this table.

**TABLE 4**  
**5/6 TONE SEQUENTIAL CODES**

**TYPICAL APPLICATIONS FOR THE AUXILIARY RELAY**  
**(Option 8205)**

**Relay Switched PTT:** If the radio's unkeyed PTT voltage exceeds 16 VDC or if inverted keying is required (closure to 12V) the auxiliary relay must be used to key the transmitter.

Enter 2 (KEY) on line 2.7. Connect the radio's PTT line to one of the Aux. Relay contacts on the barrier strip. Connect the other Aux. Relay contact to 12 VDC. Make sure JP-6 is strapped from the center to the NO position. The PTT connection on the barrier strip should not be connected.

**Remote Relay Function:** In some installations it may be desirable to remotely control (switch) something from the mobile. e.g. change channels, change CTCSS tones, change antennas etc.

Enter 3 (REMOTE FUNCTION) on line 2.7. Then select a three digit control code on line 2.8. If the code selected was 789, you would turn on the Remote Relay by sending #789. To turn off the relay send ##789.

**CONNECTING THE RELAY**

Connect the device requiring remote control to the two terminals labelled 'AUX. RELAY' on the rear panel barrier block. The 8200 is supplied with the relay strapped for normally open operation. if normally closed operation is desired, see JP-6 on page 8 for details.

**CTCSS BOARD**  
(Option TSU-32P)

Sub-audible Continuous Tone Coded Squelch System (CTCSS) tones can be added to the 8200 by simply plugging in a board. This option allows the 8200 to have CTCSS operation when connected to a radio which is not equipped with a built-in CTCSS decoder.

CTCSS operation allows the 8200 to respond only to those mobiles which are encoding the correct tone frequency. Thus providing discrimination against unwanted signals. CTCSS operation can be mobile to patch only, or if desired, mobile to patch and patch back to mobile. The latter protects the mobile from having to listen to unwanted chatter while monitoring for incoming calls.

The TSU-32P regenerates the selected CTCSS tone for the purpose of providing patch to mobile CTCSS. (Of course, the mobile must be equipped with CTCSS decode). The regenerated CTCSS tone is available on the rear panel barrier strip labelled TONE. If used, the regenerated tone must be injected directly into the transmitter's modulator through a suitable series resistor. (Try 10k-100k). Choose the largest resistor possible that will provide sufficient CTCSS tone modulation deviation. (500-750 Hz.)

**Installation:** Remove the 8200 board from the chassis. Install the nine AMP type connectors into the space marked 'TSU-32P' on the board. Solder the AMP connectors from the bottom. Be sure no solder flows into the connectors. Cut jumper strap JP-4 (Just to the right of the TSU-32 mounting position). Plug the TSU-32 board into the newly installed connectors. Set the dip switches to provide the desired CTCSS tone frequency using the table below. If the regenerated CTCSS has been connected, set the CTCSS modulation to the desired level using the potentiometer on the TSU-32P. Note that the 'JU-2' option strap on the TSU-32P board

must be cut. See the TSU-32P instruction sheet for details. This strap is already cut if the TSU-32P was factory installed.

PUT IN TONE TABLE

### **WARRANTY**

We guarantee the Model 8200 to be free from defects in material and workmanship for one year from purchase. Tampering, misuse or modification shall void this agreement.

Several components in the 8200 are mounted in sockets. We reserve the right to not cover these parts under warranty if failure is traceable to removal/re-insertion.

The quality of components used in the 8200 is excellent. It should give many years of trouble-free service. Should it fail, we shall repair it at our factory, and return it to you within one day if possible.

We reserve the right to not repair units which have been "modified".

This warranty does not cover damage caused by external overloads such as lightning or power source surges. This specifically includes failure of the PTT transistor (Q-19) which can only be made to fail with improper connection or excessive load current. Further, the warranty does not cover damage caused by any acts of nature.

The 8200 utilizes two metal oxide varistors connected from phone line to chassis ground. These "MOV's" should protect the 8200 from all but the most severe lightning strikes. However, we reserve the right to not repair a unit which in our opinion is too extensively damaged. Further the warranty of a unit which has been hit by lightning is terminated. This is because of latent damage which can surface at a future date.

Should repair become necessary, please send a copy of your sales invoice together with the interconnect.

Address repairs to: **Connect Systems Inc.**  
Service Dept.  
1802 Eastman Ave. Suite 116  
Ventura, Ca. 93003

#### **APPENDIX A**

#### **FCC NOTICE TO USERS**

-----

1. This equipment complies with part 68 of the FCC rules. On the bottom of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.
2. The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that may be attached to the line, as determined by the total REN's contact the telephone company to determine the maximum REN for the area.
3. If this product causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the

customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe necessary.

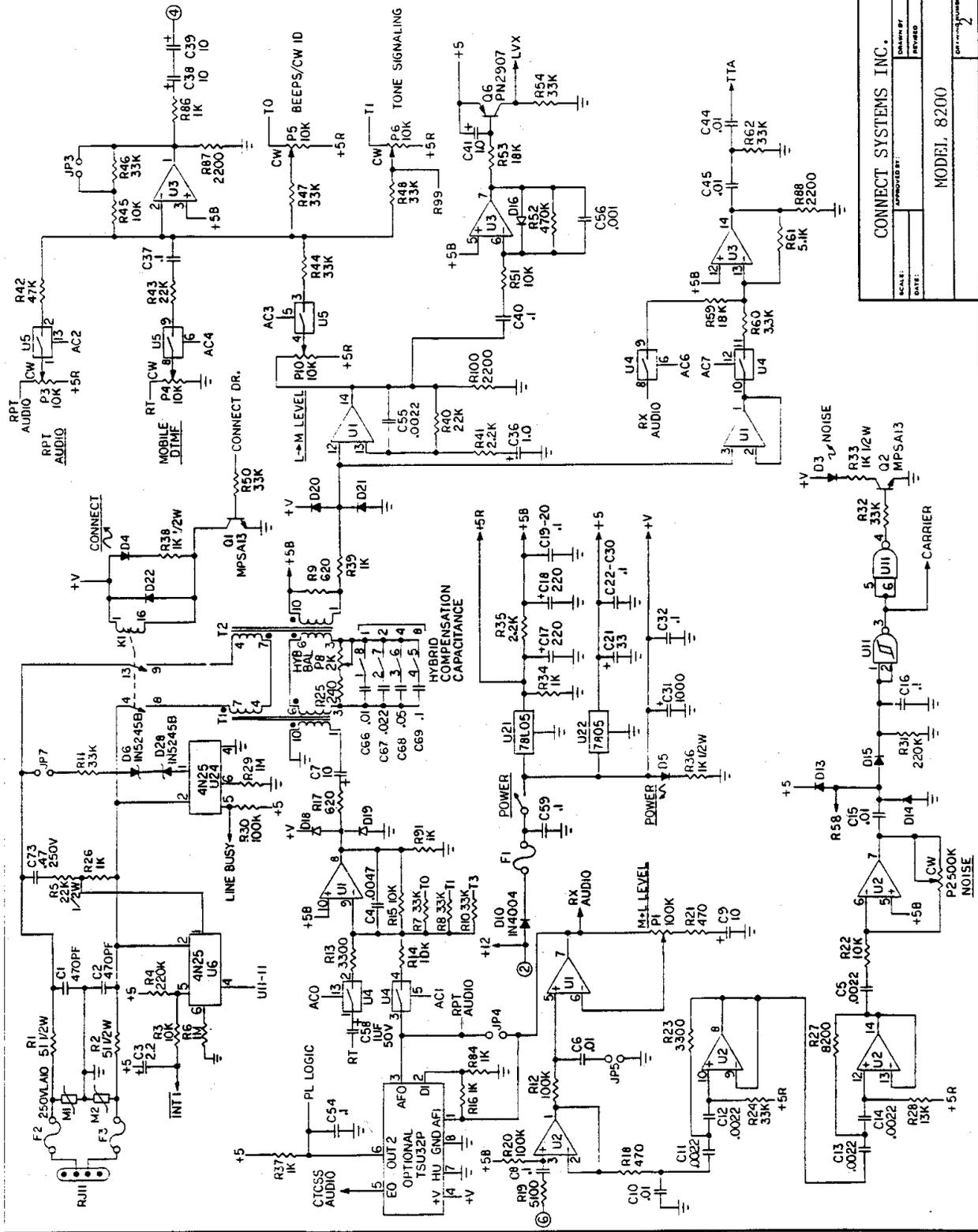
4. The telephone company may make changes in it's facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this should happen, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.
5. If trouble is experienced with this product, please contact Connect Systems Incorporated at (805) 642-7184 for repair and warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
6. There are no repairs that can be accomplished by the user. In the event of operation problems, disconnect your unit by removing the modular plug from the telephone company modular jack. If your regular telephone still works correctly, your unit has a problem and should be returned for repairs (in or out of warranty). If upon disconnection of your unit there is still a problem on your line, notify the telephone company that they have a problem and request prompt repair service. The unit may be returned to Connect System Incorporated, 2064 Eastman Ave, Suite #113, Ventura, CA 93003.
7. This interconnect product cannot be used on a public coin service provided by the telephone company. Connect to Party Line Service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.
8. This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference which may cause undesirable operation.
9. This equipment generates and uses radio frequency energy and if not installed and used properly, i.e. in strict accordance with the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

10. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - a. Reorient the receiving antenna.
  - b. Relocate the equipment with respect to the receiver.
  - c. Move the equipment away from the receiver.
  - d. Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.
  - e. Ensure that card mounting screws, attachment connector screws, and ground wires are tightly secured.
  - f. If cables not offered by this company are used with this equipment, it is suggested that you use shielded, grounded cables with in line filters, if necessary.
  - g. If necessary consult your dealer service representative for additional suggestions.
11. The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

The Rev A manual can be converted to Rev C level by substituting the following pages from the Rev C file: 1, 2, 8, 10, 14, 25, 34, 35, rev c schematics on pages 36-38 and appendix A on pages 39-40.

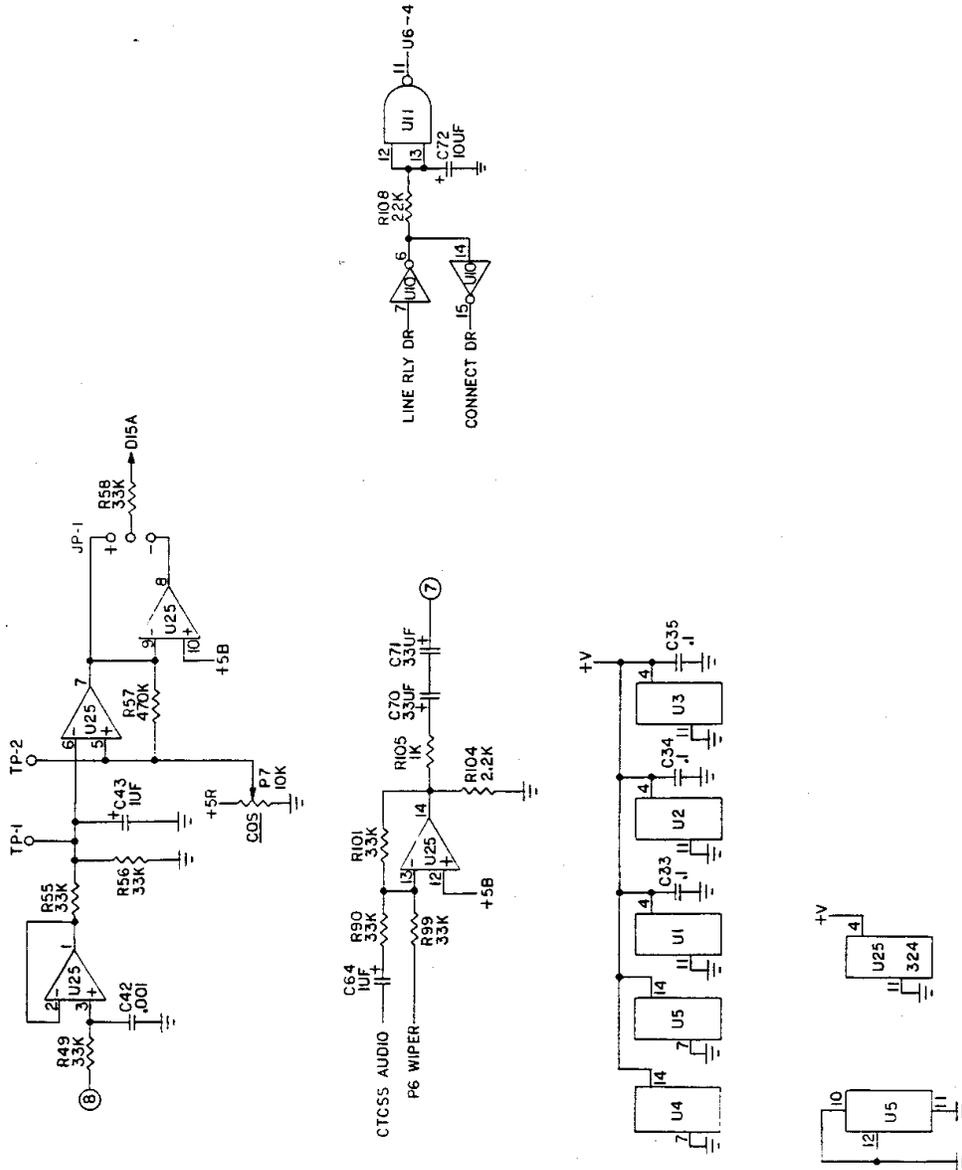
Otherwise, I believe this completes all changes required for the Rev C document.





CONNECT SYSTEMS INC.	
SCALE	DATE
APPROVED BY	DESIGNED BY
	REVISED
	DATE
	PRINTED NUMBER
	2

MODEL 8200



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DATE:	DRAWN BY:
	REVISED:
MODEL 8200	
DRAWING NUMBER:	3

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