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Model 8300

Repeater Controller & Duplex Interconnect

INSTRUCTION MANUAL
Version 2.0

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IMPORTANT NOTICES

1. CSI reserves the right to make product changes/improvements but does not assume any responsibility for upgrading previously sold products.

2. Your Model 8300 is equipped with **CTCSS Trak...** A revolutionary software decoding algorithm that gives the Model 8300 unbeatable DCS/CTCSS sensitivity and talk off resistance.

You can choose any one of 154 DCS/CTCSS tones as the input operating tone. The output can be crossed to any other tone if desired.

There are 38 standard EIA CTCSS tones, plus 12 non standard tones which are in common use making 50 total CTCSS tones. The 8300 allows you to select either 38 tone format, or 50 tone format. If you wish to use one of the 12 non standard tones you must select 50 tone format. If you are using one of the standard EIA 38 tones, you have a choice of selecting 38 tone or 50 tone format...

 Select 38 tone format if you have a clear channel or if others on
 the channel are all using standard 38 tone format. If any co-
 channel users are using non standard tones then the 8300 should be
 set for 50 tone operation even though you are using a standard EIA
 tone.

Explanation: The 38 tone setting gives some tones a wider bandwidth slot. A neighboring nonstandard tone may decode as the tone you have selected. Selecting 50 tone operation will allow rejection of the neighboring non standard tones.

3. The Model 8300 contains a power supply sensing circuit that continuously monitors the input supply voltage. An instantaneous drop below 12 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 is observed be suspicious of poor regulation from the power supply.

4. Do not attempt any reprogramming until you have the Model 8300 up and running. In doing so, you run the risk of a programming error causing a problem you do not understand. The Model 8300 can be returned to factory default programming at any time by simply installing jumper JP-6 and turning the power off and back on again. You will see || || || || in the display during the re-initializing process. When the display shows ---- the process is complete. (Please be patient, re-initializing takes approximately 90 seconds). Remove JP-6 and your Model 8300 is ready to use, but is re-programmed to factory default settings.

   Should you forget your programming mode access code you will have to return all programming to the factory default values so that you can start over again.

THE CONNECTIONS

Two connections must be made to the receiver and three to the transmitter. Use shielded wires with the shields at each end connected to chassis ground. (The rear panel barrier strip terminals labeled "GND" are chassis ground). We recommend using spade type crimp-on connectors for ease and reliability. Connect the center wires as follows:

RX AUDIO: The audio input terminal should be connected to the receiver discriminator (de-modulator) output.

RX COS: Connect to a point that has good 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 receiver has one). Otherwise, you may connect to the squelch gate control voltage. Your last choice would be to connect to output of the noise rectifier.

If the point selected goes more positive (voltage increases) when a signal is received, strap JP-10 center to the + side. If the point goes to a lower voltage, strap JP-10 from center to the - side.

When the COS threshold control P4 has been properly adjusted (see page 5), and JP-10 properly strapped (see page 7), the front panel RECEIVE LED will illuminate only when a signal is received. This condition must be achieved for proper operation .

NOTE: The squelch control in the receiver must be set for quiet (squelched) receive. Set the squelch as you would any squelch, but remember if you set it too tight, receive sensitivity may suffer.

TX AUDIO: Connect to the transmitter audio input or mic high line.

PTT: Connect to the transmitter PTT line.

SUBTONE The SUBTONE output is used to inject DCS and CTCSS into the transmitter. The injection point must be after the IDC clipper circuit, and preferably directly to the modulator.

NOTE: For CTCSS operation you may use either a phase modulated or true FM (frequency modulation) transmitter. However only a true FM transmitter will allow DCS operation.

+12 VDC: Connect to a source of 12-14 VDC. The Model 8300 is reverse polarity protected, so a polarity mistake will not damage your Model 8300. Connect the return lead (-) to GND.

ADJUSTMENTS

P1   PREAMP: The **PREAMP** control is used to match the audio level from your receiver to the Model 8300. To adjust, a signal containing the desired DCS or CTCSS tone with about +/- 600 HZ deviation should be applied to the receiver. Adjust the PREAMP control until a level of 3V P-P is observed at TP-1 using an oscilloscope. (TP-1 is located near IC U28). This completes the adjustment of the PREAMP control. Future adjustment should only be required if the Model 8300 is connected to a different receiver.

P2   CW ID: **Courtesy beeps & CW ID level:** Adjust for desired modulation level of the courtesy beep and CW ID.

P3   RPT: The **REPEAT AUDIO** control sets the level of the repeat mode voice audio. Set so that 3 KHz. input deviation causes 3 KHz. output deviation. This will cause a linear input/output relationship.

                         NOTE: The RPT AUDIO control should only be adjusted after the PREAMP control has been properly adjusted.

P4   COS: The **COS** control sets the COS input threshold level. Measure the voltage at TP-2 with no signal. Then measure the voltage again with a signal applied. Adjust the **COS** control until the voltage reading at TP-3 is approximately midway between the two readings previously obtained at TP-2. (TP-2 and TP-3 are near the COS Potentiometer).

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

                         IMPORTANT: If the COS polarity select strap JP-10 is set correctly and the **COS** control is properly adjusted, the RECEIVE LED will illuminate when there's a signal, and will go out when the signal is removed.

P5   DCS: The **DCS** control sets the modulation level of digital DCS.

P6   CTCSS: The **CTCSS** control sets the modulation level of analog CTCSS. Be sure the transmit CTCSS/DCS tone is properly selected before making this adjustment. This is especially important if the transmitter is phase modulated.

P7 DTMF: The **DTMF** control adjusts the deviation of the outgoing DTMF transpond and regenerated DTMF. Set for about 2.5 KHz. deviation.

P8 SIGNALLING: The **SIGNALLING** level control adjusts the level (Transmitter deviation) of Two Tone and 5/6 Tone signalling.

P9 M->L   The **Mobile To Land Level** control adjusts the mobile audio level as heard on the telephone.

P10 L->M   The **Land To Mobile Level** control adjusts the level from the telephone to the mobile. Press * (or access code) on a mobile unit so that a dialtone is heard. Adjust P10 until the dialtone produces about 3-4 KHz. of modulation deviation. Remove strap JP-2 if required.

P11 SIGNALLING Adjusts the sensitivity of Call Progress Tone and
DETECT   Rotary Signalling detection. Located just to left of relay K2. Also near PROG jack on rear panel.

P12 HYB BAL   The **Hybrid Balance** control is used to null out the mobile return audio in full duplex mode. See page 8 for a complete discussion.

JUMPER STRAP OPTIONS

JP-1 De-emphasis strap. (Located near IC U1). The Model 8300 should be connected directly to the receiver detector output for optimum performance. If connected properly to the detector then JP-1 should be installed so that the Model 8300 can de-emphasize the incoming audio. If you must connect downstream (past the receiver's built-in de-emphasis), you can remove JP-1 to eliminate the TP-154 Plus de-emphasis. Please note that DCS can only operate if connected <u>directly</u> to the detector.

JP-2 Output level strap. (Located near the L->M level control). The audio output is selectable in two ranges. With the strap installed, the audio out is 0-1 volt. With the strap removed, the output range is 0-5 volts. The strap should be installed in most installations.

JP-3   **DCS/CTCSS Level strap.** (Located between IC's U5 and U20). The DCS/CTCSS output level is selectable in two ranges. With the strap installed, the level is 0-1 volt. With the strap removed, the output range is 0-5 volts. The strap should be installed in most installations.

JP-4   **PTT Polarity.** (Located to the right of IC U28). This strap gives you a choice of pull to ground (GND), or pull to +12 VDC (POS) for transmitter keying.

NOTE: Pull to GND is the most common keying polarity.

JP-5   **LED Power.** (Located near the POWER led). Removal disables all front panel LEDS (except PTT) and is used to save power in low power applications such as solar powered installations.

JP-6   **Reset Factory Settings.** (Located to the left of microprocessor U17). If you wish to return the programming back to factory settings, simply install this strap and turn the power on. When the initialization begins, the display will show "|| || || ||". When the procedure is complete, the display will show "----". At this point, remove the jumper. The display will blank and the Model 8300 is ready to use just as it came from the factory. Please be patient, the re-initializing process takes about 90 seconds.

JP-7   **Auxiliary Relay Contacts.** (Located near fuse F1). Allows selection of normally open (NO), or normally closed (NC) contacts.

JP-8   **Line In Use Detector.** (Both jumpers are located near the
&   heatsink. These two jumpers are used to enable/disable Line
JP-9   In Use detection. These jumpers are mutually exclusive. That is to say that one or the other must be strapped. The Model 8300 is delivered with the Line In Use detection disabled (JP-9 strapped). To enable line in use detection remove the plastic push on clip from JP-9 and re-install on JP-8.

NOTE: The above applies to the Model 8300 LINE input. (Shared line). There is no line in use detection for lines coming into EX-8 expanders

JP-10   **COS Polarity Select.** (Located near the DTMF level potentiometer). This strap must be installed in one position or the other. Select the polarity (+ to center or - to center) that causes the REC led to illuminate when a signal is received, and go out when there's no signal. Note that the COS threshold adjustment P4 must first be adjusted.

WHAT IS A HYBRID?

Every telephone has a hybrid (sometimes called a balance 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.

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 full 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 system output in comparison to the telephone party audio. But of course the mobile and the telephone party hear each other perfectly.

Hybrid alignment is only used for full duplex operation. If you will be using only semi-duplex, there is no need to balance the hybrid at all.

HYBRID ALIGNMENT PROCEDURE

The alignment must take place on the phone line the Model 8300 will be serving. (Final alignment can not be done at the shop prior to delivery to the site).

Have a mobile place a call through the Model 8300 into a commonly called area. The party answering the called phone should leave the phone off hook during the alignment procedure.

Monitor the transmitter output with a service monitor or connect an oscilloscope to the 'audio out' terminal on the rear of the Model 8300. 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. (Hybrid alignment will not be possible if the front panel DTMF led is illuminated during alignment.)

Adjust the "HYB BAL" potentiometer (P12) to produce the least audio output. Switch the "HYB comp" dip switches to the next higher capacitance (see Figure 1) and re-null P12. Repeat this procedure 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.

HYB COMP SWITCHES 4 3 2 1	COMPENSATION CAPACITANCE
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 = ON
```

FIGURE 1

Table of hybrid compensation settings.

PHONE LINE CONNECTION

The Model 8300 is equipped with a standard RJ-11 modular phone jack labeled LINE 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 EQUIVALENCE:  0.2B

        In U.S.A.
        FCC REG. NUMBER   :  2CAUSA 21178 OT E

        In Canada
        DOC REG. NUMBER   :  2014 6126 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. Please see Appendix A at the back of this manual for additional information.

The Model 8300 can be programmed three different ways... locally, remotely over the air, or remotely from any touch phone:

Local Programming: Simply plug any DTMF telephone set into the rear panel RJ-11 jack labeled "PROG". This allows the telephone keypad to act as a programming keyboard. The front panel display will show your keystrokes and then display the results of entries which have been accepted.

DTMF Over The Air Programming: The Model 8300 can be programmed over the air from any DTMF equipped radio. The 8300 transponds a DTMF sequence in response to each command you enter, which is used to display the results of your programming on our CD-2 Communications Decoder Unit (an option that you should have). The data displayed on the CD-2 is identical to the data presented on the front panel display and eliminates any chance of errors.

Remote Dial up Telephone Programming: Occasionally the Model 8300 will be located out of radio range and over the air programming will not be possible. Simply dial up the shared line and enter your user programmable, programming mode access code. You can now perform any desired remote programming. The Model 8300 acknowledges all commands with accept or reject audible feedback. If a command has been accepted, you will hear a single long beep and you may then program the next item. If your command syntax is unacceptable at any point, you will hear a string of short beeps. Press *** which erases your attempt thus far and lets you begin again. Send #### when through.

Note: Auto-answer must be enabled to permit dial-up remote programming. If using ringout, then set auto-answer for a higher number than ringout has been set (try setting ringout to ring number one, and auto-answer to ring number nine).

To Enter and Exit Programming Mode: To enter programming mode you must enter the programming mode access code. The access code consists of six digits plus two leading pounds (##) and a trailing #. The syntax is ##pppppp#. The factory default programming access code is 123456 (note that this code is always six digits in length). Therefore, the code required to get into programming mode is ##123456#. This code will be valid unless you change the Programming Mode Access Code.

When programming is completed, send #### to exit the programming mode. (If you forget, the Model 8300 is designed to self exit three minutes after the last DTMF command).

Remote and Local Programming Modes: When the Model 8300 receives the program mode access code it checks to see if the code came from a radio, or from a dial up, or from a local telephone keypad. If the code is received from a remote source, the Model 8300 goes into Remote Programming mode. If the code comes from a telephone plugged into the

PROG jack (and the RX light is out) the 8300 goes into local program mode. The PROG led lights solid in local program mode and blinks on and off when in remote program mode.

In Radio Remote Programming mode the transmitter remains keyed and a beep will be heard about every five seconds to remind you that the Model 8300 is still in Program Mode. A DTMF sequence is automatically transponded back in response to each valid command sequence for programming validation on your CD-2 Decoder Unit (option).

In dial-up programming mode, you will hear a long beep when a command has been accepted. A string of short beeps indicates that you have made an unacceptable entry. Send *** and try again.

In Local Programming Mode, the front panel PROG led is steady on (non-flashing) and the transmitter remains off. Each time you make a programming entry, the results are displayed on the front panel display (rather than a DTMF transpond) for validation.

Command Syntax: When programming, you will enter programming sequences such as *1#73#mm#. (This command programs the first character of a subscribers CW ID). Or, *1#03#J# which enables or disables a users courtesy beep.

Input fields such as nnn, mm etc. are requesting you to enter programming choices. Input fields with J are always 1 or 0. Usually 1 for enable or 0 for disable.

De-limiters (separators) are used to segregate data fields. Every command you program begins with * and then the delimiters that follow are the # symbol.

Leading zeros: Data fields containing the letter n and m e.g. mm, nnn etc. require that you enter precisely the number of digits specified. Numbers which have fewer digits than the field calls for will require leading zeros. Example: An mm field requires two digits. You would enter a value of 6 as 06. Fields with the letter p allow you to enter precise data such a toll restrict sequence.

Local Display: The front panel display is active during local or remote programming. The * and # delimiters are displayed as - and || because the display cannot show the * and #. Each time you enter a delimiter the previous information is blanked and the delimiter plus data that follows is displayed. For example: The command *1#09#20# would appear as: ||01, ||09, ||20.

Remote Over the Air Data Downloading: The Model 8300 will transpond a DTMF validation code each time you send a programming command from your radio and each time you send a specific request for data. These codes will appear on your CD-2 Communications Decoder Unit (option) exactly as they appear on the Model 8300 front panel display and give you positive feedback about data entry and how your Model 8300 is

programmed. The command syntax for data feedback is shown in the programming lists.

WE HIGHLY RECOMMEND THAT YOU PURCHASE A CD-2 AS A PROGRAMMING AID FOR YOUR Model 8300!!

Understanding the programming format: Following is a typical line excerpted from the GLOBAL PROGRAMMING COMMANDS:

	TO PROGRAM	TO DISPLAY
STUCK MIKE ACTIVITY TIMER	***1#12#mm#**	***1#12***
mm 01-99 0=disable 10 sec/step		[mm=18=180 Sec's]

The **BOLD** line identifies the item you may wish to program and the syntax to use for programming followed by the syntax to use to read this parameter back to either the front panel display if programming locally or to your CD-2 if programming from a remote site.

The subline tells you everything you need to know to program this particular parameter. The first information lets you know the allowable range for mm and that if can you enter zero to disable this parameter altogether. In parenthesis the actual range of adjustment is indicated. If you multiply the value you enter (mm) by the step size you will have the resultant time. The information in brackets [mm = 18 = 180 Secs] is how the Model 8300 is programmed when shipped from the factory.

Example: You wish to set the Stuck Mic. Activity Timer to 60 seconds for all subscribers on the system. First, determine the value for mm. This would be 6 (6 times the step value of 10 seconds equals 60 seconds, (The desired value). To make this modification, put your TP-154 into program mode and enter the following sequence on your local or remote DTMF keypad: *1#12#06#. (Note the leading zero before the six which must be used).

To read this parameter back on the local display or on your CD-2 simply send: *1#12*. The display command is useful to view how a parameter is currently programmed without changing the current setting.

Resetting your position: If you are distracted or have a lapse and forget where you are in the middle of a command sequence, simply send * three times (***) and start the command sequence over again. Example: You have just entered *1#3 and suddenly you forget where you are. Simply send *** and begin inputting the command over again.

Be organized. To avoid being flustered during programming. we recommend thinking through what you want to program and then writing down the entire sequence of codes you must send including programming

mode access code at the beginning and exit code (####) at the end. You may send a request to display any data you wish to see on the local display or CD-2 at any time while in programming mode.

```
 _____
|                                                                   |
|              TABLE 1   CW ID CHARACTER CODES                      |
|_____|
| A = 0 | G = 6  | M = 12 | S = 18 | Y = 24 | 5 = 30 | WORD        |
| B = 1 | H = 7  | N = 13 | T = 19 | Z = 25 | 6 = 31 | SPACE= 36|
| C = 2 | I = 8  | O = 14 | U = 20 | 1 = 26 | 7 = 32 |            |
| D = 3 | J = 9  | P = 15 | V = 21 | 2 = 27 | 8 = 33 | SLANT      |
| E = 4 | K = 10 | Q = 16 | W = 22 | 3 = 28 | 9 = 34 | BAR = 37   |
| F = 5 | L = 11 | R = 17 | X = 23 | 4 = 29 | 0 = 35 |            |
|       |        |        |        |        |        | MESSAGE    |
|       |        |        |        |        |        | END = 38   |
|_____|_____|_____|_____|_____|_____|_____|
|                                                                   |
|     e.g. CW ID message desired is 'CSI' Enter 2, 18, 8, 38       |
|_____|
```

CW ID characters and corresponding mm values may be obtained from Table 1. The entry immediately following your message must be 38 which means "message stop".

Example: To program KYZ 2584 the following mm sequence is required in character positions 1-8: 10 24 25 27 30 33 29 38

nnn	CODE	nnn	CODE	nnn	CODE	nnn	CODE
001	67.0	040	199.5 *	079	156	118	423
002	69.4 *	041	203.5	080	162	119	431
003	71.9	042	206.5 *	081	165	120	432
004	74.4	043	210.7	082	172	121	445
005	77.0	044	218.1	083	174	122	446
006	79.7	045	225.7	084	205	123	452
007	82.5	046	229.1 *	085	212	124	454
008	85.4	047	233.6	086	223	125	455
009	88.5	048	241.8	087	225	126	462
010	91.5	049	250.3	088	226	127	464
011	94.8	050	254.1 *	089	243	128	465
012	97.4	051	023	090	244	129	466
013	100.0	052	025	091	245	130	503
014	103.5	053	026	092	246	131	506
015	107.2	054	031	093	251	132	516
016	110.9	055	032	094	252	133	523
017	114.8	056	036	095	255	134	526
018	118.8	057	043	096	261	135	532
019	123.0	058	047	097	263	136	546
020	127.3	059	051	098	265	137	565
021	131.8	060	053	099	266	138	606
022	136.5	061	054	100	271	139	612
023	141.3	062	065	101	274	140	624
024	146.2	063	071	102	306	141	627
025	151.4	064	072	103	311	142	631
026	156.7	065	073	104	315	143	632
027	159.8 *	066	074	105	325	144	654
028	162.2	067	114	106	331	145	662
029	165.5 *	068	115	107	332	146	664
030	167.9	069	116	108	343	147	703
031	171.3 *	070	122	109	346	148	712
032	173.8	071	125	110	351	149	723
033	177.3 *	072	131	111	356	150	731
034	179.9	073	132	112	364	151	732
035	183.5 *	074	134	113	365	152	734
036	186.2	075	143	114	371	153	743
037	189.9 *	076	145	115	411	154	754
038	192.8	077	152	116	412		
039	196.6 *	078	155	117	413		

TABLE 2
nnn vs Tone/Code

001-050 are CTCSS.
051-154 are DCS.

NOTE: CTCSS tones tagged with a * are non standard tones which are not
available if you have selected 38 tone operating mode.

Normal	Invert	Normal	Invert	Normal	Invert
023	047	223	134	445	043
025	244	225	122	446	255
026	464	226	411	452	053
031	627	243	351	454	266
032	051	244	025	455	332
036	172	245	072	462	252
043	445	246	523	464	026
047	023	251	165	465	331
051	032	252	462	466	662
053	452	255	446	503	162
054	413	261	732	506	073
065	271	263	205	516	432
071	306	265	156	523	246
072	245	266	454	526	325
073	506	271	065	532	343
074	174	274	145	546	132
114	712	306	071	565	703
115	152	311	664	606	631
116	754	315	423	612	346
122	225	325	526	624	632
125	365	331	465	627	031
131	364	332	455	631	606
132	546	343	532	632	624
134	223	346	612	654	743
143	412	351	243	662	466
145	274	356	212	664	311
152	115	364	131	703	565
155	731	365	125	712	114
156	265	371	734	723	431
162	503	411	226	731	155
165	251	412	143	732	261
172	036	413	054	734	371
174	074	423	315	743	654
205	263	431	723	754	116
212	356	432	516		

TABLE 3
Normal / Inverted DCS Codes

The DCS decode (input) and DCS encode (output) polarities must be programmed correctly. The default values are set to normal for incoming and outgoing DCS. The radios you use may need to have incoming and/or outgoing DCS set for inverted polarity.

Example: An incoming 023 code reads as 047. Inverting the DCS Polarity Decode parameter will correct the code. An outgoing code of 212 appears as 356 on your service monitor CD-2. Simply invert the DCS Encode Polarity to correct.

```
                                            TO PROGRAM        TO DISPLAY
REPEATER PARAMETERS
-------------------                              |                 |
                                                 V                 V


   REPEATER ENABLE/DISABLE                  *1#01#j#          *1#01*
j = 0 = Disabled      j = 1 = Enabled                [j = 1 = Enabled]
Used to disable the repeater capability if the Model 8300 is to be
used for interconnect only.


   COR OR DCS/CTCSS OPERATE                 *1#02#j#          *1#02*
j = 0 = DCS/CTCSS   j = 1 = COR                  [j = 0 = DCS/CTCSS]
If COR is selected, the presence of any carrier will have the same
effect as a carrier with DCS/CTCSS in DCS/CTCSS mode.


   COURTESY TONE                            *1#03#mm#         *1#03*
mm 00-99  (.01-.99 Sec's - 10 Ms/step)            [mm = 10 = 100 Ms]
Delays courtesy beep after mobile drops input carrier. Enter mm=00
to disable the courtesy tone


   CTCSS/DCS DURING HANG TIME               *1#04#j#          *1#04*
j = 0 = Disabled  j = 1 = Enabled                    [j = 1 = Enabled]
Determines if CTCSS or DCS is allowed to continue after a mobile
unkeys during the hangtime interval.


   REPEATER HANGTIME                        *1#05##mm#        *1#05*
mm = 0-99 (0 - 9.9 seconds - .1 sec/step)      [mm = 30 = 3 Sec's]
Hangtime is the amount of time the repeater transmitter remains on
the air after a user stops transmitting.


   CARRIER DROP DELAY                       *1#06#mm#         *1#05*
mm = 00-99, (0 - .99 Sec's  10 Ms./step)      [mm = 99 = .99 Sec's]

Adjusts how long carrier remains on after the CTCSS reverse burst or
DCS turn off code. Keeping the carrier on quiets mobiles not
equipped with turn off detection and allows the repeater to go off
without a squelch tail heard. The default value is .99 seconds and
probably will not need to be changed.
```

Note: The carrier drop delay is additive to hangtime and in effect
increases the total beyond the value set for hangtime.

```
   RECEIVE CTCSS/DCS TONE                   *1#07#nnn#        *1#07*
nnn = 001 - 154                                  [nnn = 001 = 67 Hz.]
Selects the receive CTCSS or DCS tone. See Table 2.


   TRANSMIT CTCSS/DCS TONE                     *1#08#nnn#     *1#08*
nnn = 000 - 154,  nnn = 000 output same as input     [nnn = 000]
Selects the transmit CTCSS or DCS tone. See Table 2.
```

ANTI-KERCHUNKING TIME   *1#09#mm#   *1#09*
mm = 01-99 0   to disable .1 sec/step   [mm = 0 = Disable]
If enabled, repeater will not hang unless user keys down at least as
long as the time set. Does not affect pick up speed.

SQUELCH TAIL LENGTH   *1#10#mm#   *1#10*
mm 00-99 (0-99 Ms - 1 Ms/step)   [mm = 0 = 0 Milliseconds]
Set to 0 for minimum tail. Only used if the receiver has a poor
squelch and can stop word clipping by adding squelch delay.

CTCSS/DCS HOLD DELAY   *1#11#mm#   *1#11*
mm 03-99 (.3-9.9 Sec's - .1 sec/step)   [mm = 30 = 3 Sec's]
Use the lowest setting possible without introducing talk off. Do not
change from the 3 Sec setting unless a problem exists.

STUCK MIKE ACTIVITY TIMER   *1#12#mm#   *1#12*
mm 01-99 0=disable   10 sec/step   [mm=18=180 Sec's]
Sets the maximum continuous (uninterrupted) talk time. If a user
talks past the activity timer time, the repeater merely stops
transmitting until the input drops and is picked up anew.

DCS ENCODE POLARITY   *1#13#j#   *1#13*
0 = Normal 1 = Inverted   [mm = 0 = Normal]
Corrects transmitted DCS polarity.

DCS DECODE POLARITY   *1#14#j#   *1#14*
0 = Normal 1 = Inverted   [mm = 0 = Normal]
Corrects received DCS polarity.

38 OR 50 CTCSS TONES   *1#15#j#   *1#15*
0 = 38 Tones 1 = 50 Tones   [j = 0 = 38 CTCSS Tones]
Select std. 38 EIA tone, or 50 tone operation.

MOB TO MOB SIGNALLING   *1#16#j#   *1#16*
j = 0 = Disabled   j = 1 = Enabled   [j = 1 = Enabled]
Enables/Disables the mob/mob signalling feature

INTERCONNECT PARAMETERS

INTERCONNECT ENABLE/DISABLE   *1#17#j#   *1#17*
j = 0 = Disabled j = 1 = Enabled   [j = 1 = Enabled]
Enables/disables the interconnect mode for repeater only use.

FULL or HALF DUPLEX OPERATION   *1#18#j#   *1#18*
0 = HALF-DUPLEX 1 = FULL DUPLEX   [j = 1 = FULL DUPLEX]

HALF-DUPLEX PRIVACY MODE   *1#19#j#   *1#19*
j = 0 = Disabled j = 1 = Enabled   [j = 0 = Disabled]
Mobile side of conversation is not heard on repeater output if
enabled.

NORMAL ACCESS CODE   ***1#20#pppppp#**   ***1#20***
pppppp = 1-999999   [pppppp = 000000 = * Connect]
Example: Enter 3467. Access code will then be *3467. To return to *
only, enter 000000. Display shows ----.

TOLL OVERRIDE ACCESS CODE   ***1#21#pppppp#**   ***1#21***
pppppp = 1-999999   [pppppp = 123456]
Example: Enter 292785. Access code will then be *292785. To return
to * only, enter 000000. Display shows ----.

DISCONNECT CODE   ***1#22#j#**   ***1#22***
j = 0 = #   j = 1 = # + ACCESS CODE DIGITS   [j = 0 = #]
Selects whether disconnect is # only, or # plus access code digits.
Normally select # only for ease.

CALL LIMIT TIMER RESET   ***1#23#j#**   ***1#23***
j = 0 = Can't reset   j = 1 = Can reset   [j = 0 = Can't reset]
Determines whether mobiles are able to reset the call limit timer by
pressing * to allow additional talk time.

CLICK AUTO-DIALING   ***1#24#m#**   ***1#24***
m = 3 - 9, m = 0 Disable   [m = 0 = disable]
If enabled, determines how many mic clicks needed to automatically
dial the phone number stored in speed-dialer memory 01.

HOOK FLASH   ***1#25#j#**   ***1#25***
j = 0 = Disable, j = 1 = Enable   [j = 0 = disable]
If enabled, mobiles can press *** to generate a hookflash to operate
phone company provided features such as call waiting.

LINE IN USE DETECT   ***1#26#j#**   ***1#26***
j = 0 = Disabled j = 1 = Enabled   [j = 0 = DISABLED]
If enabled prevents a mobile from accidentally cutting in on a call
if the 8300 is on a phone line shared with phones.

BUSY SIGNAL DISCONNECT   ***1#27#j#**   ***1#27***
j = 0 = Disabled j = 1 = Enabled   [j = 1 = Enabled]
If enabled, a busy signal occurring during a call will cause
disconnect.

DIALTONE DISCONNECT   ***1#28#j#**   ***1#28***
j = 0 = Disabled j = 1 = Enabled   [j = 1 = Enabled]
If enabled, a dialtone occurring after a call has been established
will cause disconnect.

DIALING MODE   ***1#29#j#**   ***1#29***
0 = Pulse, 1 = Tone   [j = 1 = Tone]
Selects whether the 8300 dials with pulse (rotary) dialing, or with
tone (DTMF).

ACTIVITY TIMER   ***1#30#mm#**   ***1#30***
mm = 10-99, 0=Defeat (10-99 Sec's 1 Sec/step)   [mm=30=30 Sec's]
If set, the interconnect will automatically disconnect after mm
seconds of no transmission from mobile.

CALL LIMIT TIMER   ***1#31#mm#**   ***1#31***
mm=1-99, 0=Defeat (10-990 Sec's 10 sec/step   [mm=18=3 Minutes]
Determines the maximum duration of a phone call.

Note: The call limit timer can be reset from the mobile if parameter
number 23 has been set to 1 = Yes.

Toll Restrict Sequences

PREFIX RESTRICT A   ***1#33#pppp#**   ***1#33***
One To Four Digit Toll Restrict   [pppp = - = None]

PREFIX RESTRICT B   ***1#34#pppp#**   ***1#34***
One To Four Digit Toll Restrict   [pppp = - = None]

PREFIX RESTRICT C   ***1#35#pppp#**   ***1#35***
One To Four Digit Toll Restrict   [pppp = - = None]

PREFIX RESTRICT D   ***1#36#pppp#**   ***1#36***
One To Four Digit Toll Restrict   [pppp = - = None]

PREFIX RESTRICT E   ***1#37#pppp#**   ***1#37***
One To Four Digit Toll Restrict   [pppp = - = None]

PREFIX RESTRICT F   ***1#38#pppp#**   ***1#38***
One To Four Digit Toll Restrict   [pppp = - = None]

See page 29 for information on toll restrict programming.

Toll Override Sequences

PREFIX OVERRIDE A   ***1#39#pppppppp#**   ***1#39***
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE B   ***1#40#pppppppp#**   ***1#40***
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE C   ***1#41#pppppppp#**   ***1#41***
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE D   ***1#42#pppppppp#**   ***1#42***
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE E   ***1#43#pppppppp#**   ***1#43***
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE F   ***1#44#pppppppp#**   ***1#44***
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE G   *1#45#pppppppp#   *1#45*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE H   *1#46#pppppppp#   *1#46*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE I   *1#47#pppppppp#   *1#47*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE j   *1#48#pppppppp#   *1#48*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE K   *1#49#pppppppp#   *1#49*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE L   *1#50#pppppppp#   *1#50*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE M   *1#51#pppppppp#   *1#51*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE N   *1#52#pppppppp#   *1#52*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE O   *1#53#pppppppp#   *1#53*
One To Eight Digit Toll Enable   [pppppppp = - = None]

PREFIX OVERRIDE P   *1#54#pppppppp#   *1#54*
One To Eight Digit Toll Enable   [pppppppp = - = None]

Toll override exceptions allows creating select exceptions to toll
restricts set above such as allowing certain area codes or exchanges
within area codes to be dialed. See page 29.

Incoming Calls

BUSY CHANNEL MONITOR   *1#55#j#   *1#55*
j = 0 = Disable   j = 1 = Enable   [j = 1 = Enable]
Checks to see if channel is busy prior to ringout or autoanswer to
avoid interference.

RINGOUT ONCE OR CONTINUOUS   *1#56#j#   *1#56*
j=0=One Ring   j=1=Continuous ring   [j=1=Continuous Ring]
Selects either a single ring alert or continuous ring alerts. A
built-in timer limits continuous ringing to 20 seconds in the event
the mobile fails to respond.

RINGOUT ON RING NUMBER   *1#57#m#   *1#57*
m = 0 = Disable m = 1 - 9   [m = 1 = ringout on first ring]
Set to 0 if auto-answer is enabled to allow overdialing. Determines
which incoming ring triggers the ringout.

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RINGOUT RINGING and SIGNALLING   ***1#58#mmm#**   ***1#58***
mmm = 000 - 999   [mmm = 999 = Three digit speed-call number]
This parameter sets up a three digit (mmm) speed call code which
locates the desired ringout signalling and ring alert from the
speed-caller memory. The factory default is 999 and will not need to
be changed unless you need to use 999 as a speed call number from
the outside. See Programming the Speed-Caller page 24 for more
details.

AUTOANSWER RING NUMBER   ***1#59#m#**   ***1#59***
n = 0 - 9, 0 = Disable (1 - 9 rings)   [n = 0 = Disable]
Sets which incoming ring will autoanswer to allow selective calling
by overdialing and to also allow remote programming.

OVERDIAL MODE   ***1#60#m#**   ***1#60***
0 = DTMF, 1 = DTMF or Pulse   [m = 0 = DTMF only overdial]
Determines whether overdial is allowed from pulse phones.

5/6 Tone Set Up   (disregard if not using 5/6 tone signalling)

FIVE TONE PREAMBLE   ***1#61#j#**   ***1#61***
j = 0 = Disable   j = 1 = Enable   [j = 0 = Disable]
If enabled, the preamble tone (programmed next step) will precede
the 5 Tone sequence.

PREAMBLE TONE   ***1#62#m#**   ***1#62***
m = 0 - 9   Select Tone 0-9   [m = 0 = Tone 0]

FIRST TONE SELECT   ***1#63#m#**   ***1#63***
m = 0 - 9   Select Tone 0-9   [m = 0 = Tone 0]
Selects first tone of five tone sequence.

SECOND TONE SELECT   ***1#64#m#**   ***1#64***
m = 0 - 9   Select Tone 0-9   [m = 0 = Tone 0]
Selects second tone of five tone sequence.

REPEAT SEQUENCE   ***1#65#m#**   ***1#65***
m = 1 - 9   Repeat tone sequence 1-9 times.   [m = 1]

DURATION OF TONES   ***1#66#mm#**   ***1#66***
mm = 0 - 99 Duration of each tone in Milliseconds.   [mm = 33]

GROUP SELECT   ***1#67#m#**   ***1#67***
mm = 1-6   Selects appropriate 5 Tone standard.   [mm = 1 = EIA]
1 = EIA, 2 = ZVEI1, 3 = CCIR/EEA, 4 = CCIT, 5 = EURO, 6 = ZVEI2

MISCELLANEOUS PARAMETERS

RESPONSE DELAY TO CD-2   ***1#68#mm#**   ***1#68***
mm 00-99 (0-9.9 Sec's - .1 sec/step)   [mm = 10 = 1 Sec.]
The amount of time from a download command until the Model 8300
begins outputting a DTMF download to your CD-2 Communications

Decoder Unit. This time is required if you are programming from a half duplex radio.

PROGRAMMING MODE ACCESS CODE　　　　　　***1#69#pppppp#**　　　***1#69***
Code must be precisely six digits.　　　　　　[pppppp = 123456]
This code is always used to enter programming mode, whether local, over the air or by dial up.

DISPLAY　　　　　　　　　　　　　　　　***1#70#j#**　　　***1#70***
0 = Display for 30 minutes　　　　　　　　　[j = 0 = 30 seconds]
1 = Display continuously
Determines how long the front panel display will display CTCSS/DCS tones after initiating test mode. See page 33.

REPEATER CW ID INTERVAL　　　　　　　***1#71#mm#**　　　***1#71***
mm 01-99 0 to disable (1-99 Min's - 1 Min/step)　　[mm=0=Disable]
Determines how often the system will send its callsign when the system is not in use.

CW ID SPEED　　　　　　　　　　　　***1#72#mm#**　　　***1#72***
mm 04-10　(Increase mm for slower code speed)　　[mm=05=20 WPM]

CW ID TYPE　　　　　　　　　　　　　***1#73#m#**　　　***1#73***
mm 0-3 (See page 26)　　　　　　　　　　　　[mm=0]

CWID SEQUENCE CHARACTER 1　　　　　***1#74#mm#**　　　***1#74***
CWID SEQUENCE CHARACTER 2　　　　　***1#75#mm#**　　　***1#75***
CWID SEQUENCE CHARACTER 3　　　　　***1#76#mm#**　　　***1#76***
CWID SEQUENCE CHARACTER 4　　　　　***1#77#mm#**　　　***1#77***
CWID SEQUENCE CHARACTER 5　　　　　***1#78#mm#**　　　***1#78***
CWID SEQUENCE CHARACTER 6　　　　　***1#79#mm#**　　　***1#79***
CWID SEQUENCE CHARACTER 7　　　　　***1#80#mm#**　　　***1#80***
CWID SEQUENCE CHARACTER 8　　　　　***1#81#mm#**　　　***1#81***
CWID SEQUENCE CHARACTER 9　　　　　***1#82#mm#**　　　***1#82***
CWID SEQUENCE CHARACTER 10　　　　　***1#83#mm#**　　　***1#83***
　　　　　　　　　　　　　[CHAR 1 - CHAR 10 are defaulted to 38]

CW ID characters and corresponding mm values may be obtained from Table 1. The entry immediately following the callsign must be 38 which means "message stop".

Example: To program KYZ 2584 the following mm sequence is required in character positions 1-8: 10 24 25 27 30 33 29 38.

Aux Relay Setup

AUX. RELAY　　　　　　　　　　　　***1#84#m#**　　　***1#84***
n = 0-2　　　　　　　　　　　　　　[n = 0 = Close On Connect]
0 = Connect　1 = Key　2 = Remote function

REMOTE FUNCTION ACCESS CODE　　　　***1#84#mmm#**　　　***1#84***
Relay control code must be exactly three digits.　　[mmm = 321]
NOTE: See page 34 for details on programming the Aux. Relay

SPEED-DIALER PROGRAMMING

Up to 99 phone numbers can be stored in the 8300's speed-dialer memory. The numbers can be up to 16 digits each.

When programming the speed-dialer, enter the memory location and the phone number you want in that memory.

The programming format is as follows:

```
                                            To Program        Display
                                                |                |
                                                V                V

SPEED-DIALER MEMORY 1                        *2#01#number#       *2#01*
SPEED-DIALER MEMORY 2                        *2#02#number#       *2#02*
                         .                        ..               ..
                         .                        ..               ..
                         .                        ..               ..
SPEED-DIALER MEMORY 99                       *2#99#number#       *2#99*
```

The "number" is the phone number you wish to store in each memory location.

Examples:

1. *2#05#18185551212#

```
    05               Speed-dialer memory 5
    1 818 555 1212   Phone number stored in memory 5
```

2. *2#91#911#

```
    91               Speed-dialer memory 91
    911              Phone number stored in memory 91
```

3. *2#17#5551212#

```
    17               Speed-dialer memory 17
    555 1212         Phone number stored in memory 5
```

SPEED-CALLER PROGRAMMING

The 8300 can send complex signalling sequences in response to a three digit call code overdialed by a land caller, or sent by a mobile to initiate mobile to mobile alerting. **Signalling can only be accomplished using the speed-caller.**

When programming the speed-caller, you enter the three digit call code, the signalling sequence that results from using it and the speed-caller memory location that stores it. You can even select signalling only, or signalling followed by one way voice!

This scheme allows abbreviated three digit calling of any/all sequences and allows substituting new codes if an employee is assigned to a new mobile.

If using ringout, the desired signalling and alerting parameters are must be stored in a speed-caller memory. The default memory is 99 and the default parameters are same as Example 1, below.

```
The programming format...                    To Program        Display
                                                 |                 |
                                                 V                 V
SPEED-CALLER MEMORY 1                        *3#01#sequence#      *3#01*
                                                    [*3#01#99900102#]

SPEED-CALLER MEMORY 2                        *3#02#sequence#      *3#02*
             .                                    ..                ..
             .                                    ..                ..
             .                                    ..                ..
SPEED-CALLER MEMORY 99                       *3#99#sequence#      *3#99*
```

(Memory 01 stores the default ringout alert + signalling which is 67.0 Hz CTCSS and two short rings. See Example 1 below).

The actual "sequence" to insert varies a bit for each of the five signalling formats...

```
    DCS/CTCSS:      cccnnn0r        signalling only
                    cccnnn4r        signalling + one way voice

    2 Tone   :      cccnnn1gtgt     signalling only
                    cccnnn5gtgt     signalling + one way voice

    5/6 Tone :      cccnnn2ttt      signalling only
                    cccnnn6ttt      signalling + one way voice

    DTMF     :      cccnnn3d..d     signalling only
                    cccnnn7d..d     signalling + one way voice
```

Where: ccc Is the desired three digit calling code. You may select
           any number 000 – 999

nnn Is the DCS/CTCSS tone you wish to accompany the signalling code from Table 2. nnn = 000 if you do not want any CTCSS/DCS to accompany signalling.

r   Is a choice of six ring alerts to accompany DCS/CTCSS signalling. (Not available for DTMF, 2 Tone or 5/6 Tone)...

          1 One long ring.
          2 Two Short rings.
          3 Three short rings.
          4 Two quick rings pause then two more quick rings.
          5 Short ring followed by a long ring.
          6 Long ring followed by a short ring.

gtgt Means group tone group tone from Table 5. Select the group and tone for the first tone, then the group and tone for the second tone. e.g. the gtgt for 433.7 and 1185.2 would be 1562.

ttt Is the last three digits of the five tone sequence. See Table 4. Note, the first two digits and all other 5/6 Tone parameters are programmed under; **5/6 Tone Set Up** beginning with parameter **"FIVE TONE PREAMBLE *1#61#j#"** page 31.

d..d Is a DTMF sequence which may be from 1-7 digits in length.

Complete examples:
 1. ***3#01#999 001 0 2#**   (gaps shown for clarity only)
    This example is the default ringout signalling + alerting.

   01   Speed caller memory used to store the following data:
   999   Default three digit speed-call code used for ringout
   001   67 Hz CTCSS tone signalling with selectable ring alert
   0   Signalling only, no one way voice
   2   Two short rings for alerting

 2. ***3#75#863 117 1 6219#**   (gaps shown for clarity only)

   75   Speed caller memory used to store the following data:
   863   The three digit call code to be used
   117   DCS 413 to accompany the signalling sequence
   1   Selects 2 Tone signalling without one way voice
   6219   Sends tones 1185.2 and 539.0

 3. ***23#215 019 7 13924#**   (gaps shown for clarity only)

   23   Speed caller memory used to store the following data:
   215   The three digit call code to be used
   019   123 Hz CTCSS to accompany the signalling sequence
   7   Selects DTMF signalling followed with one way voice
   13924   Is the DTMF sequence to be sent. May be 1-7 digits.

USING THE REPEATER...

The 8300 has been designed as a single user repeater/interconnect product. It will respond to any one DCS/CTCSS input tone out of 154 choices, see Table 2. The output tone can be the same as the input or crossed to any other tone. Normally, repeater input and output tones are the same.

Mobile to mobile signalling: Any subscriber having a DTMF pad can selectively call other mobiles or operate their hornhonkers using the built-in 99 memory speed-caller. The mobile simply sends...

                              ccc#

Where ccc is the preprogrammed three digit speed-call code for the mobile you wish to call.

CW ID: The CW ID mode, page 73, is determined by the CW ID TYPE (Polite means ID doesn't occur when COS active.):
  0 : ID during activity, CW Interval, polite
  1 : ID 24 hours a day, at CW Interval, polite.
  2 : ID during activity at CW Interval, not polite.
  3 : ID 24 hours a day, at CW Interval, not polite.

USING THE INTERCONNECT...

The Model 8300 will allow any of the 154 possible system users to initiate and receive phone calls using the built-in Duplex Interconnect if they have been programmed as interconnect enabled subscribers.

Placing outgoing Calls

The interconnect access code, toll override access code and DTMF/Pulse dialout are fully user programmable.

To initiate a manually dialed call: A user simply enters his/her access code or toll override access code. The desired phone number is dialed once dialtone is heard. When through, simply send the appropriate disconnect code (# or # plus connect code digits as programmed).

To initiate a speed-dialer call: The user simply precedes the access code with the desired one or two digit memory number. When through, simply send the appropriate disconnect code (# or # plus connect code digits as programmed).

Re-dial: If a manually dialed call is busy, you can try the number again using redial. Simply precede the access code with 00. A phone number dialed remains in re-dial memory until a new number has been dialed which replaces it.

Line in use detect: If an attempt is made to access and the line is in use, an artificial busy signal indicates that someone is using the phone line. If this feature is enabled (See page 18), the 8300 will not cut in on a pre-existing call.

Pulse dialing with delayed dialtone: In some areas the first or subsequent dialtones may not occur immediately upon request. Additionally, there may be the need to overdial DTMF into the final destination to dial a PBX extension or to make a selection from a menu.

Your Model 8300 has a built-in solution to these dilemmas. If the initial dialtone is delayed such that you cannot begin dialing within ten seconds, enter a * immediately after you send your connect code. This will cause the Model 8300 to give you up to three minutes to begin dialing the first dialtone. If the second (or subsequent) dialtones are also delayed, append a * to the end of each group which will allow up three minutes to begin dialing the next dialtone. Do not append the final phone number with * so that additional dialing after the phone number answers will be regenerated DTMF rather than pulse.

 EXAMPLE: You wish to pulse dial 011 52 5551212 but the first and subsequent dialtones are delayed 5-25 seconds. First enter your connect code then enter *. After the first dialtone is heard dial 011*, after the next dialtone is heard dial 52*, after the next dialtone is heard dial 5551212. Note there is no * added to the last group. If desired, you can then overdial PBX features with DTMF.

 Note: The above instructions are only needed if the Model 8300 has been programmed to dial in pulse format, and your telephone system does not respond with immediate dialtone.

Receiving Incoming Calls

Ringout
Ringout mode duplicates how you receive calls on your home phone. i.e. when someone calls in, the 8300 sends out an alerting ring accompanied with any desired CTCSS/DCS tone. You may also ringout with 2 tone, 5/6 tone or DTMF. Any mobile on the system simply keys his mic to answer the incoming call.

The desired ringout alert and signalling format are user programmed into the speed-caller along with a three digit call code. The three digit call code must also be programmed into ringout parameter 58 as mmm. The three digit call code allows ringout to locate the correct signalling in the speed-caller memory. The default speed-caller memory is 99 and the default three digit call code is 999. See page 21 RINGOUT RINGING and SIGNALLING and page 24 PROGRAMMING THE SPEED-CALLER for programming information.

The factory default programming for the speed-caller is
*3#99#99900102# which sets speed-caller memory 99 to send two short
rings accompanied with a 67.0 Hz CTCSS tone when accessed by ringout
using 999 as a call code.

Overdialed Selective Calling

If the 8300 is user programmed to auto-answer, mobiles can be called
selectively by overdialing abbreviated three digit call codes. **Note;**
all signalling must be done via the speed-caller.

Once the system is setup, someone dialing in will hear an auto-answer
go-ahead beep. The appropriate three digit call code is then
entered...

                                   ccc

Any mobile on the system can answer the call by simply pressing his
mic button. The mobile should send the disconnect code when the call
is finished.

Three digit call codes: The speed-caller can store up to 99 signalling
sequences which are each linked to manageable three digit call codes.
Thus when a three digit call code is used, the real (pre-programmed)
signalling sequence may consist of up to 16 digits.

The three digit call codes can be any three digits you want 000 - 999.
Pick digits that seem appropriate or make them match traditional CAP
codes if using 2 tone and/or 5/6 tone. See page 24 PROGRAMMING THE
SPEED-CALLER for complete programming information and examples.

Paging plus one way voice: A 20 second one way voice message can
follow the signalling sequence by entering the appropriate three digit
call code after the auto-answer beep...

                                   ccc

The mobile simply keys his mic to answer the call.

Overdialing from pulse phones: Pulse phones can have the same overdial
features as DTMF phones but use varied dial codes. To selectively call
using the features signalling features programmed
into a speed-caller memory...

                                   0ccc

OPTIMIZING ROTARY SIGNALLING:

The **SIGNALLING DETECT** control (P11) must be adjusted for optimum dial
click detect accuracy. The Model 8300 has a special test mode to
facilitate this adjustment. (P11 is just to the left of relay K2, but
is not marked on the PC board silkscreen).

Put the Model 8300 into program mode using either local or remote programming and then enter...

*1#99#

This command invokes the overdial alignment mode. Next, dial the phone number of the Model 8300 from another line. The Model 8300 will automatically answer and a beep will be heard.

It is now possible to rotary overdial any digits from the remote phone and observe each digit displayed on the front panel of the Model 8300.

While dialing digits from the remote phone and checking the accuracy with the front panel display, adjust P11 "SIGNALLING DETECT" to find the range of adjustment that permits accurate detection of dial clicks. Set P11 to the center of the usable range.

NOTE: Accurate detection of dial clicks may not be achievable on noisy phone lines.

When through, pressing any DTMF digit (from the same source you used to enter program mode) will exit the Rotary Signalling set-up mode which will return you to program mode. Press #### to exit programming mode if desired.

The setting of P11 "SIGNALLING DETECT" also affects the detection of call progress tones such as dialtone and busy signals. If the dial click set-up stops automatic disconnect on busy signals and/or dialtone then turn P11 up just slightly, but not so much that rotary detection accuracy is affected.

More on interconnect operation...

Toll restricts: There are six separately programmable restricts which can be sequences of from 1 to 4 digits each. Examples of restricted sequences on a typical system might be...

    1   Prevents 1+ long distance calls
    0   Prevents dialing operator to place calls
    976   Prevents dialing cost per call "services".
    911   Prevents dialing 911 emergency numbers
    411   Prevents dialing to directory assistance.

Toll overrides: There are sixteen separately programmable toll override exceptions which can be sequences of from 1 to 8 digits each. These are used to permit specific toll override capability. For example, you may wish to allow dialing into specific exchanges within another area code, or to permit 1-800 calls which are free to the caller. Here are some examples...

```
1800      Allows dialing 1-800 numbers.
1888      Allows dialing 1-888 numbers.
1704636   Allows dialing to exchange 636 within area code 704.
18185     Allows dialing all numbers beginning with 5 in area
          code 818.
121248    Allows dialing all numbers beginning with 48 in area
          code 212.
```

Activity timer: The activity timer can be set anywhere from 10 to 99 seconds. This timer automatically aborts a call if the mobile does not transmit often enough to keep the timer reset. Single beeps occurring at about two second intervals warn that a disconnect will soon occur. The mobile need only press the Mic. button to reset the timer.

Call limit timer: The call limit timer can be set anywhere from 10-990 seconds (16.5 minutes). Two quick beeps in rapid succession heard at three second intervals warn that your call will disconnect within 20 seconds. The call limit timer is resettable by sending * if the 8300 is programmed to be able to do so. Otherwise, the call will terminate at three minutes or whatever time has been set.

Hookflash: Simply send ******* which will generate a precise 570 Ms. flash to operate call waiting, etc.

Half duplex privacy: The Model 8300 can be set for either full or half duplex operation. If Half duplex is programmed, you may select whether half duplex operates in regular or privacy mode. However, by sending a DTMF command, a user can temporarily switch to the opposite condition as need indicates. Here are the commands to use...

> Half duplex privacy on: ***1**
> Half duplex privacy off: ***0**

Temporary half duplex privacy mode (enabled or disabled) will automatically revert to the programmed condition at the completion of the current call.

Busy signal and dialtone disconnect: These two features are a convenience which can be individually enabled or disabled. When enabled, a call will automatically disconnect if the number dialed is busy, or if a dial tone occurs after a number has been dialed.

CW ID: In interconnect mode, CW ID can be user programmed to occur upon connect and disconnect, or disconnect only. A callsign of up to ten characters can be programmed.

Note: The CW ID on connect and disconnect choice consumes more airtime and can be aggravating to others waiting to use the repeater or interconnect.

Select Tone #	1 EIA	2 ZVEI1	3 CCIR/ EEA	4 CCIT	5 EURO	6 ZVEI2
0	600	2400	1981	400	980	2400
1	741	1060	1124	697	903	1060
2	882	1160	1197	770	833	1160
3	1023	1270	1275	852	767	1270
4	1164	1400	1358	941	707	1400
5	1305	1530	1446	1209	652	1530
6	1446	1670	1540	1336	601	1670
7	1587	1830	1640	1477	554	1830
8	1728	2000	1747	1633	511	2000
9	1869	2200	1860	1800	471	2200
R	459	2600	2110	2200	1063	970

TABLE 4
5/6 TONE SEQUENTIAL CODES

The following setup choices must be made in the 5/6 Tone Set Up Programming area...

   A preamble tone can be enabled at FIVE TONE PREAMBLE and the desired preamble tone selected at PREAMBLE TONE.

   The first two tones of a 1000 call five tone sequence are selected from the appropriate group and entered at FIRST TONE SELECT and SECOND TONE SELECT. These two tones will automatically be sent with each selective call.

   To increase the probability of successful signalling, the 5/6 sequence can be automatically repeated up to nine times at REPEAT SEQUENCE.

   Select the desired time duration of each tone at DURATION OF TONES.

   Select the desired group from one of the five tone groups from the table above and enter at GROUP SELECT.

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

Example: A pager sequence of 1023, 1305, 1587, 741 and 1446 Hz is required. Enter 0 (disable) on line 61. Enter 3 on line 63. Enter 5 on line 64. Enter 1 (EIA) on line 67. The three digit selective call code is then = 716

TONE SEL	MOT GPA	MOT GP1	MOT GP2	MOT GP3	MOT GP4	MOT GP5	MOT GP6	GE GPA	GE GPB	GE GPC
0	358.9	330.5	569.1	1092.4	321.7	553.9	1122.5	682.5	652.5	667.5
1	398.1	349.0	600.9	288.5	339.6	584.8	1153.4	592.5	607.5	712.5
2	441.6	368.5	634.5	296.5	358.6	617.4	1185.2	757.5	787.5	772.5
3	489.8	389.0	669.9	304.7	378.6	651.9	1217.8	802.5	832.5	817.5
4	543.3	410.8	707.3	313.0	399.8	688.3	1251.4	847.5	877.5	862.5
5	602.6	433.7	746.8	953.7	422.1	726.8	1285.8	892.5	922.5	907.5
6	668.3	457.9	788.5	979.9	445.7	767.4	1321.2	937.5	967.5	952.5
7	741.3	483.5	832.5	1006.9	470.5	810.2	1357.6	547.5	517.5	532.5
8	822.2	510.5	879.0	1034.7	496.8	855.5	1395.0	727.5	562.5	577.5
9	912.0	539.0	928.1	1063.2	524.6	903.2	1433.4	637.5	697.5	622.5
DG	569.1	569.1	979.9	569.1	569.1	979.9	979.9	742.5	742.5	742.5

TABLE 5
TWO TONE SEQUENTIAL CALL CODES

The built-in (standard) Two tone sequential supports Motorola and GE 99 etc. Other Two tone formats may be available at extra cost. Please call Connect Systems Inc. for details.

Two tone sequential sequences are programmed into the speed-caller using a four digit sequence consisting of the group and tone for the first tone, then the group and tone of the second tone (gtgt, see page ?? for actual programming instructions). We allow you to program tones using a four digit format rather than conventional three digit cap code format because it allows you to use tone A from one group and tone B from a different group if desired.

For example: The selective call code required to generate tone A = 296.5 and tone B = 1006.9 would be: 3237. See the Speed Calling section and Receiving incoming calls for more details.

NOTE: 1. Tone duration: Tone A = 1sec, tone B = 3sec

DTMF DISPLAY: The display will indicate all DTMF codes that are received on the repeater input when in operate mode. However, the digital displays used in the Model 8300 are not capable of directly displaying the *, #, A, B, C or D. The * and # are displayed using - and ||. A, B, C and D are displayed using the numbers 1. 2. 3. and 4. Note that these are distinguishable from 1 2 3 and 4 because a decimal point accompanies the digits. The Table below shows all the DTMF digits and how they appear on the front panel display:

```
1 = 1          5 = 5          9 = 9          A = 1.
2 = 2          6 = 6          0 = 0          B = 2.
3 = 3          7 = 7          * = -          C = 3.
4 = 4          8 = 8          # = ||         D = 4.
```

RE-BOOTING: A variety of conditions can occur (e.g. lightning) that will occasionally lock up a microprocessor. The only solution is to restart the processor. A restart can be made locally or remotely...

  Locally: Simply turn off the 8300's power for a few seconds and reapply the power.

  Remotely: Press any DTMF digit for ten or more seconds.

Re-booting will have no effect on user programming.

TEST MODE

DCS/CTCSS display: While at the site you may wish to have the front panel display indicate the DCS and CTCSS codes of all signals heard on the repeater input (even those of co-channel users). To activate this mode simply enter the following code while in operate mode:

##123456*

Where 123456 are the same digits programmed as the program mode access code. The difference is that the program mode access code ends with # while the display mode sequence ends with *. If the factory programmed access code has not been changed simply enter ##123456* to activate the DCS/CTCSS display mode.

The display mode is disabled in any of the following ways:

1. By entering #### from your DTMF keypad.
2. By entering programming mode.
3. A built in software timer will automatically turn off the display mode 30 minutes after it has been enabled.

Note: The Model 8300 does not normally display DCS or CTCSS in operate mode to realize a significant reduction in average power consumption which is important in solar powered installations. In some applications a slight buzz in the repeat audio may be noticeable while in display mode. However this will go away as soon as display mode is turned off.

NOTE: The display can be user programmed to display CTCSS/DCS continuously. If you have set programming parameter 70 for this condition, the above does not apply.

AUXILIARY RELAY

The Model 8300 is equipped with an auxiliary relay that can be used for customer required applications. The contacts are available on the rear panel barrier block and are labeled "RELAY". JP-7 is a three position header that allows you to select normally closed or normally open contacts.

The following choices of relay operation are made available by programming parameters 84 and 85.

0 = Connect	Relay is energized whenever the TP-154 is Off-Hook.
1 = Key	Relay is energized whenever the TP-154 is keying the transmitter.
2 = Remote Function	Relay is energized and de-energized in response to the user programmable three digit "Remote Function Access Code". The following format controls the relay:

Relay on: #xxx
Relay off: ##xxx

COS: Carrier Operated Switch.

Courtesy beep: A brief tone at the end of a users transmission that lets the party you are speaking with know that it is their turn to reply.

CTCSS: Continuous Tone Coded Squelch System

CTCSS/DCS hold delay: A software timer that fills in momentary DCS or CTCSS loss when a signal is weak. When the hold delay is set to at least three seconds talk off should be nearly impossible.

Note: CTCSS Trak and CTCSS Hold delay are exclusive CSI software inventions available only in CSI panels.

CW ID: Automatic identification of call sign in Morse Code.

DCS: Digital Coded Squelch.

DCS polarity: Characteristics of receivers and transmitters can invert DCS. The Model 8300 has independently programmable receive and transmit invert to accommodate varying radios.

DTMF: Dual Tone Multi Frequency (Touch tone).

Hangtime: The amount of time the repeater transmitter remains on the air after a user stops transmitting.

JP: jumper (wire or plug) used for making a hardware selection.

Kerchunking: A kerchunker is a user that briefly hits his PTT switch to see if he can raise the repeater. Many find this practice annoying. The Anti-Kerchunking feature in the Model 8300 is designed to stop users who like to kerchunk. The Anti-Kerchunking filter does not affect pick-up time or repeat capability, however if a transmission is shorter than the Anti-Kerchunk time there will be no hangtime when the user unkeys.

PTT: Push To Talk. (The line that keys the transmitter).

Response delay to CD-2: The amount of time from a download request until the Model 8300 begins outputting a DTMF download to your CD-2 Communications Decoder Unit. This time is required if you are programming from a half duplex radio.

Stuck Mic. activity timer: Sets the maximum continuous (uninterrupted) talk time. If a user talks past the activity timer time, the repeater merely stops transmitting until the input drops and is picked up anew.

Repeater Mode...

The incoming audio is buffered, de-emphasized and amplified to the amount set by the PREAMP control by input op amps U1. The audio then proceeds to a six pole low pass filter and a six pole high pass filter. The low pass filter U2 removes voice audio and extracts the DCS/CTCSS signal for detection at the adaptive differential comparator. The comparator output is fed to the microcomputer U17 pin 12 for software DCS/CTCSS detection. The six pole high pass filter (U3) removes CTCSS and DCS from the incoming audio to avoid retransmission of CTCSS or DCS. The audio from the high pass filter continues through the squelch switch U7 and on to the audio output amplifier U3.

The COS input is buffered and compared to a reference voltage which is set by the COS threshold pot. The output then proceeds to the polarity select strap jP-10 and then to the microcomputer U17 pin 32.

DTMF is decoded and regenerated by U18 with some assistance from the microcomputer U17.

DCS is generated directly by the microcomputer U17. CTCSS is generated by waveform generator U14. The microcomputer U17controls the U14 waveform generator via pins 34, 35 and 36. DCS and CTCSS have separate level controls the output of each is fed to summation amplifier and four pole low pass filter U5. The output of U5 feeds the transmitter modulator with the SUBTONE output.

The PTT circuit consists of Q6, Q7 and Q15. This circuit is controlled by the I/O shift register U16 which is in turn controlled by microcomputer U17 via pins 7, 8 and 28. Polarity select strap JP-4 gives the choice of ground keying or keying to the plus supply.

A power on reset circuit consisting of Q8 and associated components monitors the input voltage and quickly halts the microcomputer if the applied input voltage is too low. The power on reset circuit provides proper computer start up after power is applied and protects the EE memories U21 and U22 on power up and down.

Counters U26 and U27 divide the 448 KHz clock from U18 and allow remote re-booting of the microprocessor when any incoming DTMF digit exceeds 9 seconds in duration. At the end of nine seconds U27 pin 15 turns on transistor Q5 which in turn enables the power on reset circuit.

The front panel digital display U6-U9 are controlled by the display driver U5. The microcomputer U17 talks to U5 via pins 3, 4 and 28.

Incoming power is fed through reverse polarity protect diode D5 and then fuse F1. From there the +V voltage feeds a +5 volt regulator U8 used by the digital components. Another smaller +5 volt regulator U9 is used to supply bias and reference voltage to the analog op-amps etc.

Interconnect mode...

Many of the repeater mode signal paths are also used in interconnect operation. Here are is a brief description of the interconnect specific circuits.

Mobile audio is passed through the M->L level control P9 and squelch switch U7 to line driver U6 which drives the two transformer duplex hybrid. Phone line audio from the hybrid is amplified by U5 and passes along to the L->M level control P10 and then on to the TX audio driver U3. Some of the output of U5-1 is processed by U6 and Q9 and feeds the microprocessor U17 pin 33. The microprocessor constantly analyzes this processed signal for the presence of dialtone and/or busy signals.

The LINE input is the shared line and passes through lightning protect network fuses F2, F3 and MOV's M1, M2. U11 senses ringing on the shared line and notifies the microprocessor U17 on pin 5. U12 detects the On or Off hook condition of the shared line and notifies the microprocessor U17 on pin 6.

Relay K1 connects the phone line via control from the I/O shift register U16.

Land to mobile and Mobile to mobile signalling tone are generated by U13 under control of the microprocessor U17 via pins 37, 38 and 39.

About the hybrid...

Transformers T1 and T2 are proper telephone hybrid transformers that are connected so that mobile audio passes to the phone line, however self cancels and is largely rejected from feeding the transmitter. This helps to prevent audio oscillation in a full duplex mobile. Audio arriving from the phone line is simply amplified by U5 and flows toward the TX audio output. The hybrid balance control P12 and dip switch selectable capacitors C55-58 allow achieving the best possible trans-hybrid null by simulating the complex impedance of the phone line with the best possible impedance model.

LIMITED WARRANTY on Model 8300

Connect Systems Inc. (CSI) hereby warrants our products to be free from defective workmanship for a period of one year and defective parts for a period of five years from date of sale to the initial end user. This warranty applies only to the original consumer / end user purchaser of each CSI product. During the first year of warranty, CSI will repair any of its products at no charge providing the defective unit is returned prepaid to Connect Systems Inc. During the years 2-5, there shall be no charge for replacement parts providing that the defective unit is shipped prepaid and service is performed by CSI. Conventional prevailing labor and shipping charges will apply following the end of the first year. CSI, at its sole discretion, will replace defective parts on an exchange basis for the first five years of ownership by the original purchaser. All shipping costs are the responsibility of the customer.

What is not covered by this limited warranty:

This warranty shall not apply if, in our judgment the defects are caused by misuse, lightning strikes, customer modification, water damage, negligent use, improper installation, overloads caused by external voltage fluctuations, use of unregulated power supply, damage caused in transit or handling or any abusive treatment not in accordance with ordinary product use or the product serial number has been removed, altered or defaced.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, STATEMENTS OR REPRESENTATIONS, AND UNLESS STATED HEREIN, ALL SUCH WARRANTIES, STATEMENTS OR REPRESENTATIONS MADE BY ANY OTHER PERSON OR FIRM ARE VOID. ALL IMPLIED WARRANTIES IN CONNECTION WITH THE SALE OF THIS EQUIPMENT, INCLUDING THE WARRANTY OF MERCHANTABILITY, SHALL BE OF THE SAME DURATION AS THE WARRANTY PERIOD STATED ABOVE. SOME STATES D0 NOT ALLOW LIMITATIONS OF HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. IN THE EVENT OF PRODUCT FAILURE WHICH PROVES TO BE CAUSED BY A DEFECT IN WORKMANSHIP OR MATERIALS, YOUR SOLE REMEDY SHALL BE THE REPAIR OF THE DEFECT BY CSI OR ITS APPOINTED REPAIR STATION AS STATED IN THIS WARRANTY, AND UNDER NO CIRCUMSTANCES SHALL CSI BE LIABLE FOR ANY LOSS OR DAMAGE, DIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF THE USE, OR INABILITY TO USE, THIS CSI PRODUCT. SOME STATES D0 NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

If your new CSI product should ever fail, contact Connect Systems Inc. Customer Service Dept. for repair and warranty information at (805) 642.7184.
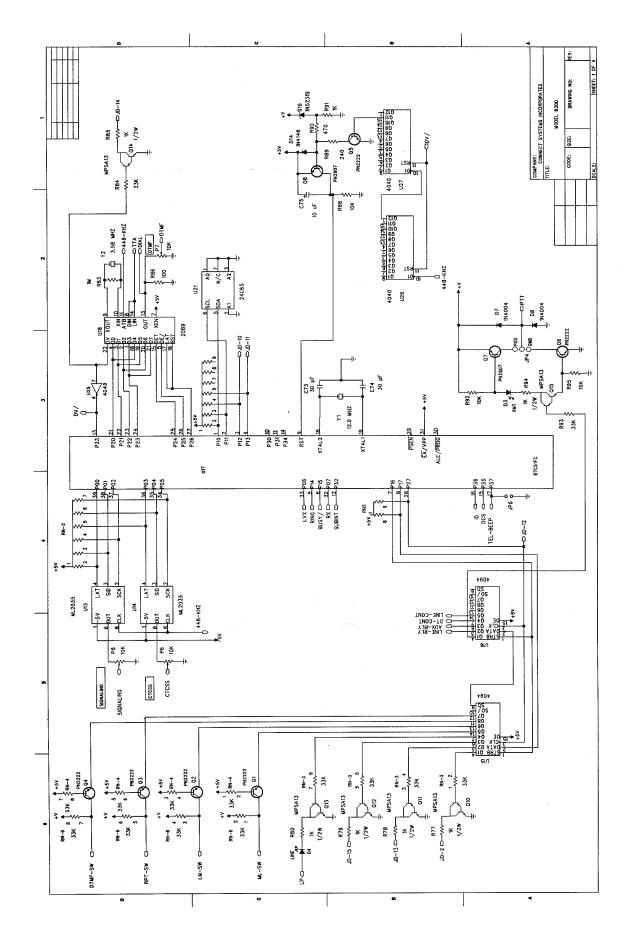
Note: Connect Systems Inc. reserves the right to render a modest service charge when returned units are found to be free of parts or workmanship defect(s) (i.e. operating to factory specifications) within the first year of the warranty. Such units will be returned freight collect to the sender, including the appropriate service charge.
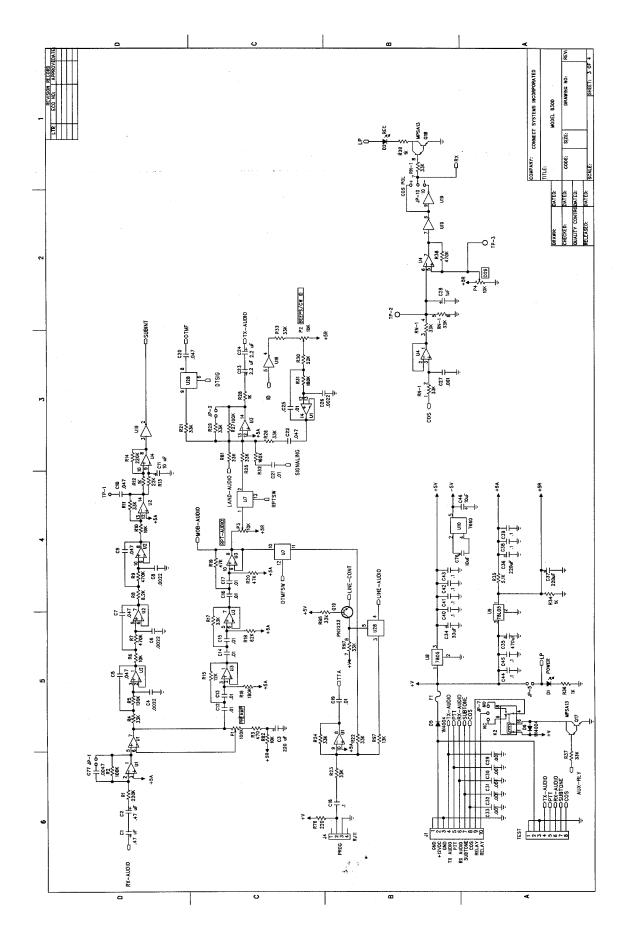
FCC NOTICE TO USERS
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1. This equipment complies with part 68 of the FCC rules. On the bottom of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If 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 Systems Incorporated, 2259 Portola Rd. 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.

Connect Systems, Inc. - Model **8300** Schematic Sheet 1 of 4

Connect Systems, Inc. - Model 8300 Schematic Sheet 2 of 4

Connect Systems, Inc. - Model **8300** Schematic Sheet 3 of 4

Connect Systems, Inc. – Model **8300** Schematic Sheet 4 of 4