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**Model 9600**  
**CONTROL STATION INTERCONNECT**

**USER'S INSTRUCTION MANUAL**

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**Congratulations:** You have just purchased the most powerful and versatile control station interconnect in the entire land mobile industry.

Twenty four dip switches and ten jumper strap options make the 9600 more user configurable than any other control station patch.

Built in connectors permit instant factory or field installation of the following powerful options:

- 9701 Electronic Voice Delay and Pulser
- 9602 FCC registered coupler
- 9603 CW Identification chip.
- 9604 Spare Relay

To gain familiarity with your new model 9600, it is suggested that you thoroughly read (and understand) this manual from cover to cover before attempting installation and set up.

## OPERATION

### **MOBILE DIALOUT**

Send a connect code (\* or \*12) for local calls or the secret toll override code (\*1\*12) to call long distance. When the dial tone drops off, dial a phone number just as you would from a telephone. The pause time between digits must not exceed 2 or 4 seconds depending on the setting of the dial pause dip switch.

If the number that has been dialed is busy, the 9600 will disconnect automatically.

Otherwise, carry on a normal "take turns" conversation.

Send a # to disconnect when finished.

NOTE: Refer to the "Access Code" subheading in the user programming section for programming details. (Codes shown in parenthesis are the factory installed access codes)

### **RINGOUT**

(Voice path enabled by mobile DTMF)  
(SCL/ACL dip switch in ACL)

Select ringout mode to receive incoming calls just as you would from a telephone.

You may select ring once or ring with multiple alert sequences. Select with the RO M/RO 0 dip switch.

You may also select which incoming ring will trigger the alert beeps. This is useful to only allow ringout to the mobile if the office phone has not been answered by the quantity of rings preselected by the auto answer dip switches.

After an alert has been heard simply send your usual access code (\* or \*12) to answer your call. Send # to disconnect when through.

NOTE: Multiple ringout beeps are not permissible in most U.S. business radio applications.

### **SELECTIVE CALLING (DTMF-DTMF)**

(Voice path enabled by mobile DTMF)  
(SCL/ACL dip switch in SCL)  
(SCON/OFF dipswitch in OFF)

Selective calling allows a caller to direct his call to a specific mobile or portable. The 9600 can selectively call mobiles and/or operate horn honkers with fully regenerated touch tone (standard feature).

The caller first dials the phone number of the 9600 terminal. If the channel is not in use the call is automatically answered on the first, second, fourth, or eighth incoming ring depending on the setting of the auto answer dip switches. When the call is auto-answered, the caller will hear an acknowledge beep. The caller then sends a selective call code followed by # (for example 4369#). The # is optional. It merely speeds up the process by letting the 9600 know that the code sequence is completed rather than waiting five seconds to default.

When the correct mobile has been signalled, he responds by sending a connect code to complete the voice path. Two way voice communication can immediately proceed. The mobile sends # to disconnect when through.

After sending a selective call code, the 9600 holds the incoming call for approximately 35 seconds. The 9600 disconnects the call if there is no mobile response within this period.

NOTE: The caller must begin sending the selective call code within five seconds of hearing the acknowledge beep. Otherwise the opportunity is lost.

#### **TELEPHONE INITIATED CONTROL FROM A TOUCHPHONE**

(Voice path enabled from originating phone)  
(SCL/ACL dip switch in SCL)  
(SCON/OFF dipswitch in OFF)

By using the telephone control mode, a caller can take full control of the 9600 from any touch phone and initiate two way voice (and/or selectively call) mobiles that are not equipped with touch dialers.

The telephone control mode has many exciting solutions to formerly difficult communications problems. Such as calling any roaming portable in the plant from any telephone. Or remote controlling a base station without dedicated wire pairs by using standard dial up lines. Indeed the 9600 completely eliminates the need for the conventional DC or tone remote.

To take control, the caller calls the terminal as in selective calling. However, after the acknowledge beep the caller sends the system access code (same access code that mobiles use) to connect. This completes the voice path to permit two way voice communication. Example: "\*" or "\*12"

To selectively call and also activate tel-control, send the selective call code after the beep followed by the system access code. For example; XXXX\* or XXXX\*12 (X's are the mobile call code)

Once in the tel-control mode, the touch phone has complete control. Timers are resettable with \* and a # disconnects when through.

All status beeps including the disconnect beep (or CW ID) are heard by the telephone party.

#### **TELEPHONE INITIATED CONTROL FROM A DIAL PULSE PHONE**

(Voice path automatically enabled)  
(SCL/ACL dip switch in SCL)  
(SCON/OFF dip switch in SCON)

When set in the self connect mode the 960~ automatically completes the voice path without the need for touch tone commands. This makes it possible to initiate two way voice communication from a (rotary) dial pulse phone.

After the 9600 automatically answers your call, the usual acknowledge beep will be heard. At this point the 9600 will self connect and send an alert beep sequence. Two way voice can now take place.

If you talk too long from the phone side (20 seconds) the 9600 will give you activity timeout beeps for the next 10 seconds. You can reset the activity timer by pausing for a moment. (Since you do not have a \* button to press). If you ignore the warning and talk the 9600 into stand-by, you will hear faster beeps which indicates that you are no longer on the air. If the mobile has a touch pad he can restore normal operation with a "\*". Otherwise, you will have to hang up and start over.

When you are finished simply hang up. (Since you have no # button to press to force disconnect). Most phone systems will either go silent or return to dialtone. The 9600 will timeout without transmitting if the line goes silent. The automatic disconnect on dialtone feature will cause disconnect if a dialtone is returned. Either way, the 9600 will not cause interference to your radio system.

#### **USING THE 9688 AS A DIAL UP DC REMOTE**

The 9600 can completely simulate a conventional DC remote by using a speaker phone as the control head. (The speaker phone must have a mute button) Simply dial up the 9600 from the desired dispatch location and never hang up. Leave the speaker phone in mute when not communicating. (The 9600 timeout timer must be defeated. The OFF/3 min. and OFF/6 min. dip switches must both be in the OFF position.)

When a mobile calls, you will hear him through the loudspeaker. Unmute to reply. While actually communicating, it is better to use the handset because background noise is not as readily picked up.

Prior to initiating a dispatch, press 0 to check if the channel is already in use. Press \* to return to CTCSS (private) monitoring. Refer to the "SPARE RELAY" subheading in the INSTALLATION section for instructions on using the spare relay to remotely enable/disable CTCSS.

Using the 9600 as a DC remote has the following advantages over conventional DC REMOTES...

1. No wires to run.
2. No dedicated pairs to rent.
3. No expensive control heads to purchase.
4. Dispatch point can be changed instantly and without cost.
5. No ugly control heads on your desk.
6. Mobiles can be selectively called with regenerated DTMF.

#### **USING THE 9699 AS A DIAL ACCESS REMOTE**

As previously mentioned, the 9600 allows every touch phone in the plant to double as a dispatch terminal. And by using the self connect feature, dispatch can even be accomplished from dial pulse phones.

#### **OPERATION THROUGH REPEATERS OR TRUNKED SYSTEMS**

Operating the 9600 through a repeater appears to the user as straight simplex operation. It makes no difference if the repeater is CTCSS or carrier activated. Or if the repeater has hang time. Actually, three or four seconds of hang time will improve operation because there will be fewer noises to distract the conversation.

The optional 9701 electronic voice delay board is highly recommended when the 9600 is used through repeaters to eliminate word clipping or loss.

## AUTOMATIC CONTROL FEATURES

The 9600 incorporates four very powerful and convenient automatic control features...

### **BUSY SIGNAL DISCONNECT**

When the mobile dials a number that is busy, the 9600 will automatically disconnect. The busy signal disconnect feature can be defeated by strapping JP-12 if desired.

### **CALL PROGRESS TONE DISCONNECT**

The 9600 contains a new fully digital call progress tone detector. This allows the 9600 to detect unwanted dialtones etc. And automatically disconnect. Any call progress tone of a continuous nature will be detected regardless of the tone frequencies used. This allows the 9600 to automatically disconnect on dialtone if the party called should hang up before the mobile can disconnect. The call progress tone detection feature can be defeated by strapping JP-II if desired.

### **ACTIVITY TIMER**

If the telephone audio keeps the base station in transmit for 30 continuous seconds the 9600 goes into a stand by mode.

Slow beeps during the final ten seconds give both the mobile and phone party warning of impending talk off. Fast beeps after 30 seconds tells the phone party they are off the air.

Normal operation can be restored by sending a \* from the mobile. Or from the phone side but only if the call is under telephone initiated control.

If you do not wish to resume listening to whatever caused the talk off, send # to disconnect. Or simply forget the whole thing and the 9600 will automatically timeout and return to the ready to use condition.

### **TIMEOUT TIMER**

Calls are limited to the time selected by the timeout dip switches. Warning beeps occur every four seconds during the last minute to warn of timeout. The beeps are heard by both the mobile and telephone side. The timeout timer can be reset by the mobile by pressing \* if the "OFF/MTR" dip switch is set to allow timer resetting.

If the call is under telephone initiated control, the telephone party can also reset the timeout timer.

## **USER PROGRAMMING**

Much can be learned about the 9600 and it's capabilities by thoroughly reading the following topics; DIP SWITCH PROGRAMMING, JUMPER STRAP OPTIONS and ACCESS CODE.

As you read, make your dip switch selections. We suggest not changing jumper strap options until last. That is after the 9600 is up and running. Then only make one change at a time (if any). This way if something goes wrong you will know which step caused it.

### **DIP SWITCH PROGRAMMING**

#### **TIMEOUT:**

Select: 3 minutes or 6 minutes. Leaving both switches off defeats the timeout timer. NOTE: Only one switch may be on at a time.

#### **OFF/BG ID**

Select BG ID (ID at beginning) if you wish for CW ID after a connect command as well as when a disconnect occurs. Leave in OFF position if CW ID is only desired when disconnecting. Also leave in the OFF position if a CW ID chip has not been installed.

#### **STC/OFF**

Enables or disables a mobiles ability to override the toll restrict with the "secret toll code".

#### **MDA/\***

Selects multi-digit access or \* access.

#### **COS-/COS+**

"Carrier operated squelch" polarity reverse. Select such that the front panel COS LED lights when a carrier is received.

#### **LD/TR**

Select: "Long distance" (defeats toll protection) or "toll restricted" (use secret toll override code to make long distance calls)

#### **SCON/OFF**

Select "self connect" to automatically enable voice communications when calling from a dial pulse telephone. SCON eliminates the need to send a DTMF code to enable the voice path. NOTE: This switch only has effect if the SCL/ACL switch is in the SCL position.

#### **SCL/ACL**

Choose: "selective calling" (incoming calls automatically answered) or "all call" (ringout) NOTE: Must be in the "SCL" position for all land to mobile capabilities except ordinary ringout.

**OFF/MTR**

Defeats or enables the ability to perform a "mobile timeout reset" by pressing the \* button.

**RDET/OFF**

Must be in the "ring detect" position if ringout, selective calling, or any telephone initiated control capability is to be functional. Turn off only if the 9600 is used strictly to make outgoing calls.

**DP2/DP4**

Selects a 2 second or 4 second interdigit "dial pause" during mobile dialout. Determines how much time you have available to press the next digit and subsequently how rapidly the 9600 will switch from dialout mode to VOX mode. use DP4 for most applications.

**OFF/TB**

"Tone block" eliminates the transmission of regenerated DTMF to the telco after a phone number has been dialed. Saves the telephone party's ear when sending DTMF commands such as a timer reset or disconnect. Leave in "TB" unless DTMF over dial is required.

**CMON/CMOF**

"Channel monitor on" inhibits ringout, selective call or telephone initiated control if the channel is in use. Emergency services may want to select "CMOFF" so that emergency calls will not be missed.

**RO M/RO 0**

Select "multiple" ringout beeps or "once"

NOTE: This control is only functional if "a 11 call" (ringout) mode has been selected. (SCL/ACL dip switch in ACL)

**STONE/PULSE**

Selects regenerated tone or pulse dialing.

**AUTOMATIC ANSWER RING NUMBER**

enables ringout or "auto answer" on the first, second, fourth or eighth incoming ring.

Important: Only one of the four switches may be on at a time.

**TOLL RESTRICT**

Select 1,0,8 and/or 9 as toll restricted first digits. Any combination is ok.

### JUMPER STRAP OPTIONS

- JP-2** Selects "#" or "\*A" (first two digits of access code) as the disconnect command. Factory strapped for # disconnect.
- JP-3** Selects solid state PTT (sink to ground) transmitter keying. The pad labelled "PTT" can be wired alternately to the spare relay contacts to provide inverted keying. The 9600 is factory strapped for GND keying. (See "Spare Relay" page 13 for additional details).
- JP-4** Installing strap eliminates ringout and selective call alert beeps.
- JP-5** Jumper 5 and jumper 6 must both be cut to enable CW and  
**and** Identification. Do not remove unless the optional CW ID chip is  
**JP-6** installed.
- JP-8** Cutting this strap increases the audio output range from 0- 1.5 volts to 0-6 volts. Some radios such as Motorola require high level audio. Strap is factory installed (low range).
- JP-9** Must be cut if the Electronic Voice Delay option (9701) is installed.
- JP-10** Strap in: mobile under carrier control. Strap out: mobile under RX VOX control. This strap must be out for operation through repeaters. Take your pick for straight simplex. Strap is not factory installed.
- JP-11** Defeats automatic dialtone disconnect capability. Strap is not factory installed. **JP-12** Defeats automatic busy signal disconnect capability. Strap is not factory installed.

**Note:** There is no JP-1 or JP-7.

### ACCESS CODE

The 9600 can be connected with a "\*" or \* followed by two user programmable digits depending on the position of the MDA/\* dip switch.

It is necessary to use "MDA" if you want the secret toll override code to operate.

The multi digit access code is programmed with two wire straps soldered to a removeable dip plug installed in the "ACCESS CODE" socket on the circuit board.

"AB" are the select inputs for the access code. The plug has been factory strapped with "A" connected to 1 and "B" connected to 2. This makes the factory supplied code \*12.

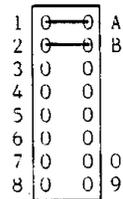
The secret toll override code consists of sending the first two digits of the access code followed by the full three digit code, five digits total. Thus \*1\*12 is the toll override code if the factory supplied code (\*12) has not been changed.

To connect, send \*12 or the toll override code \*1\*12.

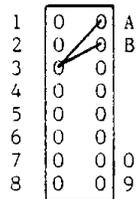
To disconnect send #. (JP-2 permits an alternate disconnect code. See page 10 for details)

The factory installed codes will function until they are user reprogrammed.

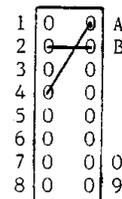
Several examples shown in Figure 1 should make the programming method clear.



FACTORY  
INSTALLED  
CODE=\*12



EXAMPLE 1  
CODE=\*33



EXAMPLE 2  
CODE=\*42

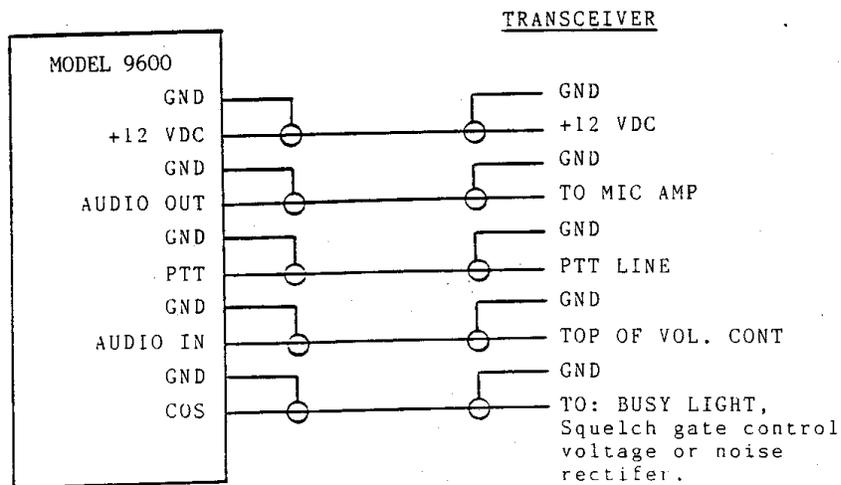
FIGURE 1  
EXAMPLES OF MDA CODE PROGRAMMING

## INSTALLATION

Installing the 9600 is easy and straight forward. Please use shielded wire for all five connections. For the sake of neatness and reliability use "crimp-on" spade style end terminations when connecting to the 9600 rear panel barrier strip.

Refer to Figure 2 when making the following connections:

1. **POWER:** Connect to a source of 10-16 VDC that can supply up to 100 MA. The 9600 is reverse polarity protected so a polarity mistake will not cause damage.
2. **AUDIO OUT:** Connect to the microphone amplifier input. (Sometimes a series resistor is helpful to eliminate mic circuit loading).
3. **PTT:** Connect to the radio "Push to Talk" line.
4. **AUDIO IN:** Connect to the top of the volume control in most installations.
5. **COS:** Connect to (in order of preference); busy light, squelch gate control voltage or noise rectifier. A point must be chosen that swings substantially in DC level. And rapidly follows mobile transmitter keying. Please refer to page 15, "Operation Without a COS Connection" if connecting to a DC or tone remote.



**FIGURE 2  
INSTALLATION OF THE 9600**

## **CW IDENTIFICATION**

(Option 9603)

The 9600 contains a CW Id'er as a standard feature. ID will occur whenever the 9600 is disconnected. To engage CW ID, simply install the factory programmed chip into the socket labeled "CW ID" chip. Then cut jumpers JP5 and JP6.

CW ID can also be made to occur when the 9600 is commanded into connect. Simply place the OFF/BG ID dip switch into the BG ID position.

The spacing between characters is adjusted to produce 20 WPM.

Exceptions: There is no ID if the 9600 disconnects due to an unauthorized toll call attempt or if disconnecting without first dialing a phone number.

## **SPARE RELAY**

(Option 9604)

Occasionally a custom or otherwise unusual installation will require a relay to solve some particular interface problem. The 9600 circuit board contains a socket to receive the optional relay. The socket is located adjacent to the large electrolytic capacitor C24.

The relay contacts are brought out to clearly labelled pads immediately in front of the relay socket:

**NC**=Normally closed **W**=Wiper **NO**=Normally open

A group of five pads just below the relay pad group controls the relay switching. Connect relay drive (RLYDR) to one of the following four pads to achieve the desired relay action:

**PAT** Relay is on whenever the 9600 is in use.

**ROX** Relay is on during mobile alert beeps

**KEY** Relay is on whenever the 9600 keys the transmitter.

**MON** Relay is on when 0 is pressed from the controlling telephone.  
Pressing \* turns the relay back off.

## **TYPICAL APPLICATIONS FOR THE SPARE RELAY**

**Remote CTCSS Enable/Disable:** When using the 9600 as a DC remote, it is desirable to monitor the channel for activity prior to dispatching. The spare relay can be used to allow the remote switching of the radios' hook switch. Pressing 0 turns the relay on. Pressing \* turns the relay back off. Thus the radio can be set to carrier receive and back to CTCSS operation remotely.

Connect RLYDR to MON. Connect the normally closed relay contacts (W and NC) in series with the radios' hook switch.

**Disabling tone squelch:** Many of the new microprocessor radios will not transmit when the microphone is on hook. The spare relay can be used to fool the radio into thinking the MIC is off-hook.

Connect RLYDR to PAT. This will energize the relay whenever the 9600 is in use. Connect the normally closed contacts (W and NC) in series with the radios hook switch.

**Key System Compatability:** In order to simulate a keyset phone, the A leads (black and yellow) must be shorted whenever the 9600 is in use (connected). Connect the two "KEYSYS" pads (adjacent to U58) to NO and W respectfully. Connect RLYDR to PAT.

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

Connect RLYDR to KEY. Remove the jumper in JP-3. Connect JP-3 PTT to NO. Connect W to GND. For inverted keying connect W to 12V.

**Semi-Duplex Operation:** The 9600 can be connected to any repeater or duplex base station to provide semi-duplex phone patch operation.

Connect RLYDR to PAT. Remove the strap in JP-3. Connect JP-3 PTT to NO. Connect W to GND. For inverted keying connect W to 12V. Turn off the VOX by turning the Tel. VOX Sensitivity control P7 fully counterclockwise.

If installed, the Electronic Voice Delay board must be removed when converting to semi-duplex. Be sure to re-strap JP-9.

The connections to the repeater or duplex base are similar to those made to a simplex radio.

NOTE: The automatic disconnect on dialtone and busy signal features are not operational when used in the semi-duplex mode.

## ADJUSTMENTS

The following set-up procedure assumes that the radio equipment is in proper working order. Touch tone deviation from the portable or mobile should be somewhere between 1.5 and 3.0 KHz. It is preferable if the audio take off point is after de-emphasis. If it is necessary to take audio before de-emphasis (such as directly off the discriminator) please refer to the heading "Audio Compensation".

The controls are clearly identified with silk screening on the printed circuit board. Due to a fully digital timing and logic design, there are no timing adjustments in this product. This greatly eases the burden of set-up. The potentiometers and their function are as follows:

- P1 Mobile to land (M-->L) audio level
- P2 Land to mobile (L-->M) audio level
- P3 Beeps and CW ID to mobile level
- P4 Land to mobile DTMF level
- P5 COS DC threshold
- P6 RX VOX Sensitivity
- P7 Tel VOX Sensitivity

Initial settings: Set P1,P2,P3,P4 and P7 to mid rotation. Set P6 to maximum (fully clockwise)

### **COS THRESHOLD**

Measure the DC level at TP-1 (a pad located between C-35 and the 8 pin test connector) both with the squelch open and closed. Note these two DC voltage levels.

Next, move your meter to TP-2 (just to the right of TP-1). Rotate the COS threshold control P5 until a reading midway between the two previously measured TP-1 readings is obtained.

For example: TP-1 reads 2 volts squelch closed and 4 volts squelch open. Adjust COS (P5) for a reading of 3 volts on TP-2.

Select the COS polarity (COS-/COS+ dip switch) that causes the front panel COS led to light when a carrier is received. The COS led must extinguish when there is no carrier present.

**Operation without a COS connection.** When interfacing the 9600 to a DC Remote there will be no COS point available to connect to. Short the COS input to GND with a short piece of buss wire. Rotate the COS threshold control P5 to mid rotation. Place the COS-/COS+ dip switch in the COS- position. The front panel COS led should now be permanently illuminated. The 9600 can operate with any source of pre-squelched audio without a COS connection if set up as just described.

**NOTE: Do not proceed until the COS is properly adjusted and working. DTMF will not decode unless the COS led is illuminated when the mobile is in transmit.**

#### **LAND TO MOBILE AUDIO LEVEL**

Press the front panel connect/disconnect switch toward connect. A dial tone should now be heard. Adjust P2 (L-->M) until approximately 4Khz transmitter deviation is achieved.

If the drive level is insufficient, cut strap JP-8 which will increase the available output drive. Re-adjust P2.

NOTE: The automatic disconnect on dialtone feature will only give you about six seconds of dialtone to work with.

#### **MOBILE TO LAND AUDIO LEVEL**

Find a setting of the (M-->L) level control (P1) that allows mobile touch tone decoding as indicated by the front panel DTMF led.

Have the mobile place a call through the patch to a phone that can give you assistance. Adjust P1 until the mobile audio level is satisfactory as heard on the telephone.

NOTE: This adjustment cannot be accomplished if the COS is not working properly. If P1 cannot be turned down sufficiently or if there are DTMF decoding problems refer to the "Audio Compensation" section.

#### **MOBILE BEEP LEVEL**

The level of mobile status beeps (activity/timeout warnings, ringout beeps and disconnect beep or CW 10) are controlled by the setting of the beeps level control P3.

Each time the connect/disconnect switch is pushed toward disconnect (after a connect) a disconnect beep or CW 10 will be produced. Adjust P3 until the desired transmitter modulation level is achieved.

#### **SELECTIVE CALL DTMF LEVEL**

The level of land to mobile regenerated OTMF is set with P4. If DTMF selective signalling is not used set P4 to minimum (fully counterclockwise).

To adjust P4 it will be necessary to perform a land to mobile selective call as described in the operation section. (page 3)

Adjust P4 to produce about 2.5 Khz of OTMF deviation from the base station transmitter.

### **TEL. VOX SENSITIVITY**

Our digitally processed "FAST VOX" (Patent Pending) represents as fine a VOX as has ever been designed. But the VOX level control P7 will require a little experimentation over a period of several calls for totally optimum results. 1/2 rotation (about 12 o'clock setting) is a very good starting point. If the sensitivity is too low, the VOX will not attack well on weak voices. (By the way, you should instruct the person you are speaking with to talk directly into the handset microphone). If the sensitivity is too high (CW) background noises such as TV sets playing may either trip or hold the VOX. A compromise must be achieved. Once set correctly, the VOX will perform splendidly. Our VOX always responds (keys the PTT line) in under 15 milliseconds.

### **RX VOX SENSITIVITY**

P6 can be thought of as a receiver VOX. The proper setting for P6 in most installations is fully clockwise (max). However, in simplex operation if the receiver has a leaky squelch (a bit noisy when squelched) P6 may have to be turned down a bit. In repeater operation, if the repeater does not fully quiet the base station radio P6 may have to be turned down a little. The symptom is that you will not be able to hear the party on the phone after you finish speaking! P6 is at full CW in 99% of installations.

### **AUDIO COMPENSATION**

Two pad's labelled "Comp" on the circuit board can be found just to the left of pin 7 on IC 062. The audio comp pad's can be used to deal with audio that is not de-emphasized, or has excessive amplitude.

**To add de-emphasis:** Simply solder a .1 uf capacitor in the "Comp" pads. Some installations may require a smaller value.

When the audio is not properly de-emphasized touch tone decoding will be erratic. Some rows or columns will operate or partially operate, others will not. When the audio is correctly de-emphasized, all twelve buttons will decode equally well.

**Excessive Input Amplitude:** if PI cannot be turned down low enough or if DTMF will not decode at all, the input level is probably above the useable range. (4 volts P-P max).

To attenuate the incoming audio simply install a 10k resistor into the comp pad's.

Go back to "Mobile to Land Audio Level" (page 16) and re-adjust P1.

