

CONNECT SYSTEMS INCORPORATED

1802 Eastman Ave., Suite 116
Ventura, Ca. 93003

Phone (805) 642-7184
Fax (805) 642-7271

PRIVATE PATCH II

TONE TO PULSE SIMPLEX INTERCONNECT

USER'S INSTRUCTION MANUAL

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CONGRATULATIONS! You now own the most technically advanced, feature packed, and capable autopatch/interconnect product available. Autopatch independence is now yours.

Private Patch II is truly a complete function mobile to telephone interface which will operate on either tone or rotary telephone exchanges. The possibilities for **Private Patch II** are endless. The most obvious use is setting up **Private Patch II** each day to fulfill your specific communications requirements. For example, if you are to remain local, you will want to operate simplex for greater privacy and freedom. If you are going to drive out of simplex range, you will want to place **Private Patch II** on your favorite repeater which covers your direction of travel. (Repeater should have at least 1-3 seconds "hang time" for satisfactory results.) The ringback and dial restrict switches should be set for your requirements. Another use for **Private Patch II** is linking two mobiles together which are out of mutual radio range via telephone landline. Simply call your friend's phone number from your mobile. He receives and answers your call by using the ringback feature on his **Private Patch**. You now converse with the hook-up behaving as a repeater. One more possibility is having several Private Patch II interconnects located in different cities but all on the same repeater, each having a different access code. You select the Interconnect which will give you a toll free call.

ACCESS CODE

Subsets of a single five digit user programmable touch tone (DTMF) code provide all of the Private Patch II functions. All five digits (ABCDE) provide the line connect. The first four of the same sequence provide the disconnect (ABCD). The first three provide the timer reset function (ABC). The factory installed code is 12345. Therefore until Private Patch II is user reprogrammed, the connect code is 12345 (ABCDE). The disconnect code is 1234 (ABCD) and reset is 123 (ABC). The reset code also serves as the ringback connect code.

A DIP terminal strip labeled "Access Code" may be found between integrated circuits U-37 and U-7 on the printed circuit card. This is where the access code is programmed. (The DIP terminal strip may be removed from its socket for easy programming.) Your code can be any combination of the digits 1 through 9. There are 59,049 code combinations to choose from! The code sequence goes in the order ABCDE. Therefore, if you connect the A to 1, B to 2, C to 3, D to 4, and E to 5 the code is 12345, as factory supplied. See Figure 1 for clarification. The three examples in Figure 1 should make clear the programming procedure.

Dial your commands no slower than 1 digit per second (very slow) nor faster than 15 digits per second (very fast). Both accessing and phone number dialing may be accomplished with most speed or auto-dialers if desired.

If you do not require the ultimate security of a mixed five digit number sequence, you can connect A,B,C,D,E all to the same digit. This will simplify accessing as all you will have to do is quickly press the same digit five times, four times or three times depending on the desired response.

DIAL RESTRICT

Calls to phone numbers beginning with any digits you choose are positively locked out when the front panel switch is in the "Dial Restrict" position.

Private Patch II is factory programmed and delivered with 0 and 1 as the restricted first digits. This precludes calling the operator, and out of area code dialing in most U.S. localities.

A dip terminal strip labeled "Dial Restrict" will be found between integrated circuits U-37 and U-7 on the printed circuit card.

Any two numbers can readily be restricted by connecting separate jumper wires from the desired digits to each of the pins labeled "R".

A single digit may be restricted by placing a wire from the desired digit to either of the "R" pins. Leave the other "R" pin open.

If it is desired to restrict more than two digits, diodes (IN4148) will be required instead of jumper wires.

Several examples are shown in Figure 2. The examples should make the dial restrict programming clear.

CW ID PROM

If you purchased your **Private Patch II** factory direct, your CW ID PROM is already installed. If you purchased it through a dealer, a jumper wire is installed in the circuit board between the CW ID PROM socket U-19, and U-32. The jumper will enable you to use Private Patch II until you receive your CW ID PROM chip. Until you install your ID PROM, the ID will consist of a string of dits.

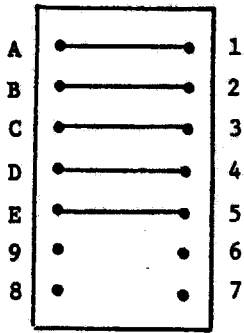
Send proof of purchase (a copy of your receipt will do) along with the call you wish programmed into the PROM to:

**Connect Systems Incorporated
1802 Eastman Ave., Suite 116
Ventura, CA 93003**

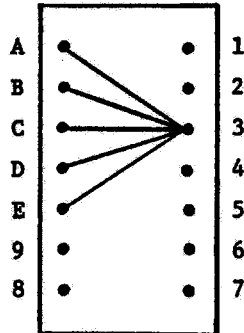
Within 24 hours we will ship your ID PROM postpaid to you. No charge.

When you receive the PROM chip, unplug your **Private Patch II**, take off the cover, and cut the jumper wire out. Do not risk damaging the circuit board by unsoldering! Carefully install the PROM into socket U-19. Be sure the cut out end or dot end of the IC is toward the rear of the unit.

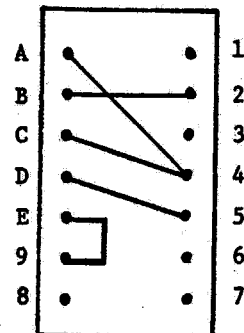
Should you change call sign, we will program a new PROM for a nominal fee of \$15.00.



FACTORY
INSTALLED
CODE = 12345



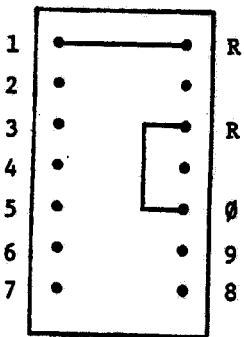
EXAMPLE 1
CODE = 33333



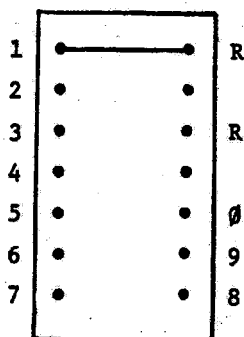
EXAMPLE 2
CODE = 42459

FIGURE 1

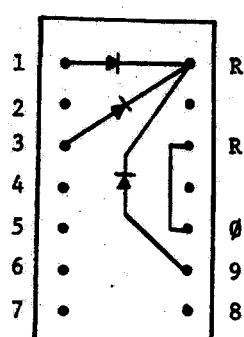
ACCESS CODE PROGRAMMING



EXAMPLE 1
1 AND Ø
(AS FACTORY
DELIVERED)



EXAMPLE 2
1 RESTRICTED



EXAMPLE 3
1, 3, 9 and Ø
RESTRICTED

FIGURE 2

DIAL RESTRICT PROGRAMMING

OPERATION

Learning to use the **Private Patch II** commands and modes will seem a little involved at first. But soon you will use it as naturally as driving your car.

THE COMMANDS: ABCDE will refer to your private access code, while 12345 will refer to the factory installed access code. To make a call, you will need a line connect. Send 12345 (ABCDE). Should you misdial your number, send the connect code again. No need to send the disconnect (off) command first. When through, send the disconnect (off) command 1234 (ABCD). Your autopatch will automatically "time out" (causing a disconnect) after six minutes. (Time out disconnect may be changed to three minutes by connecting the board strap from the "6" position to the "3" position at a location on the circuit board between integrated circuits U31 and U1B, labelled "TIMER"). If delivered into commercial service, the timer will be strapped to three minutes.) Prior to "time out" disconnect, CW ID will warn four separate times during the last minute that "time out" is imminent. You may send the timer reset code to gain another timer period. Send 123 (ABC) to reset. You can send the reset code as often as you like. The reset code serves also for answering incoming calls if Ringback mode is selected. Ringback will be covered in detail later on.

Commands can only be sent when the interconnect is receiving. Simplex by definition means one way at a time. You must wait until the interconnect stops transmitting before a new command may be issued.

For example:

1. You call a number and there is no answer. You wish to disconnect. Send the disconnect sequence 1234 (ABCD) between rings while the interconnect is "listening".
2. You have successfully completed a call and talked five minutes. Suddenly you hear CW ID timeout warnings on top of your party. You now wish to send the reset sequence 123 (ABC) for additional talk time. But you must wait until your party finishes talking and **Private Patch II** returns to the "listening" state before you can send the timer reset sequence.

TO MAKE A CALL: Send the connect code 12345 (ABCDE). **Private Patch II** will respond with your station call sign in CW followed by a dialtone. CW ID and the dialtone may overlap somewhat if your call sign is lengthy. After two seconds the dialtone will disappear. **Private Patch II** has gone into the receiving mode to pass your dialing instructions on to the phone line. Press the "Push to Talk" button on your mobile or handheld radio and dial the number you wish to connect with. You must start dialing within three seconds after the dialtone disappears. Also, you must not pause too long between digits. Otherwise your interconnect will assume you are finished dialing. The next thing heard will either be a ringing or busy signal.

If the dial restrict switch was on and a call was attempted to a number beginning with a restricted digit, you will not hear anything. Your interconnect has disconnected and is in the stand-by mode awaiting further use.

When your party answers be sure to explain to them that you must take turns talking. Often, "first timers" do not understand this and confusion results. When you are finished, wait for your party to hang up before sending the disconnect command 1234 (ABCD). The act of hanging up will generate audio on the phone line. **Private Patch II** will "think" this is your party speaking and come on the air for about one half second. If you are sending a command when this occurs, **Private Patch II** may miss some of your digits and not respond to your command. Therefore, it is best to wait for your party to hang up first before transmitting commands.

ACTIVITY TIMER: Suppose the number you had called were busy. **Private Patch II** would think the busy signal was speech and transmit continuously so that you could hear the party you had called. Obviously control would be lost. But the **Private Patch II** activity timer logic assures positive control. If the Interconnect transmits continuously for twenty seconds (this seldom happens in the course of conversation) the activity timer causes a three second interrupt "window". Quickly, during this three-second window, you send control commands. Connect 12345 (ABCDE) to redial, or disconnect 1234 (ABCD) if finished. However, a short-cut single digit disconnect method will function during "interrupt windows". Merely send a restricted dial digit. At any time other than an "interrupt control window" the four digit sequence 1234 (ABCD) is required for disconnect.

An alternate option to "interrupt control windows" is "Talk Off Disconnect" (TOD). A jumper wire may be connected between the pads labeled "TOD" on the printed circuit board. (Near integrated circuit U-32). Now instead of obtaining a control window after twenty seconds, automatic disconnect will occur instead. This is useful for busy signals, but could be a problem when speaking with someone who is a bit longwinded. Develop a communications posture that encourages interactive conversation. By talking back and forth say 2-15 seconds each, the activity timer will be constantly reset. (Note: If delivered into commercial service, the "TOD- strap will be in place.)

TO USE SIMPLEX: Set your base station transceiver and your mobile to the same simplex frequency. Be sure transmitter offset frequency switches are "off". Set the Autopatch transceiver squelch control to a point well beyond the squelched (quiet) side of threshold. You will not want the control fully "tight" However in simplex because some range may be lost. **Private Patch II** is super easy to use in simplex. You should master the technique of using your autopatch on simplex frequencies before attempting repeater operation. Install good quality antennas as high as possible and you will be surprised how good your simplex range can be. But often simplex range is not sufficient.

TO USE THROUGH REPEATERS: Set the transmit and receive frequencies on your autopatch transceiver just as though you were going to talk through the selected repeater. Set your mobile or handheld likewise. Set the squelch control on the autopatch transceiver fully tight. (Be sure you have selected a repeater which has at least 1-3 seconds hang time. The more hang time the better). Operation through the repeater proceeds identical to simplex. However, occasionally CW ID originating in the repeater may cause temporary directionality confusion in the autopatch, for the duration of the CW ID. Perhaps five seconds every three minutes or so. Not really a problem.

As usual, when operating through repeaters, squelch tails are different than when operating simplex. In simplex, when the autopatch stops transmitting, the squelch you hear closing is your own. But when through a repeater, the squelch you hear is at the repeater. You do not hear your own squelch close until the repeater drops out. The point is, you cannot control **Private Patch II** unless it is listening. **Private Patch II** is listening immediately after any squelch tail even though the repeater is still transmitting. Suppose you dial a number, and there is no answer. You wish to make another call or disconnect. **Private Patch II** will transmit during each ring and for half a second afterward. After you hear the squelch tail but before the next ring, send the command (connect or disconnect) you desire. **Private Patch II** will respond immediately to your commands.

RINGBACK: Ringback allows you to receive incoming telephone calls. This feature may be turned on and off from the front panel. Ringback is not permitted in some radio services and must be left off. When turned on, (ringback position) phone calls coming into your autopatch phone line will cause **Private Patch II** to come on the air and transmit CW ID. Only one CW ID page cycle will occur. If the channel is busy, or has had activity within the last 15 seconds, **Private Patch II** busy channel monitor logic will not allow the CW ID page to be transmitted. This feature will be appreciated by your co-channel users as inadvertent interference is avoided. Shortly after the CW ID, the autopatch will stop transmitting. Now send your ringback connect code 123 (ABC) to answer. You may now respond to the caller. If your party has hung up before you answer, you will get a dial tone upon answering. Wait for a control interrupt window, and send a disconnect command (ABCD), or simply send a restricted dial digit.

After answering your call with a ringback connect code 123 (ABC), the call proceeds just as though you placed the call yourself. The CW ID time out warning and time out timer features are functional. You may send the reset code 123 (ABC) for additional talk time. When you are finished you must send a disconnect command 1234 (ABCD) to terminate the call (hang-up).

Note: The "Busy Channel Ringback Inhibit" feature can only function if carrier/noise squelch is used. PL (sub audible tone squelch) will prevent your co-channel users' audio from being detected by **Private Patch II** logic.

COVERAGE TEST: Suppose you really do not wish to make a call, but are curious about how well you can hear the autopatch from your present location. Send a connect command 12345 (ABCDE). **Private Patch II** will respond as if you were going to call someone. But, instead of dialing a number when the dialtone drops, send a disconnect 1234 (ABCD). Or merely a restricted dial digit will do if the Dial Restrict feature is turned on.

THE CONNECTIONS

One of the many benefits of the **Private Patch II** design is the simplicity of interface to your transceiver. No connections to the inside of your receiver are necessary. You will need to make up three shielded cables which go between **Private Patch II** and your transceiver. These shielded cables will have RCA phono plugs on the **Private Patch II** end and a plug which mates to your accessory socket or microphone and speaker jacks on the transceiver end. Many transceivers have the PTT, microphone and speaker connections in the accessory socket. This is the preferable connection point, since you can leave your microphone connected to the transceiver. This will allow easier use of your transceiver as a base station. Be sure to turn **Private Patch II** off when using your base station locally. When **Private Patch II** is turned off, the local microphone will not be loaded down. The three phono plugs and a modular phone cord are provided. Plug the modular cord into the modular jack in the rear of the **Private Patch II**. Connect the other end either to your private phone system or a telephone coupler. Figure 3 makes the connection clear. Be careful not to create solder shorts or heat induced shielded cable shorts.

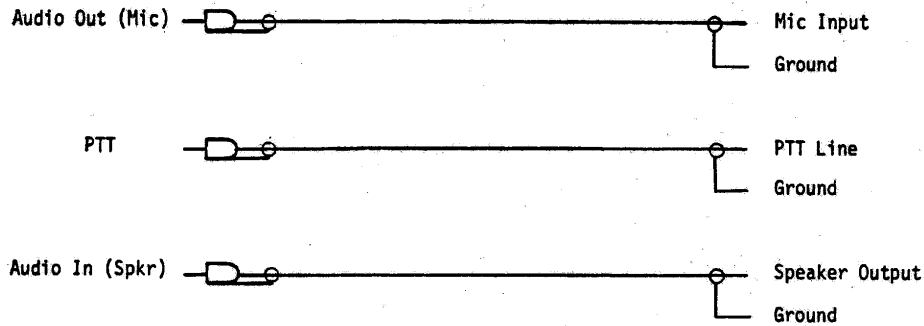


Figure 3
Interconnect/Transceiver
Interface

ADJUSTMENTS

It will be necessary to remove the cover to make three internal adjustments. Before removing the cover, be sure to unplug the power cord. Make all the necessary connections to your transceiver and the phone line. Plug in the AC cord and turn on the power switch. WARNING, there are dangerous electrical voltages on the transformer end of the printed circuit board. If not qualified, obtain professional help when working inside the unit.

The following set-up procedure assumes that the touch tones are operating properly in your mobile, handheld or what have you. The frequencies must be correct, and the touch tone deviation level of your transmitter should be set to about 4 KHZ if using straight tone dialing. The tone deviation (level) is not critical if using tone to pulse dialing.

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:

- P-1 touchtone injection level
- P-2 Receiver noise gate
- P-3 Phone line VOX sensitivity
- P-4 Phone line to transmitter Audio level

The audio level transferred from the autopatch transceiver to the phone line is adjusted with the volume control on the transceiver front panel. With the exception of P-4 and the transceiver volume control adjustment, the other pot settings should be "close" as delivered from the factory. As a first cut, set the volume control on your base transceiver to about half rotation. P-1 touch tone injection level should also be set to half rotation. Set-up for simplex operation as previously described. Sequentially press all the digits on your touch tone keyboard. The touch tone decode LED D-12 (near U-23) should light whenever any of the digits are pressed. If it does not light, turn up the volume control on your autopatch transceiver until it does light when you press any of the digits. D-12 is provided for your convenience in setting up the touch tone decoder level (P-1). If all the digits illuminate the LED D-12, you may now send a connect command 12345 (ABCDE). The autopatch should respond immediately, as described earlier.

Make your first call to a friend and get the audio levels set up. Adjust the base autopatch transceiver volume as necessary until your level sounds correct at the telephone end. Adjust P-4 on the circuit card until the audio level sounds good in the mobile coming from the phone line. Once that is established, set up the touch tone decoder level. Transmit any digit, D-12 should light. Adjust P-1 CCW until D-12 goes out. Rotate P-1 CW and see if it goes out on the high end. It probably will not. Set P-1 midway between these two extremes. The decoder is very forgiving, making P-1 a very non-critical adjustment. P-2 the receiver noise gate is normally set at full CW rotation. Full CW is always correct for simplex and nice loud repeaters. But if you are trying to operate through a repeater which is so distant as to be received noisy, you may need to reduce the setting of P-2. The symptom is that you will not be able to hear the party on the phone. 99% of users will leave P-2 fully CW.

Note: If your transceiver has a squelch circuit which is a bit noisy when squelched, you may need to reduce the setting of P-2 slightly. Reduce only to a point where the autopatch functions properly.

Our audio and digitally processed VOX (Patent pending) represents as fine a VOX as has ever been designed. But the VOX level control P-3 will require a little experimentation over a period of several calls for totally optimum results. Half rotation 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. Incidentally, a VOX is the only practical way an autopatch can function through a repeater. It also saves you from having to listen to sampling kerchunks, saves you from making connections to the squelch circuits in your transceiver, greatly relaxes T/R speed requirements in your transceiver etc.

WARRANTY

We guarantee **Private Patch II** to be free from defects in material and workmanship for one year from purchase. Tampering, misuse or modification shall void this agreement.

The quality of components used in **Private Patch II** are excellent. It should give many years of trouble-free service. Should it fail, we shall repair it for a very nominal charge, and return it to you within 1 day if possible.

We will not repair units which have been "modified".

This warranty does not cover damage caused by any acts of God.

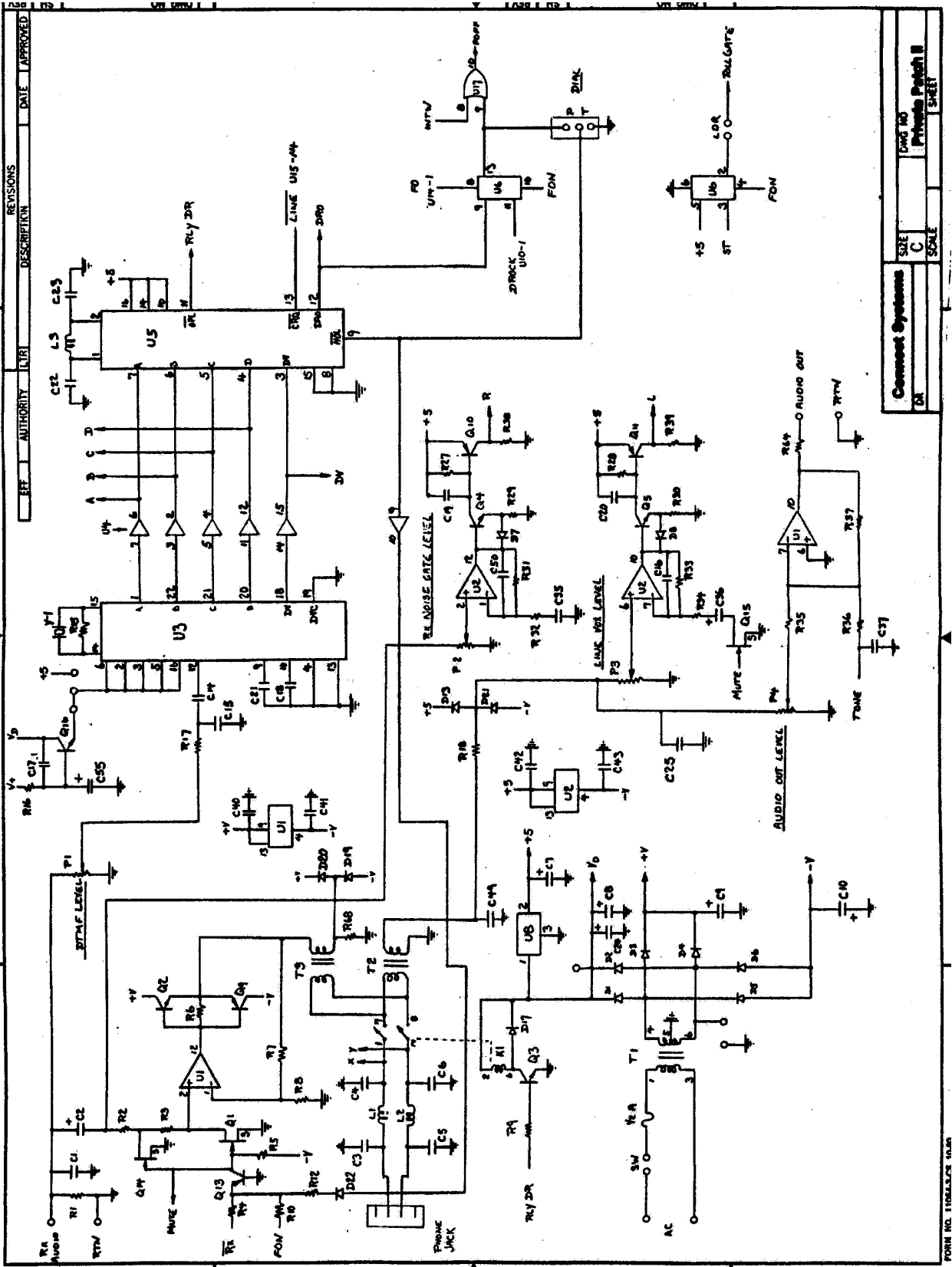
NOTES

1. **Private Patch II** is normally delivered "strapped" for tone to pulse type dialing. The board strap for straight tone or pulse dialing is adjacent to integrated circuit U-17. It is labeled "dial" and has a P and T side. A strap from the center pad to the "P" pad is for pulse. Conversely, A strap from the center pad to the "T" pad is for tone dialing. We recommend tone to pulse dialing, as this mode solves telephone company signaling problems. The tone decoder and logic in your interconnect is much more sophisticated than phone company equipment. Therefore when using tone to pulse, you can dial your number even when you are so distant you are noisy. Also you can dial up to 15 digits per second with speed dialing equipment. On average, it only takes three seconds longer to convert to pulse over straight tone dialing. Should you desire or require straight tone dialing be sure your mobile and/or handheld is transmitting touch tones at a high level. About 4 KHZ deviation should be used because the phone company requires loud tones.

2. A slow or sluggish squelch in your mobile and/or handheld may cause you to miss the first portion of the first word when your party responds to you. Adjust your mobile and/or hand-held squelch to "just squelched". This will speed up the squelch. In extreme cases you may want to change the value of your squelch delay capacitor for quicker response. When using **Private Patch II** through a repeater, this is not a problem because the repeater opens your squelch before your party even replies. The **Private Patch II** VOX system detects audio and keys your PTT in 10-20 milliseconds.

3. A transceiver without any T/R relays is preferable because it can change from receive to transmit more rapidly. But satisfactory results should be obtained from most transceivers regardless.

4. The chances of a strike are remote, but lightning can be lethal to your patch. Just as you would disconnect antennas from your radio(s) during a storm, you might consider unplugging the phone line from your patch. A lightning strike can vary from no damage, all the way to unrepairable. Protect your equipment!



PARTS LIST

Integrated Circuits

U1 MC1747	Q10 PN2907	R17 10K	C24 1000 25V
U2 MC1747	Q11 PN2907	R18 5.1K	C25 .001 DISC
U3 3201	Q12 PN2907	R27 220K	C26 .1 DISC
U4 MC14050	Q13 PN2907	R28 470K	C27 .1 DISC
U5 MC14408	Q14 2N5639	R29 5.1K	C28 .1 DISC
U6 MC14013	Q15 2N5639	R30 100K	C35 .1 DISC
U7 MC14026	Q16 PN2222	R31 100K	C36 1 50V
U8 LM78L05		R32 2.2K	C37 .1 DISC
U9 MCC14027	<u>Diodes</u>	R33 220K	C38 .001 DISC
U10 MC14040		R34 470	C39 .01 MYLAR
U12 MC14013	D1 1N4004	R35 220K	C40 .1 DISC
U13 MCC14013	D2 1N4004	R36 10M	C41 .1 DISC
U14 MC14027	D3 1N4004	R37 220K	C42 .1 DISC
U15 MC14027	D4 1N4004	R38 100K	C43 .1 DISC
U16 MC14017	D5 1N4004	R39 100K	C49 .001 DISC
U17 MC14071	D6 1N4004	R52 1K	C50 .001 DISC
U18 MC14013	D7 1N4148	R53 100K	C51 3.3 50V
U20 MC14040	D8 1N4148	R54 33K	C52 .001 DISC
U21 MC14011	D9 1N4004	R56 470	C54 .001 DISC
U22 CS7800	D10 1N4004	R57 10K	C55 2.2 50V
U23 CS6402	D11 1N5248	R58 470	
U24 CS6570	D12 LED	R59A 2.2K	<u>Misc.</u>
U25 CS9330	D13 1N4148	R59B 100K	
U26 CS4760	D14 1N4004	R61 100K	N1 NE2B
U27 MC14001	D15 1N4004	R62 100K	P1 100
U28 MC14040	D16 1N4148	R63 7.5K 1%	P2 1K
U29 MC14013	D17 1N4148	R64 1K	P3 100K
U30 MC14040	D18 1N4148	R66 10K ½ w	P4 100K
U31 MC14040	D19 1N4004	R67 470	Y1 3.58 XTAL
U32 MC14013	D20 1N4004	R68 470	L1 1MHY
U33 MC14081	D21 1N4148	R69 22K	L2 1MHY
U34 MC14081	D22 1N4148		L3 6.8MHY
U35 MC14071		<u>Capacitors</u>	T1 SSC5-20
U36 MC14013	<u>Resistors</u>		T2 CS017
U37 MC14011		C1 .01 DISC	T3 CS016
U38 MC14050	R1 10 1/2W	C2 1 50V	K1 EDS 2212
U39 4N25A	R2 22K	C3 390pf 1KV	FUSE ½ AMP
U40 MC14071	R3 22K	C4 390pf 1KV	
U41 MC4081	R4 18K	C5 390pf 1KV	
U42 MC14017	R5 100K	C6 390pf 1KV	
	R6 470	C7 2.2 50V	
<u>Transistors</u>	R7 5.1K	C8 1000 25V	
	R8 1K	C9 1000 25V	
Q1 2N5639	R9 18K	C10 1000 25V	
Q2 PN2222	R10 18K	C14 .01 DISC	
Q3 MPSA13	R12 5.11.	C15 .01 DI5C	
Q4 PN2222	R13 100K	C16 .001 DISC	
Q5 PN2222	R14 100K	C17 .1 DISC	
Q7 PN2222	R15 10M	C19 .1 DISC	
Q8 PN2222	R16 470	C22 .033 MYLAR	
Q9 PN2907		C23 .033 MYLAR	