



PTB1A SelCall Module Application Note & Programming Details.

Release History	Rev 1.62	8/8/1995	Connector Colour Codes
	Rev 1.63	18/10/1995	1.27 software User notes
	Rev 1.64	7/11/1996	Corrected Prog. Cable Diag.
	Rev 1.65	18/7/1997	New loom colours.
	Rev 1.66	1/11/1999	PTB1A Circuit Diagram

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Hardware

Introduction

The Pentone PTB1A is a compact multi-tone SelCall module with full encoding and decoding in any of the standard internationally defined tonesets.

The PTB1A requires a 5 volt supply from the radio and interfaces to the radio Rx, Tx, and control circuitry via CMOS compatible logic.

The module can be interfaced to matrix keypads or BCD switches but may also be controlled using 1 to 4 individual push-button switches.

The module outputs user information via a status LED, a decode output line, and a range of alert tones. To facilitate the use of PTB1A modules in existing systems the module can be set up to use alert tones that are compatible with those used by other manufacturers.

The PTB1A supports a wide range of programmable signalling functions including:-

- Full ANI transponding
- Multiple Status digits
- Group calls (including International format)
- Over-Air Reset (stun), Kill, and Unkill
- Over-Air Silent Status Request
- Emergency functions including Covert Listening

The PTB1A is configured using simple menu-driven PC software via a cable from the printer port, and, with the exception of the Alert tone output level/impedance all configuration is software controlled, requiring no links or switches to be set on board.

The PTB1A programming model allows a remarkable degree of flexibility in message composition and tone sequences are not limited to 5 tones. The module is thus fully compatible with complex systems requiring multiple repeater access tones and multiple tone sequences.

Installation

Handling Precautions

The PTB1A uses static-sensitive CMOS devices and is therefore supplied in an anti-static bag. To prevent damage to the module Electrostatic Discharge Precautions should be employed at all stages of the fitting process.

Connectors

The PTB1A module is fitted with Hirose 1.25mm pitch connectors and is supplied complete with plugable wiring looms. This allows the module to be removed from an installation for re-programming etc. Replacement looms are available from Pentone (order codes PTB1C11 and PTB1C12).

The connector part numbers are

DF13-11S-1.25C	11 way socket
DF13-12S-1.25C	12 way socket
DF13-2630-SCF	CRIMP

Audio Alert Levels

If the alert tones from the PTB1A are to be used to directly drive the speaker, then the on board link (solder bridge) should be made. If the link is left off then the PTB1A alert tones will drive an amplifier or high impedance load.

Power Requirements

The PTB1A requires a single 5 volt dc supply @ <4.0 mA (typ). Additional current will be drawn dependant on the radio installation.

Mounting The Module

Ensure that there is adequate clearance around the PTB1A and stick the module into the radio using a double-sided sticky pad. Do not install the PTB1A into areas of the radio where it may be subject to unnecessarily high RF fields.

The PTB1A should be programmed before installation into a radio please refer to the programming section.

User Interface Connector – CON1

The user interface signals on CON1(the 12 way loom) are shown below.

Pin	Old Colour	New Colour	Prog. Mode	Operating Mode
1	White	Red	Vcc +5 V dc	Vcc +5Vdc
2	Black	Black	GND Digital Ground	GND Digital Ground
3	Brown	Black Stripe	NC	COM
4	Red	Orange	NC	C3
5	Orange	Orange Stripe	NC	C2
6	Yellow	Pink	NC	C1
7	Green	Green	/SEN PC requests dialogue	R4 / SEND A
8	Blue	Brown Stripe	/CS 'RTS' from PC	R3 / OQ
9	Violet	Brown	CLK Data clock from PC	R2 / EMERG
10	Grey	Green Stripe	RX Serial data from PC	R1 / SEND B
11	Brown	Grey Stripe	ACK 'CTS' to PC	ACK alarm horn output
12	NC		TD Serial data to PC	NC

ACK

The ACK output (CON 1/11) is enabled after the detection of a SelCall or group call. The output is buffered from the microprocessor with an open collector transistor driver and may be used to switch a relay to drive a car horn or similar.

The PTB1A can be interfaced to a keypad or BCD switches to allow the input of address and status information, and a number of 'Event' switches may also be connected to allow other operations.

The optional event switches are:

SENDA	A push-button between R4 and COM, can be set to cause a SENDA event or OPEN/QUIET (short press) and SENDA (long press) dependant on configuration.
OPEN/QUIET	A push-button between R3 and COM, used to toggle the OPEN/QUIET state.
EMERGENCY	A push-button between R2 and COM, can be set to cause an EMERGENCY or OPEN/QUIET (short press) and EMERGENCY (long press). The length of press required to trigger an EMERGENCY sequence is set up by the programming software.
SENDB	A push-button between R1 and COM, may be used to cause a SENDB event.
DIVERT	A toggle switch between R1 and COM, may be used to set the PTB1A into Call Divert mode. NOTE: Divert and SENDB are mutually exclusive and the programming software defines which switch type is to be used.

NOTE: If no keypad or BCD switches are required then the above event switches **except for SENDA** may optionally be connected to either COM or GND. If a keypad or BCD switches are required then the event switches must be wired to COM.

A 4*3 matrix keypad may be connected to the row (R1-4) and Column (C1-3) lines. The key between C1 and R4 (often marked '*') is the SEND event key, and the key between C3 and R4 (often marked '#') is the group digit. dependant on software configuration the SEND key can also be used to toggle the OPEN/QUIET state (short press).

Alternatively up to 3 BCD switches can be connected to the PTB1A. Each BCD switch must be connected via 4 diodes as shown in the diagrams below. The software configuration defines how many address and status digits are to be read from the BCD's.

Figure 2 shows a PTB1A connected to a keypad and 4 additional event keys.

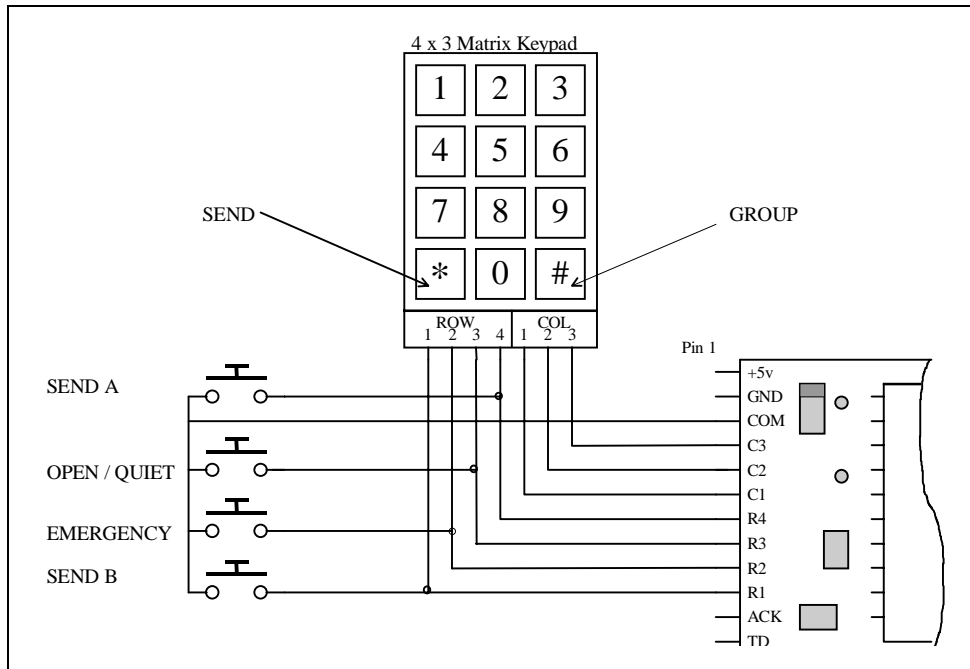


Figure 2

Figure 3 shows a PTB1A connected to three BCD switch and 4 event keys

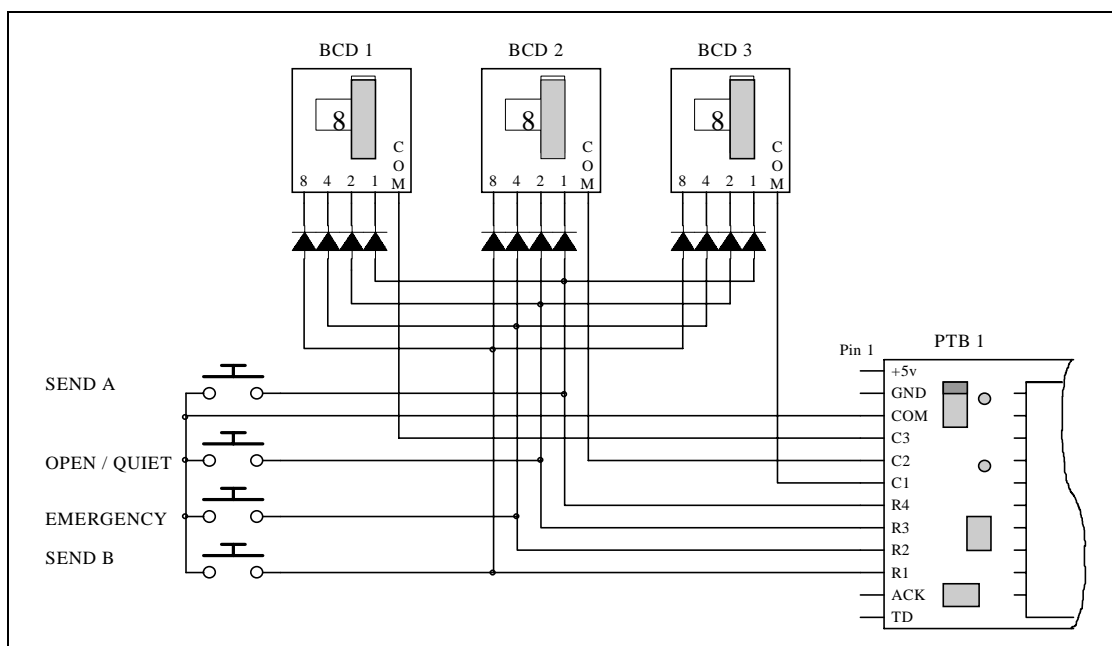


Figure 3

Figure 4 shows a PTB1A connected to 4 event keys.

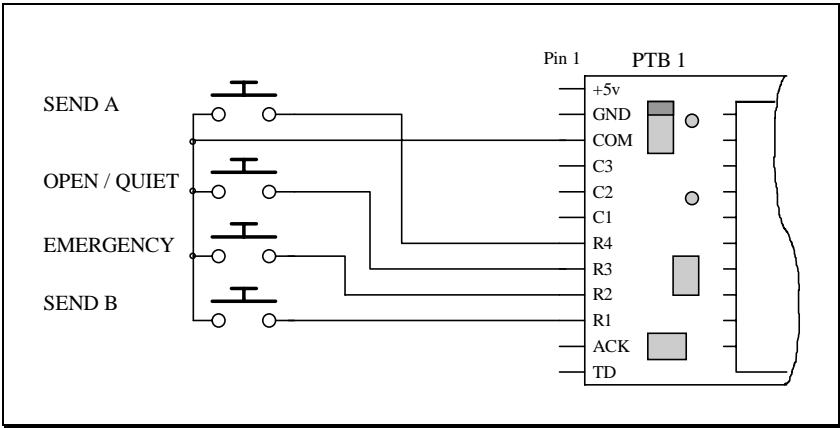


Figure 4

Figure 5 shows a PTB1A with Divert Switch

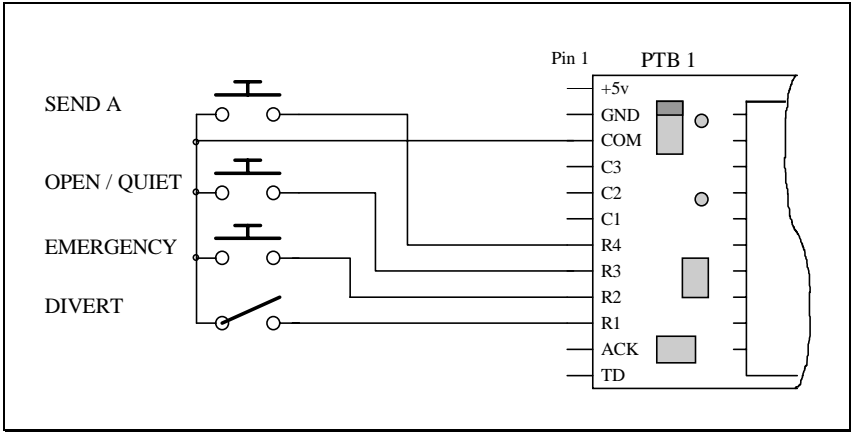


Figure 5

Figure 6 shows the alternative event switch wiring.

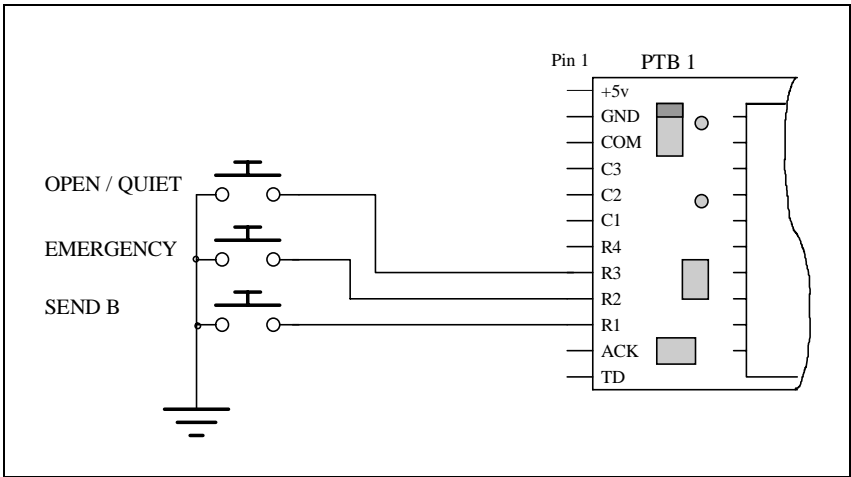


Figure 6

Radio Interface Connector – CON2

The tables below describe the pin functions of the PTB1A interface ports in each of the various modes.

Pin	Old Colour	New Colour	Function
1	Red	Violet	SI Audio signal in
2	Black	Black	GND Analogue Ground
3	Brown	Green Stripe	TONES Encoded tones output
4	Green	Orange	ALERT Alert tones output
5	Yellow	Blue	PTT I/O PTT in/out for radios with unbroken PTT line PTT in for radios with broken PTT line
6	Orange	Blue Stripe	PTT OUT PTT out for radios with broken PTT line
7	Red	Pink	STATUS Drive for status LED
8	Grey	Grey	MIC MUTE Output used to prevent microphone signals corrupting tones
9	Violet	Grey Stripe	RX MUTE Output used to mute RX circuitry of radio
10	Grey	Orange Stripe	AMP EN Output used to enable the audio amplifier during alert tone output .
11	Blue	White	BUSY Input to indicate channel busy state

The MIC MUTE, RX MUTE, AMP EN, and BUSY signals are configurable as active high or active low.

SI

The SI input should be connected directly to the output of the radio's discriminator.

TONES

The TONES output should be connected to a summing point in the radios Tx Audio path. If it is connected after the radio's limiter stage then a series resistor may be required to limit the deviation.

ALERT

The ALERT output should be connected to a summing point in the radios Rx Audio path. It may be connected before the audio amplifier or directly to the loud speaker. If connection is to be made before the amplifier, then the amplifier must either be permanently on, or must be capable of being enabled with the AMP EN signal (CON2/10). The output level/impedance are set using the solder bridge on the PCB.

PTT I/O

This connection is a bi-directional active low line that monitors the radios PTT switch and can pull PTT low when the module transmits tones. If the radios PTT line cannot be broken then this line is used without PTT OUT (CON2/6) being connected. In this case Tx time-outs etc. are not available.

PTT OUT

The PTT OUT output is only used in installations where the PTT line can be broken. It is an active Low signal which normally follows the PTT input signal as applied to PTT I/O (Con2/5)

STATUS

The STATUS output is active Low and may be used to drive an LED. The Cathode of the LED should be connected to STATUS. No external current limiting resistor is required. The Anode of the LED should be connected to +5 Volts.

MIC MUTE

The MIC MUTE output is an open collector signal used to inhibit the microphone from corrupting outgoing SelCall tones by pulling the microphone signal to ground. MIC MUTE is programmable active high or low and should be connected to the Tx Audio path at a suitable point before the TONE output.

RX MUTE

The RX MUTE output is an open collector signal used to inhibit the radios Rx Audio by pulling the Rx Audio path to ground. RX MUTE is programmable active high or low and should be connected to the Rx Audio path at a suitable point before the ALERT tone output.

AMP EN

The AMP EN output is a programmable Active High or Low signal which may be used to enable the radios Audio amplifier during alert tone generation. If the radio does not support this feature then it should be left unconnected. Care must be taken to ensure that the radio is able to drive the audio amplifier independently.

BUSY

The Busy input is programmable Active High or Low and is used to signal to the PTB1A that the channel is busy and that transmissions should not take place. For BUSY to operate the radios PTT line must be broken and the PTB1A connected via PTT I/O and PTT OUT. If this facility is not used then the BUSY line should be left unconnected and programmed active low.

Analogue Switch – CON3

Pin	Function
1	ASI Audio Switch Input. Switch follows Open/Quiet Mode and may be used for switching the signal path if required
2	ASO Audio Switch Output

ASI

The ASI input is one pole of a general purpose audio switch which may be used for switching the radios audio path if required. Connection to the audio switch is via the two PCB pads of CON3. The switch state follows the Open/Quiet state.

ASO

The ASO output is the second pole of the audio switch (see ASI above).

Hardware Details

PTB1A Circuit Board – Bottom

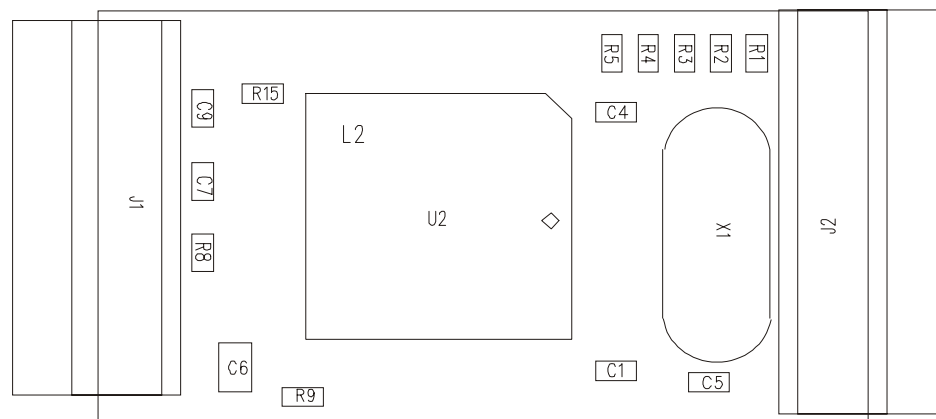


Figure 7

PTB1A Circuit Board – Top

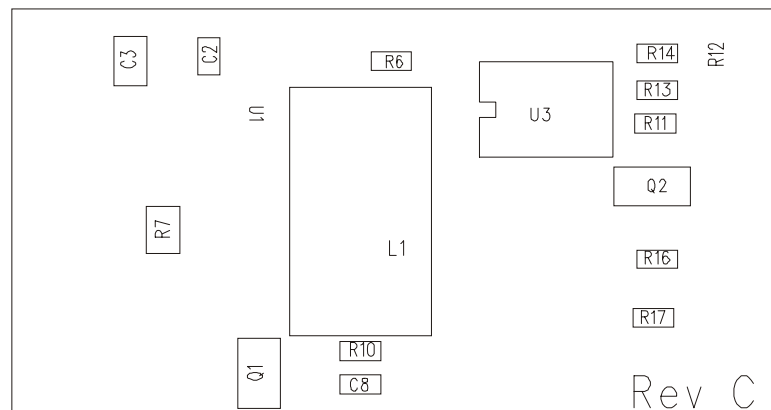


Figure 8

PTB1A Circuit Diagram

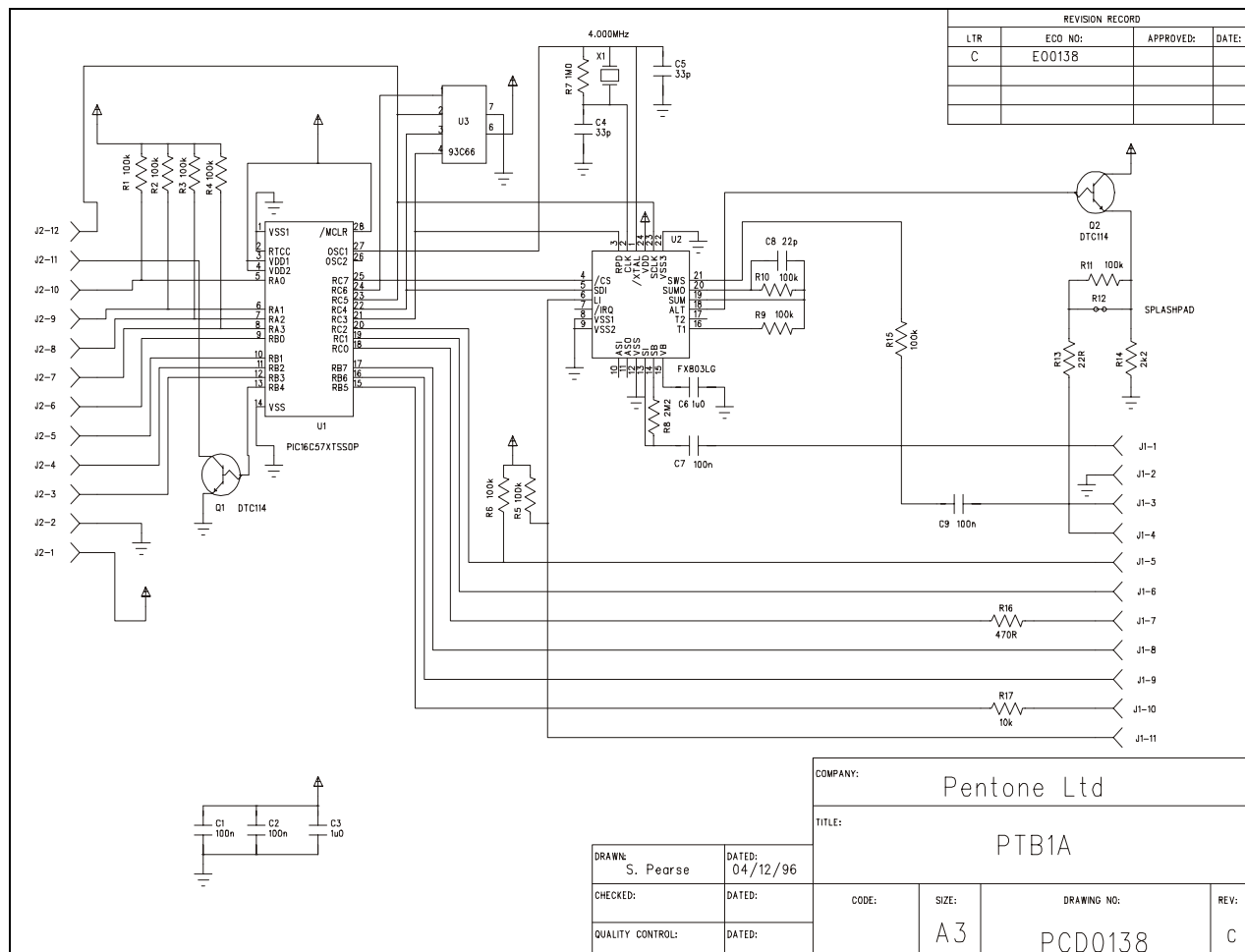


Figure 9

PTB1A Components List

Item	Qty	Reference	Value
1	2	C1,C7	1uF
2	2	C2,C3	33pF
3	4	C4,C6,C8,C9	100nF
4	1	C5	22pF
5	2	Q1,Q2	BC847
6	10	R11,R12,R16,R17,R18,R21,R22,R23,R24,R27	100K
7	3	R15,R25,R28	10K
8	1	R20	1M0
9	1	R26	2M2
10	1	R29	470R
11	1	R31	2K2
12	1	R32	22R
13	1	U1	93C66
14	1	U2	FX803LS
15	1	U3	PIC16C57XT
16	1	X1	4.00 MHz

Specifications

Absolute Maximum Ratings

Exceeding the maximum rating can result in module damage. Operation of the module outside the operating limits is not implied.

Supply Voltage	4.5V to 5.5V
Operating Temperature Range	0 to +70 deg. Celsius
Storage Temperature Range	-20 to +85 deg. Celsius

Operating Limits

All module characteristics are measured under the following conditions unless otherwise specified:

Vin = 5.0 Volts, Temp = 20 deg. Celsius

Characteristic	Note	Min.	Typ.	Max.	Unit
Supply Voltage (Vin)		4.5	5.0	5.5	V
Operating Current	1		4.0		mA
Standby Current	2		2.5		mA
LED Drive Current				15.0	mA
Current Limit (PTT/Mute O/P's)				50.0	mA
Tone Decode Bandwidth			3		% of centre frequency
Input Sensitivity	3	31.0			mVrms
Tone Out Level			308		mVrms
Tone Out Accuracy		f		+/-0.1	%
Alert tone o/p level	4		350		mVp-p
Signal to Noise	5		100		%
Logic "1" in		3.5		5.5	V
Logic "0" in		0		1.0	V
Logic "1" out		VDD-0.7			V
Logic "0" out				0.6	V
Audio Switch				5.0	Vp-p
Alert Output Impedance	6 7		140 100		Ohm kOhm
Signal input impedance			20.0		MOhm
Signal Output Impedance			10.0		kOhm
On Board Clock			4.0		MHz
VDD start voltage to guarantee reset			VSS (0.0)		V
VDD rise time to guarantee reset		0.05	0.1		V/ms

NOTES

1. Additional current will be drawn from the PTB1A dependant on the radio installation.
2. In Quiet Mode.
3. Under pure-tone conditions.
4. The "Alert" square wave driving an 8 Ohm load with LINK in position.
5. At -4.0dBs S/N (using a 100mS CCIR signal at 248 mVrms).
6. With LINK in position.
7. with LINK removed.

Programming The Module

Programming is accomplished using a PC type computer and a simple programming cable. Details of the programming cable are shown below. Note: the 4 diodes and resistor must be incorporated into the cable.

The programming cable can be connected to any of the standard PC parallel printer ports (LPT1,2,3) and will be auto-detected by the programming software.

NOTE: When programming, the PTB1A derives its 5v supply from the PC's parallel port. Some notebook computers may only provide 3v signals at the port and these may not reliably program the module. If you experience programming difficulties verify that the programming cable is connected to the PARALLEL port and not the RS232 serial port.

Pentone supply a programming cable (order code PTB1C)

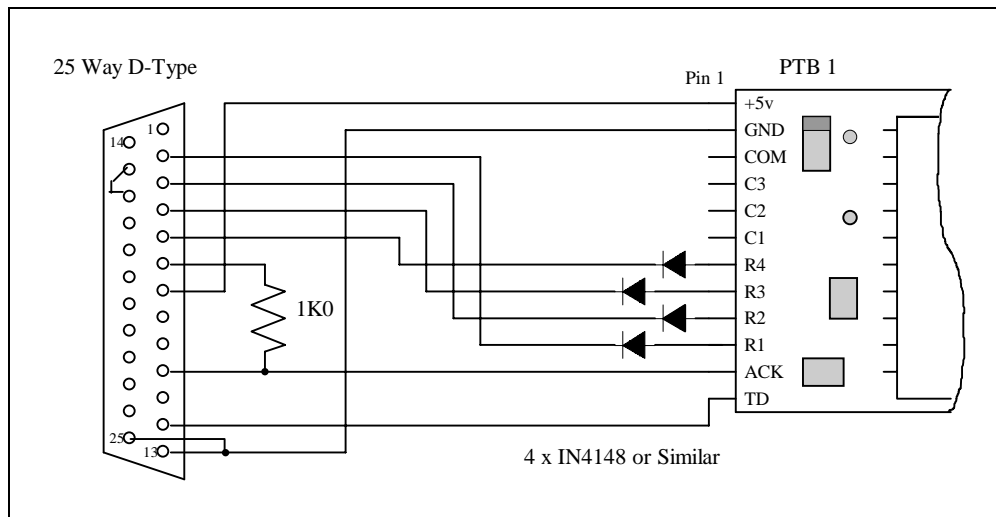


Figure 1

PTB1A Programming Software

The PTB1A derives its flexibility of operation from the programmable parameters coded into its EEPROM. The PTB1A may be programmed to operate in a variety of different ways according to the users requirements. The SCPROG software allows the installer to edit a set of parameters which may then be downloaded to the PTB1A's on board EEPROM via the programming cable. The SCPROG software is a simple to use, menu driven system which allows for loading, saving and editing of the PTB1A parameters before they are programmed into the PTB1A.

Overview

To run the software insert the SCPROG disk into drive A: and enter,

```
A:↵  
SCPROG↵
```

The software will enter the Main Menu which allows the following options:

Main Menu

- F. File Menu
- P. Programming Menu
- E. Edit Parameters Menu
- C. Configuration Menu
- X. Exit

The **File Menu** option allows Parameter files to be loaded from disk, saved to disk or output to a printer.

The **Programming Menu** allows the Parameter set to be downloaded to the PTB1A via the programming cable, retrieved from an already programmed PTB1A, and verified against the parameters held in the PTB1A.

Selecting **Edit Parameters** allows the setting and modifying of all the programmable parameters of the PTB1A on four input screens. The input screens may be selected using the **PGUP** and **PGDN** keys, and individual parameter fields may be selected using the cursor **UP** and **DOWN** keys.

The **Configuration Menu** allows the software to be set up to program the appropriate version of PTB1A. This is to allow for future improvements in facilities and O.E.M versions. Version 1.49 Programming Software supports the programming of Version 1.20 to Version 1.27 PTB1As.

Select **Exit** to return to DOS.

NOTE: Although it is possible to run the programming software in a DOS session under Microsoft Windows this is not recommended as correct operation requires careful setting of the windows parameters.

Parameter Files

The complete configuration for a PTB1A may be saved to disk in a parameter file. This allows the user to set up the desired configuration for a particular application and save this information to disk. If more PTB1As are required for similar applications, the configuration may be loaded from disk and edited as required before downloading to the PTB1A.

e.g. If a set of transceivers is required for a fleet, with similar operation, but different ANI and Decode sequences, the programming operation may be as follows:-

1. Set up all the parameters required for the first transceiver in the fleet.
2. Set up the ANI and Decode address for this transceiver.
3. Download the parameters to the first PTB1A.
4. Save the Parameter File to disk.
5. For each successive transceiver in the fleet, load the initial Parameter file from disk.
6. Modify the ANI and Decode address as appropriate .
7. Download the Parameters to the PTB1A.
8. Save the Parameters to disk for future use.

It is recommended that a copy of the Parameter file for each PTB1A programmed is kept on disk for future reference. The complete set of parameters may be output to a printer if a paper copy of the PTB1A configuration is required.

Editing the Parameters

The PTB1A Parameter Set is divided into four functional sections, each section has one edit screen which may be filled in by the installer. The four sections are as follows:

1. Tonesets and Encoder Slots.
2. SelCall Encoder Operation.
3. Decoder Operation.
4. System Operation and Timing.

When the Edit Parameters option is selected from the main menu, The Toneset and Encoder Slots input page is displayed. Use **PGUP** and **PGDN** to select the other input pages.

Tonesets and Encoder Slots.

This edit page allows the user to select the required toneset(s) for the encoder and to create sequences of tones to perform the required encoder tasks. There are seven programmable Tone Slots (A to G), each Tone Slot may be a multi-tone sequence, with up to 8 tones chosen from a toneset, or may be a single tone of specified frequency, or a dual tone with each frequency and the inter tone gap independently specified.

Multi-tone slots can use any of the following Tonesets

1. **CCIR** - CCIR with 100ms, 70ms or 40ms tone length
2. **EEA** - EEA toneset, 40ms tone length.
3. **ZVEI1** - ZVEI1 toneset 70ms tone length
4. **ZVEI2** - ZVEI2 toneset 70ms tone length
5. **ZVEI3** - ZVEI3 toneset 70ms tone length
6. **PZVEI** - PZVEI toneset 70ms tone length
7. **NATEL** - Natel toneset 70ms tone length
8. **USER** - User defined toneset may be set up as required.

Separate Tone Slots may encode from different tonesets or from the same toneset as required. In each Tone Slot it is possible to enter wild cards 'X' for address or 'S' for status instead of a normal tone digit. When these are encoded the wild card address and status digits will be replaced by the address keys and status keys read from the transceiver keypad or BCD's.

SelCall Encoder Operation

This edit page allows the installer to define how the transceiver is to operate, and the functions that will be available to the transceiver user. The encoder is divided into a set of 'Events', such as press of PTT or keypad Send key. Each transceiver event may be programmed to generate up to 8 of the Tone Slots specified in the Toneset and Slots page in any order as shown Below.

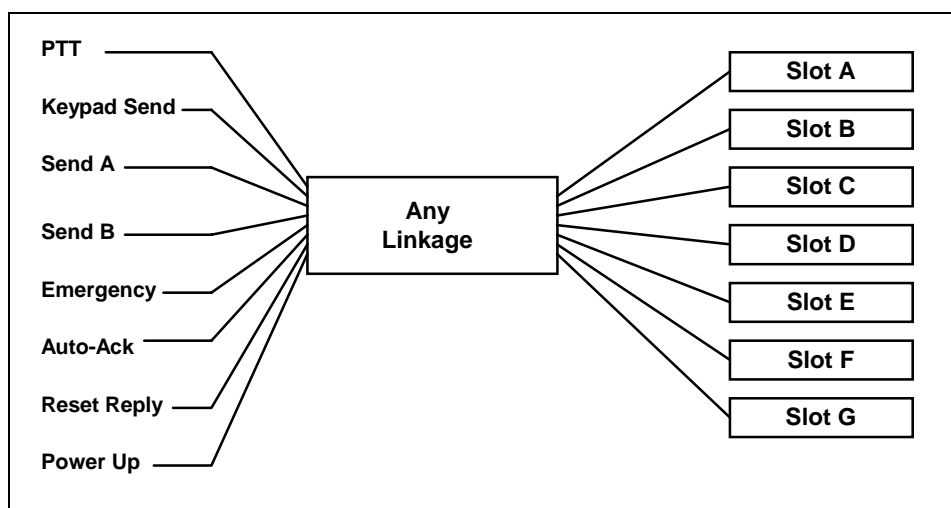


Figure 10

e.g. If Emergency is required to transmit the units ANI, followed by a control tone, The ANI sequence could be programmed into Tone Slot 'A'. The control tone could be programmed as Tone Slot 'E' and Emergency Operation set to transmit 'AE'.

The programmable events are as follows:

1. **PTT/ANI** Operation specifies the encode action to be taken on PTT. ANI may be at Start, End or Start and End of PTT action and a programmable ANI delay is also available.
2. **Emergency** Operation specifies the action to be taken when the Emergency key is pressed. A programmable Hold Off Delay prevents accidental transmission of the Emergency sequence. If Silent Emergency is selected there is no audible signal that the Emergency key has been pressed. The Emergency Event may be programmed to occur only if both the Emergency Key and the PTT Key are Pressed Simultaneously. The Emergency sequence may be repeated up to 15 times if necessary, the repeats will be cancelled if the unit receives its SelCall Decode address. If the unit receives a Status Request during Emergency Sequence transmission, it will enter Covert Eavesdrop mode. The Unit will drop PTT, and keep it Low for 1 minute, allowing the Base to hear what is occurring at the Mobile, without intervention from the Mobile operator.
3. **Keypad Send** Operation specifies the Tone Slots generated when a SelCall is initiated by pressing the keypad SEND key.
4. **Send A** specifies the Tone Slots generated when the external SEND A switch is pressed.
5. **Send B** specifies the Tone Slots to be transmitted when the SEND B switch is pressed. Alternatively if Call Divert is selected and the SEND B switch is made, this sequence will be transmitted when the unit receives its SelCall Decode address. The Call Divert feature may be used for re-directing calls to SelCall Pagers or other mobiles.
6. **Reset Reply** specifies the Tone Slots to be transmitted in response to decoding a Reset or Kill control sequence.
7. **Ack/Status** specifies the Tone Slots to be transmitted when the unit decodes its SelCall address. This may be used for status interrogation from the base.
8. **Power Up** specifies the Tone Slots to be transmitted when the unit is powered on. This may be used as a Log On sequence to a SelCall Base Controller.

Decoder Operation

The Decoder may be programmed to detect a sequence of up to 8 tones selected from any of the supported tonesets, including the User toneset. When the Unit receives its decode address the unit Opens and alerts the operator with a sequence of up to 15 'beeps'. The call may be accepted by pressing the transceiver PTT key. A set of over-air control functions are also available, by appending one of three control tones to the end of the SelCall Decode address. The available control functions are:

1. **Control Tone 1** programmable as
 - Ack/Status Request, causes the unit to respond with its Status without the operator being alerted.
 - Secondary Decode causes an alternative decode alert to be generated.
2. **Control Tone 2**
 - Reset, Switches the transceiver into quiet mode.
 - Kill, 'Permanently' Disables the transceiver.
3. **Control Tone 3**
 - Open, If Reset is selected on Control Tone 2, this control tone may be used to Open the radio remotely. This facility can be used for the remote control of the Open Quiet State of the transceiver.
 - Unkill, If Kill is selected on Control Tone 2, Unkill may be programmed to allow re-enabling of the units over the air if required. If Unkill is not enabled, the units may only be re-enabled after a Kill by re-programming.

System Operation and Timing

This section allows the various system timers to be set up, and allows the installer to specify the way in which the PTB1A interfaces to the transceiver. The following programmable features are supported:

1. **Open/Quiet** may be controlled by a dedicated Open Quiet switch, or by a short press on Send A, the SelCall Send key, or the Emergency Key. The transceiver may be programmed to power up in the Open mode, or in the Quiet Mode.
2. **Alert Tones** may be enabled or disabled. If power up tones are enabled, a double 'beep' is heard when the unit receives power.
3. The **Conversation timer** is used to limit the operators use of PTT. When the time out timer expires PTT_OUT is switched off for the TOT Penalty Period. If TOT warning is enabled, a low beep is generated 5 seconds before the time out timer expires. For the time out timer to function, the transceiver PTT line must be broken and fed through the PTB1A via PTT_IN and PTT_OUT.
4. When a SelCall is decoded the transceiver will automatically open. The **Auto Mute timer** determines the period of inactivity on PTT and busy before the transceiver automatically re-mutes.
5. When a SelCall is decoded the Decode O/P is activated. This output remains active until the call is accepted, or the **Decode Output Timer** expires.

6. The **Auto Ack Delay** specifies the time between decoding the incoming call and responding with the ACK/STATUS sequence. This timer should be set to enable the incoming sequence to be completed before the ACK/STATUS sequence is transmitted.
7. The **Lead in Delay** is the time required for the transmitter to stabilise before SelCall sequence is transmitted. PTT will be pulled LOW for this period, before any Encode Sequence is transmitted.
8. **I/O Active States** allow some of the PTB1A's input and output lines to be configured as active low or high depending upon the particular installation requirements.
9. The **User interface** may be configured by selecting between No Keypad, Keypad A, Keypad B, 1 BCD, 2 BCD's, or 3 BCD's.
10. **Address Digits** and **Status Digits** allows the number of variable digits in an encoded SelCall, or the Number of variable status digits to be specified. The wild card characters in the Encode sequences will be replaced by this number of address or status keys entered on the keypad or BCD's.

Programming the PTB1A

When all the parameters have been set up as required they may be downloaded to the PTB1A via the programming cable supplied. The programming cable will be auto-detected by the programming software on any of the standard parallel ports. The PTB1A should be attached to the programming lead via the 12 way connector. This is the cable closest to the 4 MHz Xtal on the PTB1A. During programming the PTB1A derives its supply from the programming cable and does not require any other connections to be made.

From the SCPROG Main Menu select Programming Menu and Download. The parameter set will be downloaded, then read back and compared with memory. The results of this verification are displayed on the screen.

NOTE Please ensure that connection is made to the Parallel port of the PC, **NOT** the serial port.

User Operation Notes

These notes are an overview of the features available to the user, and how to operate them. Specific cases will vary dependant on the programmed mode of operation of the PTB1A SelCall board.

Keypad Operation

The PTB1A SelCall board may have a 4 x 3 telephone type keypad connected. The keypad may be used to set up calls to the Base or other mobiles, or may be used to encode status digits which the base can read without disturbing the mobile user. Status digits are often used to encode information such as location and cleared state for a Taxi system, or alarm status in a remote alarm installation.

The keypad may be set up in two different ways for different system requirements, Keypad A allows separate Address and Status digits to be entered. This enables the mobile user to set up individual or group calls on the system as well as encoding and storing Status information for interrogation by the Base. Keypad B allows two separate SelCall strings with embedded Status information to be generated from the keypad with the minimum of key-presses. Keypad B operation is ideal for Taxi fleets requiring a simple means of telling the Base Controller which area they are in and whether they are cleared or busy.

Keypad A.

The Diagram below shows the key operation in mode A.

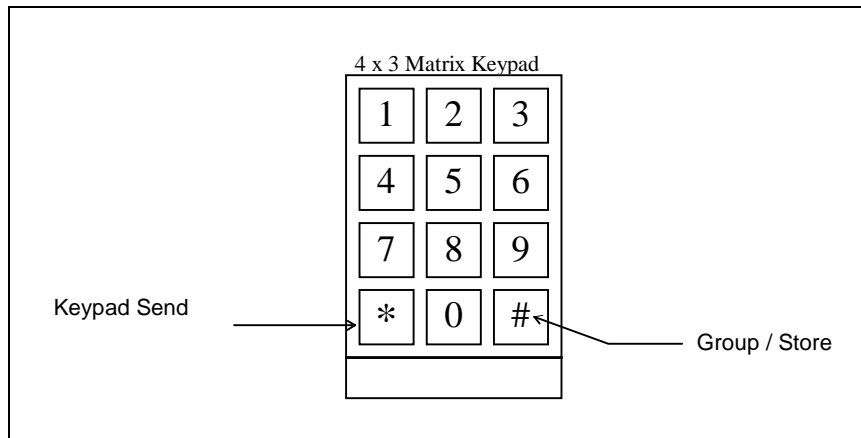


Figure 11

Each transceiver in the system is allocated it's own unique address, programmed into the PTB1A module. To Send a selective call, enter the address on the keypad and press '*'. The transceiver will transmit the call as soon as the channel is clear. Addresses are padded with leading zero's, so to call unit address 003 you may enter '003*' or simply '3*'. The address entered is stored by the unit, and may be 'Repeat Dialed' by pressing the '*' key again.

If an incorrect address is entered (too long), or no key is pressed for more than 5 seconds, then a low pitched 'beep' is heard and the key buffer is cleared.

To Send a group call, replace any of the call digits with the '#' key. e.g. to call units 010 to 019, enter '1#*'. All the transceivers in the group will alert. To call all units in the fleet, replace all address digits with the '#' key. e.g. '###*' will call all units in a system requiring 3 address digits.

If it is required to set up a call address, without sending a call, then enter the address on the keypad followed by a long press of the '#' key (greater than half a second) . This will store the address in memory without transmitting it. The call may then be sent when required by pressing the '*' key.

Status Digits may be entered by first pressing and holding the '#' key. A short beep will be heard. The status keys may then be entered, and stored with a final long press of the '#' key. Once the status has been entered it will remain in the memory until a new status is entered (even if the transceiver is switched off). The base may interrogate the status of the transceiver at any time by simply issuing a 'Status Request' call.

Keypad B

The Diagram below shows the key operation in mode B.

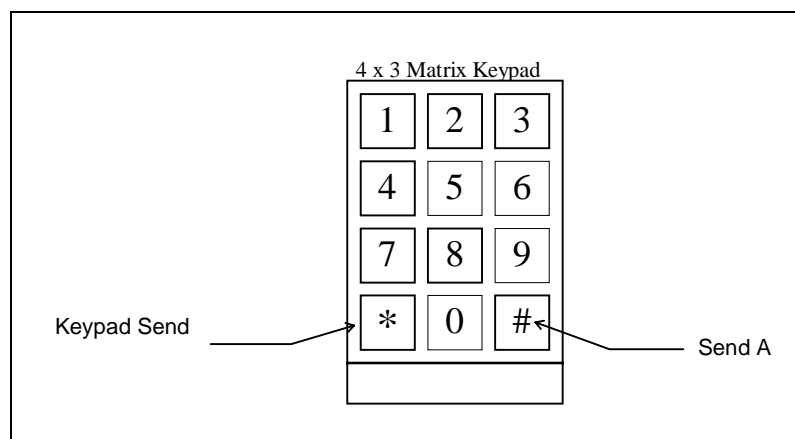


Figure 12

This Mode of operation is ideal for a Taxi fleet in which it is required to transmit an area code, and whether the car is cleared or busy in that area.

To send Call 1 (cleared), press the area code followed by the '*' key. To send call 2 (Busy), press the area code followed by the '#' key. The length of the area code is programmed into the unit, but may be from 1 to 6 digits. The unit will remember the last area code entered, so a press of '*' will indicate 'cleared' in the area last selected.

In this mode of operation, group calls and the separate status buffer are not available.

BCD Operation

BCD thumbwheels may be used as an alternative to a keypad to set up address and status information. Group calls are not possible if BCD thumbwheels are used but for many operations they may be more convenient than a bulky keypad.

To Send a selective call, enter the address on the 'Address' BCD thumb wheels, up to 3 digits may be used for the address depending on the units programming. When the address is selected press the SEND A key to transmit the call. When the channel is clear the call will be transmitted to the address specified.

To encode the status simply select the appropriate number on the 'Status' thumbwheel(s), up to 2 digits may be used for status depending on the units programming. The status may be interrogated by the Base at any time with or without alerting the user.

A maximum of 3 BCD's may be connected to the PTB1A, so the total of Address and Status digits cannot exceed 3. The Address is read from the left hand side of the row of BCD's, while the status is read from the BCD digits following the address.

e.g. if 2 address digits are selected and 1 status digit is required.

- Address digit 1 will be read from BCD 1,
- Address digit 2 will be read from BCD 2,
- Address digit 3 will be read from BCD 3.

Open / Quiet Operation

The unit includes control of the transceivers audio path, and may be configured for user selectable Open / Quiet operation, or for Remote controlled Open Quiet operation. When the unit is Open, incoming audio can be heard at the speaker and is controlled only by the squelch. When the unit is closed, only alert tones generated by the SelCall board can be heard by the user.

User Selectable Open / Quiet.

The Open / Quiet state of the transceiver may be controlled by a press of the Open / Quiet button. This may be either a separate push button or may be a short press of either the SEND A key of the Keypad Send key depending on the units programming. If a call is received, the transceiver will automatically open to prevent the user missing the first part of the conversation.

Remote Controlled Open / Quiet Operation.

The transceiver powers up in the quiet state. To make a call, the user presses the SEND key. The units ANI is transmitted to the Base. When the Base answers the call, the users transceiver automatically opens and remains open while the conversation is in progress. When the conversation terminates, the transceiver will automatically close after a pre-determined period, or may be closed remotely by a 'Remote Reset' command from the Base.

Separate pushbuttons

In addition to the Keypad or BCD switches a range of SelCall events may be transmitted by the set of attached push buttons. Send A, Send B, Emergency Call and Call Divert features are supported. The pushbuttons may be used to provide basic ANI and Emergency features without the difficulty of modifying the transceiver to accept a keypad or BCD's.

Send A / Send B

Two pushbuttons are provided to initiate independent SelCall sequences. These may be to provide special status or control information to the Base, or to call between different groups of transceivers in a system. Each SelCall string may include address or status information. The Send A key may double as an Open / Quiet toggle key.

Emergency

A special sequence may be generated by this key to alert the Base to an emergency condition at the mobile unit. The sequence will be transmitted up to 15 times, depending on the units programming. The first 5 repeats of the sequence will not monitor Busy, after that transmission will only occur when the channel is clear. The emergency call will be cancelled when the base calls the units address.

If only one repeat is programmed this push-button may be used as another Send key.

Call Divert.

If the unit is programmed for 'Call Divert' and the Call Divert switch is ON, when the unit receives its call ID, it can re-transmit a sequence to alert a pager or handportable. This is a useful feature for keeping in contact when out of the vehicle. In addition the 'Call Divert' sequence may encode address or status keys, enabling the user to specify the address of any mobile or handportable in the fleet where they may be reached , or where deputy services are available. To program a call divert address, the user simply enters the address digits, followed by a long press of the '#' key, before setting the divert switch to 'ON'.

SelCall Operation Notes - Receive Call

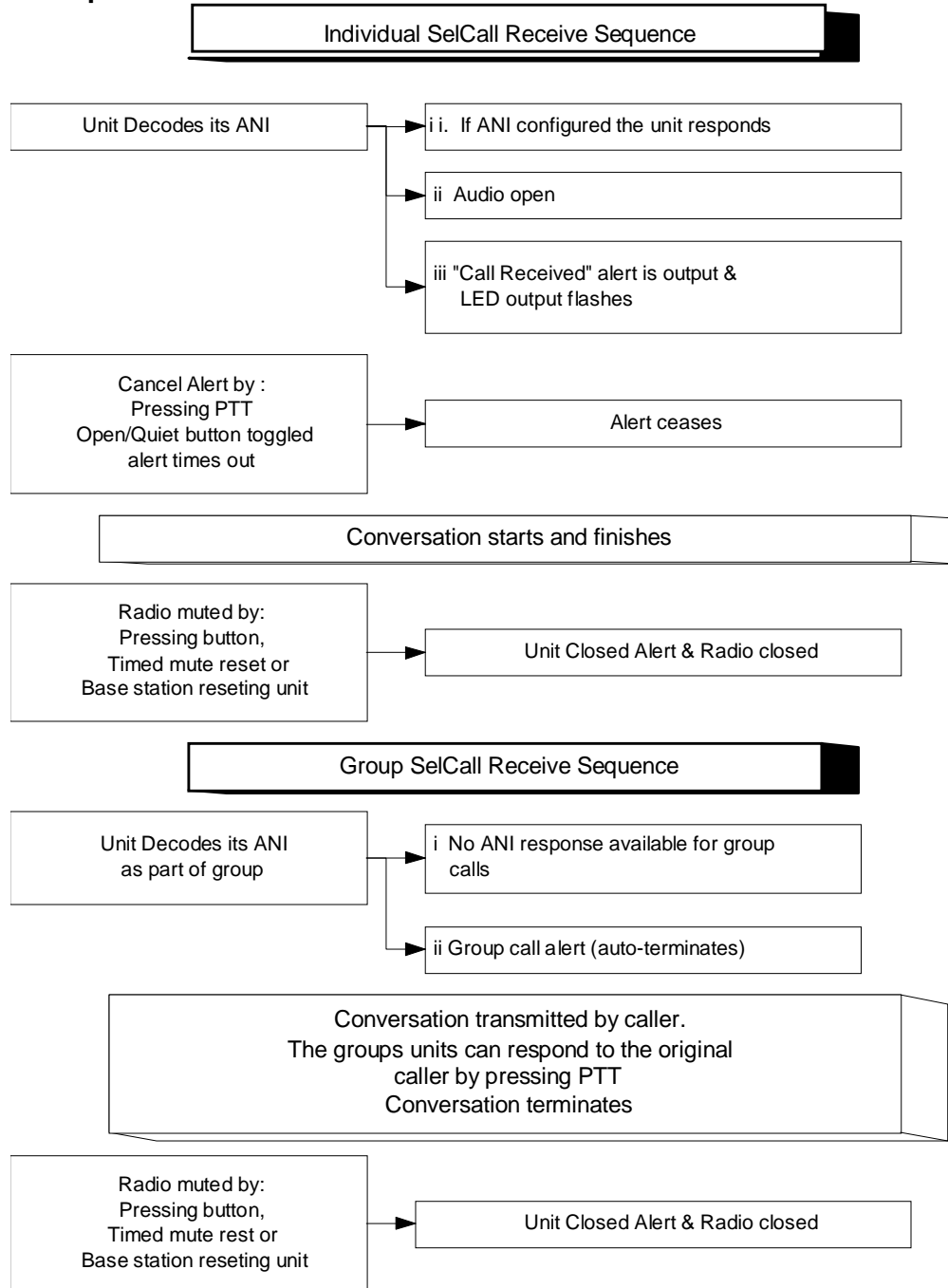


Figure 13

SelCall Operation Notes - Transmit Call

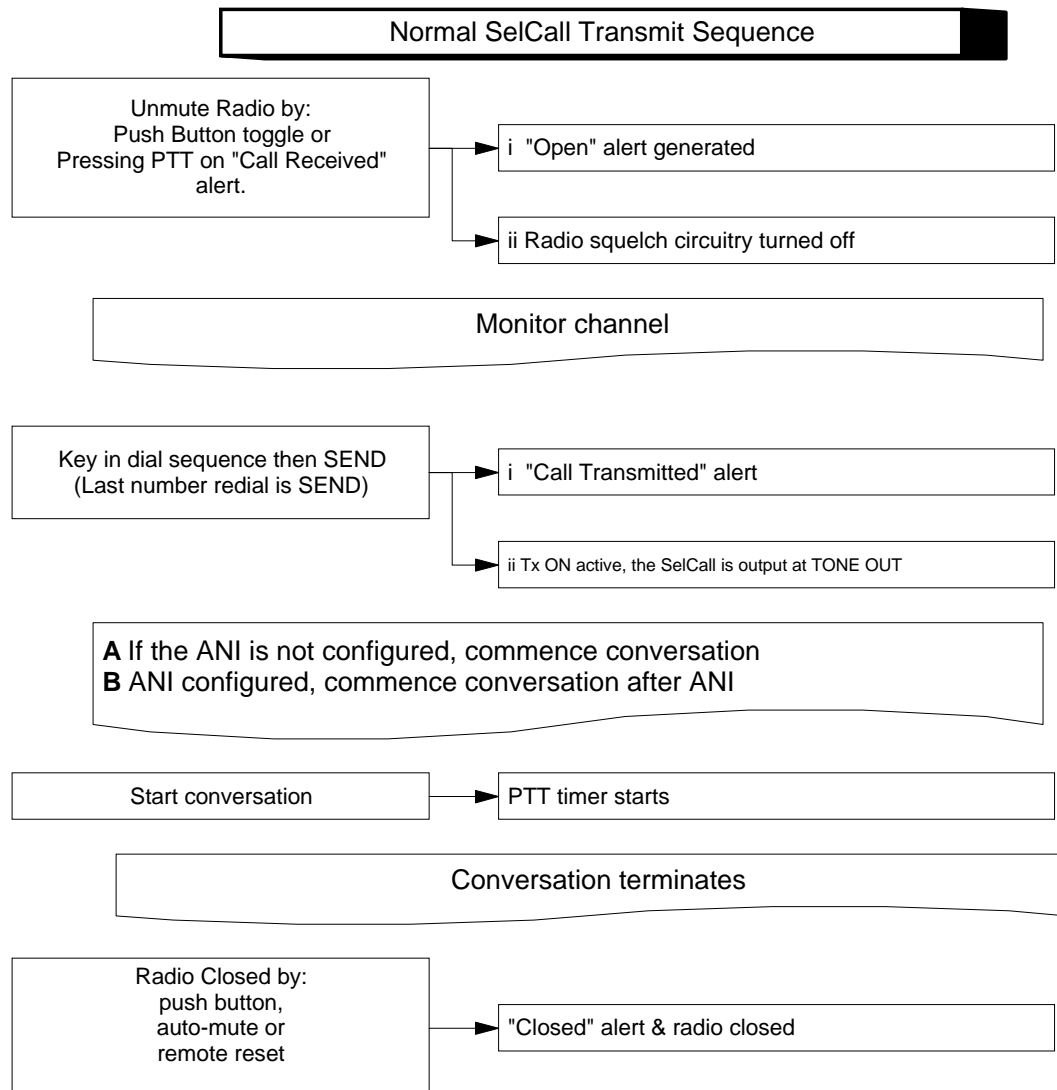


Figure 14

Example 1 ANI system

A Set of transceivers are required which each transmit a CCIR 5 tone ANI sequence '123nn' (where 'nn' will be different for each transceiver) when PTT is pressed. ANI should not be transmitted more than once every 20 seconds by any unit. The transceivers are required to 'Beep' once if they receive their own ANI, but no automatic squelch control is required.

Since only a single encode sequence is required, this may be achieved using only one of the programmable sequences in the Toneset and Slots Menu.

In the Toneset and Slots Menu, set Tone Slot 'A' to be Multi Tone, CCIR1. The Tone Slot will need to be varied for the different transceivers in the group, but should be programmed as '12301' for the first unit. Extended 1st tone and Delay may both be set to zero.

The only Encode Event required is PTT. In the SelCall Encoder and Decoder Menu, set PTT/ANI Operation to Send ANI at Start. The Slots to send is programmed as 'A' which will cause the sequence programmed above to be transmitted. Set the Multi ANI Delay to 20 seconds. All the other events should be left blank so that no other encode sequences are produced.

The Decoder must be programmed to the same address and toneset as the ANI encoder. Set the Decoder Toneset to CCIR1, and the Tone Sequence to 12301. Decode Beeps should be set to 1. Ack/Status Request is not required and may be left at 500Hz. Remote Control should be set to OFF.

In the System Operation and Timing Menu, Open/Quiet control is not used. Program the Open Quiet operation to OQ Input and to Power Up Open. The Alert Tones should be 'ON', with Power up tones 'OFF' to enable the decode 'Beep' to be heard. The Conversation Timer is not required and should be set to 'OFF'. Auto Mute Timer, Decode Output Timer and Auto Ack Delay are not required and may be left as default values. A lead in delay should be programmed depending on the requirements of the transceiver, typically 0.5 Secs.

I/O Active states should be set according to the installation requirements of the radio. Amp Enable is required to turn on the transceivers Audio path so that the decode 'Beep' may be heard. Busy input is not required and should be left unconnected and active LOW. Mic-mute and Rx-mute control the transmit and receive audio paths during SelCall encode and decode. These should be set as appropriate to the installation.

User Interface should be set to No Keyboard. Address and Status Digits may be set to zero.

This Configuration is available as a demonstration file 'ANI.FRQ' on the programming disk. For each successive transceiver in the fleet the Decode Address and Sequence 'A' should both be incremented.

Example 2 International Group Call system

A set of transceivers is required, equipped with keypads. The transceivers should be able to make individual and group calls from mobile to mobile and from mobile to base. The base must be able to call individual mobiles, groups of mobiles and to reset mobiles remotely when necessary. A called mobile should 'beep' three times and automatically Open for 30 seconds. The SelCall transmissions are to be arranged as three groups of 5 tones as follows:-

All SelCall tones are required to be ZVEI1 70ms. All User Alert tones are required.

In the Toneset and Slots Menu. Set Tone Slot 'A' to contain the repeater access codes '6789X'. In operation the 'X' will be replaced by the first address key entered on the keypad.

Set Tone Slot 'B' to Multi Tone, ZVEI1 to contain the units ANI sequence '12301' for the first transceiver in the batch.

Set Tone Slot 'C' to contain the SelCall address of the called party '123XX'. In operation the 'XX' will be replaced by the second and third address keys entered on the keypad.

In the SelCall Encoder and Decoder Operation page, PTT ANI is not required so set Send ANI to OFF. Set Emergency, Send A, Ack/Status and Call Divert Slots to blank.

The SelCall sequence is transmitted when the keypad 'SEND' key is pressed. This should be set to transmit the 3 Tone Slots in order e.g. 'ABC'.

The Decoder Tone set and address should be set to ZVEI1 '12301' for the first transceiver in the batch. Decode beeps should be set to three. Ack/Status is not required and can be left at 500Hz. Remote Control should be set to Reset and the reset control frequency programmed. In operation the Reset control frequency must immediately follow the units decode address and should not be a frequency which is contained within the toneset(s) in use.

The Open Quiet Operation should be programmed to Keypad '**' to allow control over the open/quiet state of the transceiver via the keypad. Power Up Quiet should be selected .

Alert Tones and Power up tones should both be selected 'ON'. Conversation Timer is not required and should be set OFF.

Auto Mute Timer should be set to 30 Secs. The Decode Output Timer and Auto Ack timer are not used and may be left at the default values. The Lead in Delay should be set as appropriate for the transceiver, typically around 0.5 Secs.

I/O Active states should be set as required by the installation. If BUSY monitoring is NOT required, this should be left unconnected and active LOW.

The User Interface should be set to Keyboard A. Address Digits should be set to 3, which is the number of wild cards in the full SelCall encode string. Status is not required and Status Digits should be set to zero.

This Configuration is available as a demonstration file 'IGC.FRQ' on the programming disk. For each successive transceiver in the fleet the Decode Address and Tone Slot 'B' should both be incremented.

