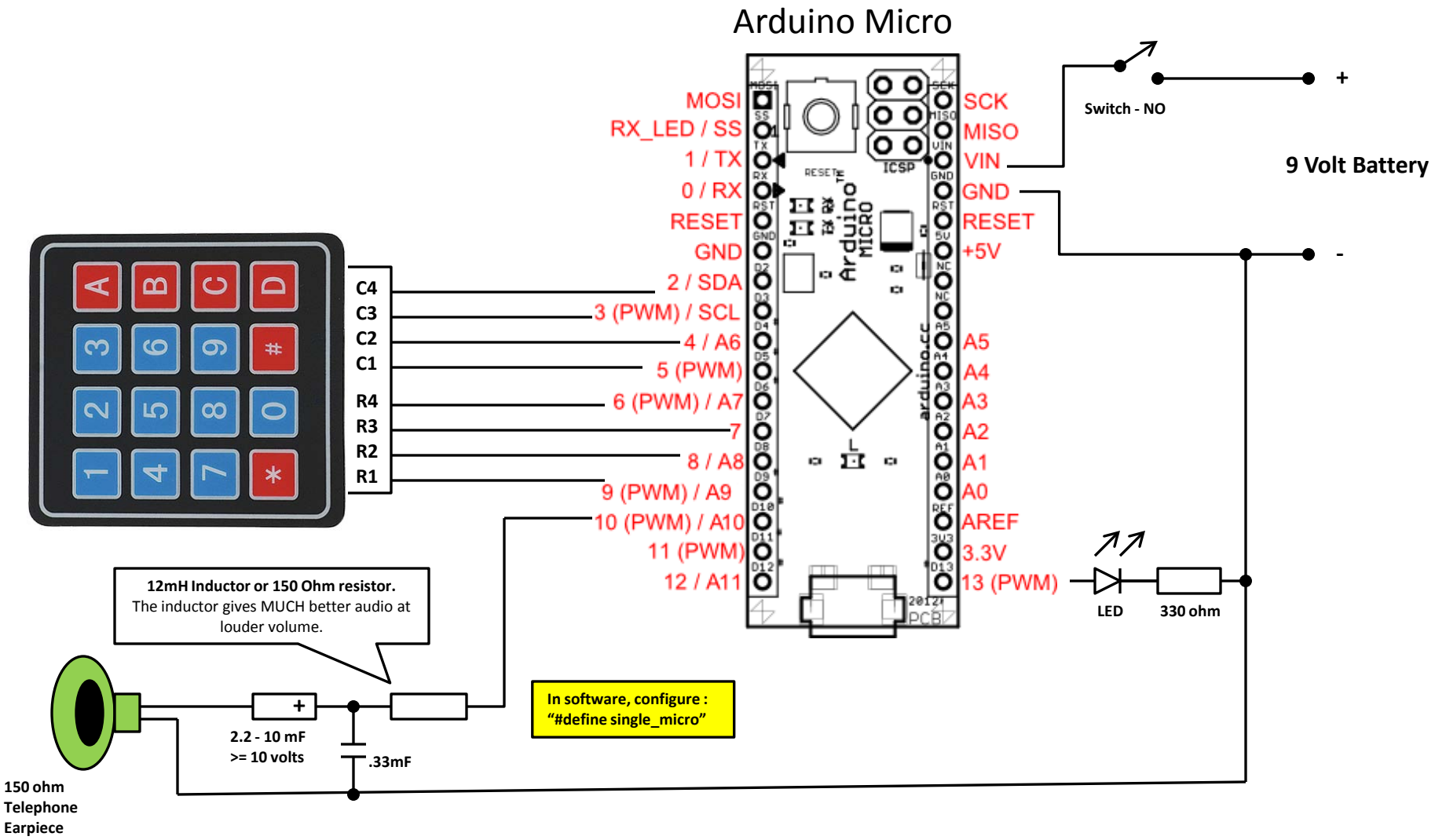
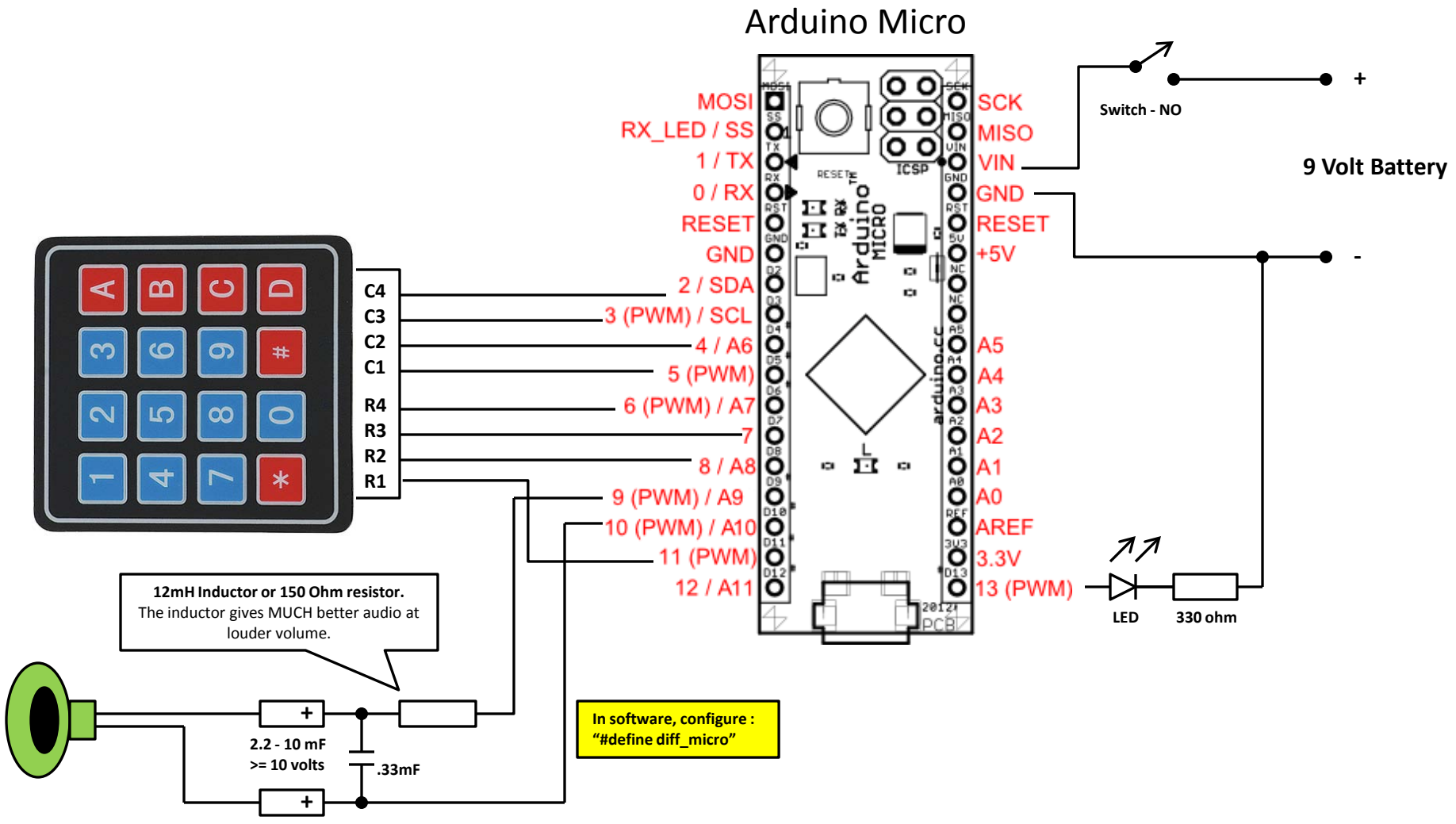
Arduino Blue Box Connections – Arduino Micro
PWM Sine Wave Output, Single-ended Output (lower volume)

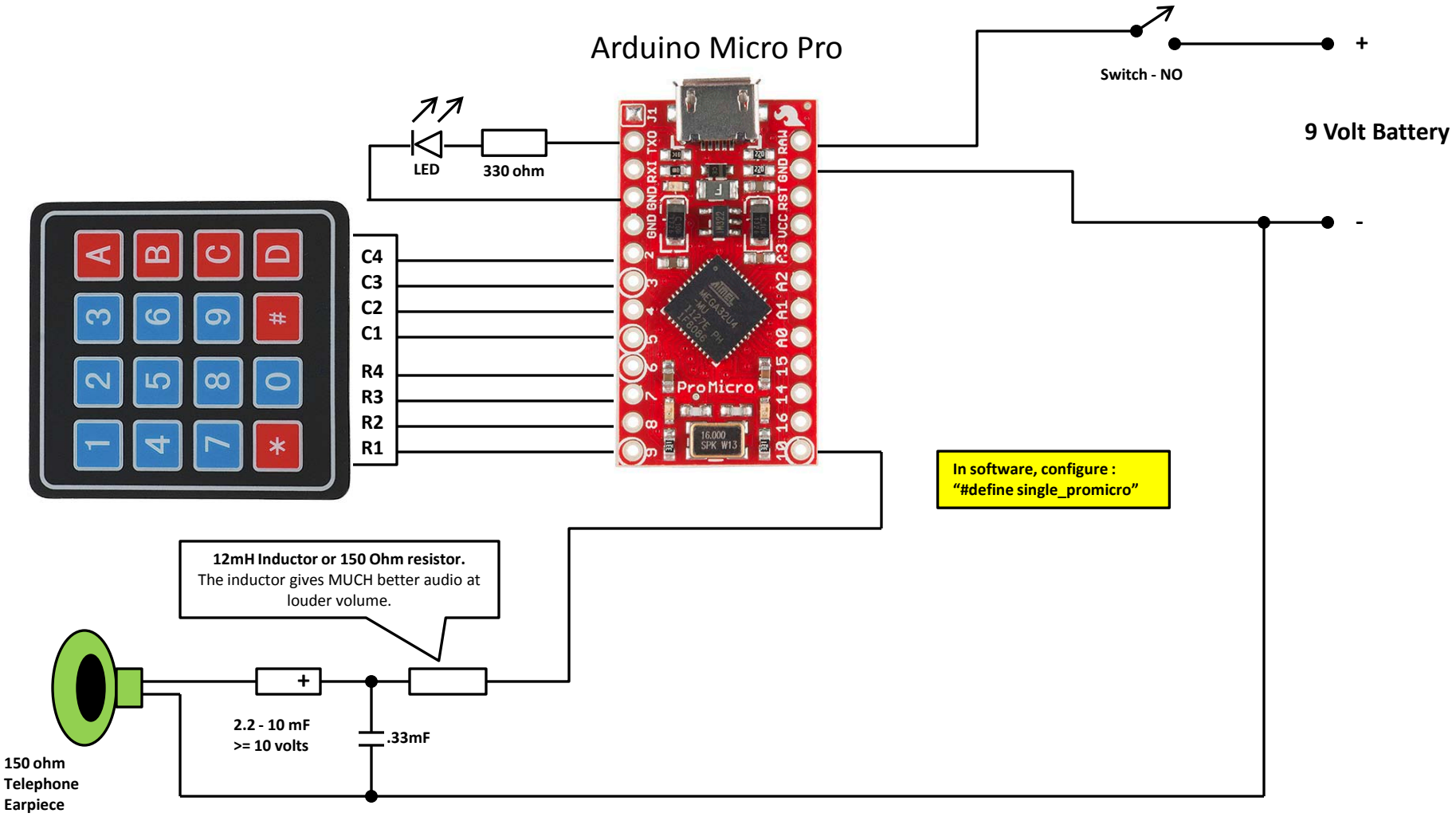
Default Configuration



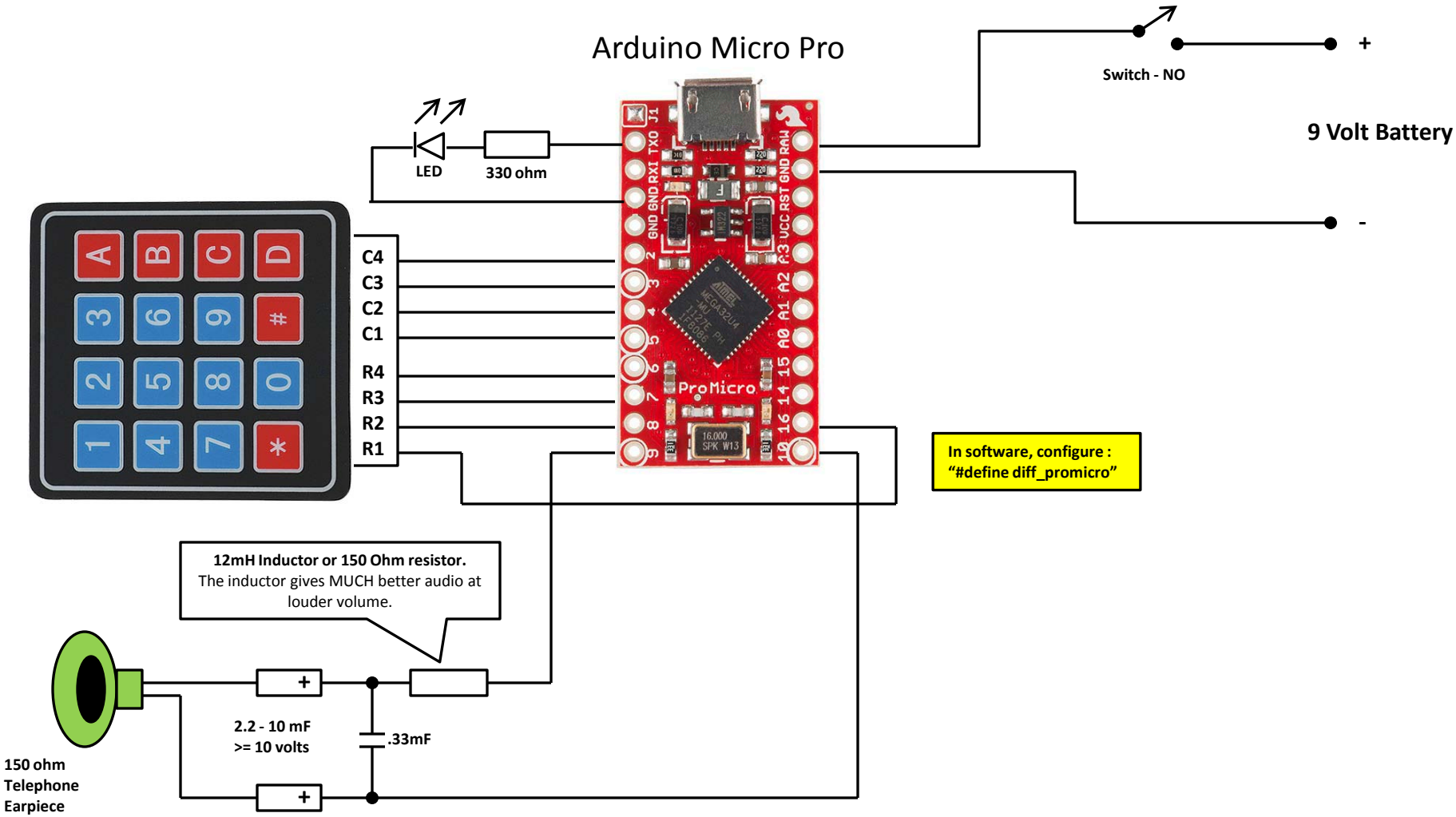
Arduino Blue Box Connections – Arduino Micro
PWM Sine Wave Output, Differential Output (higher volume)



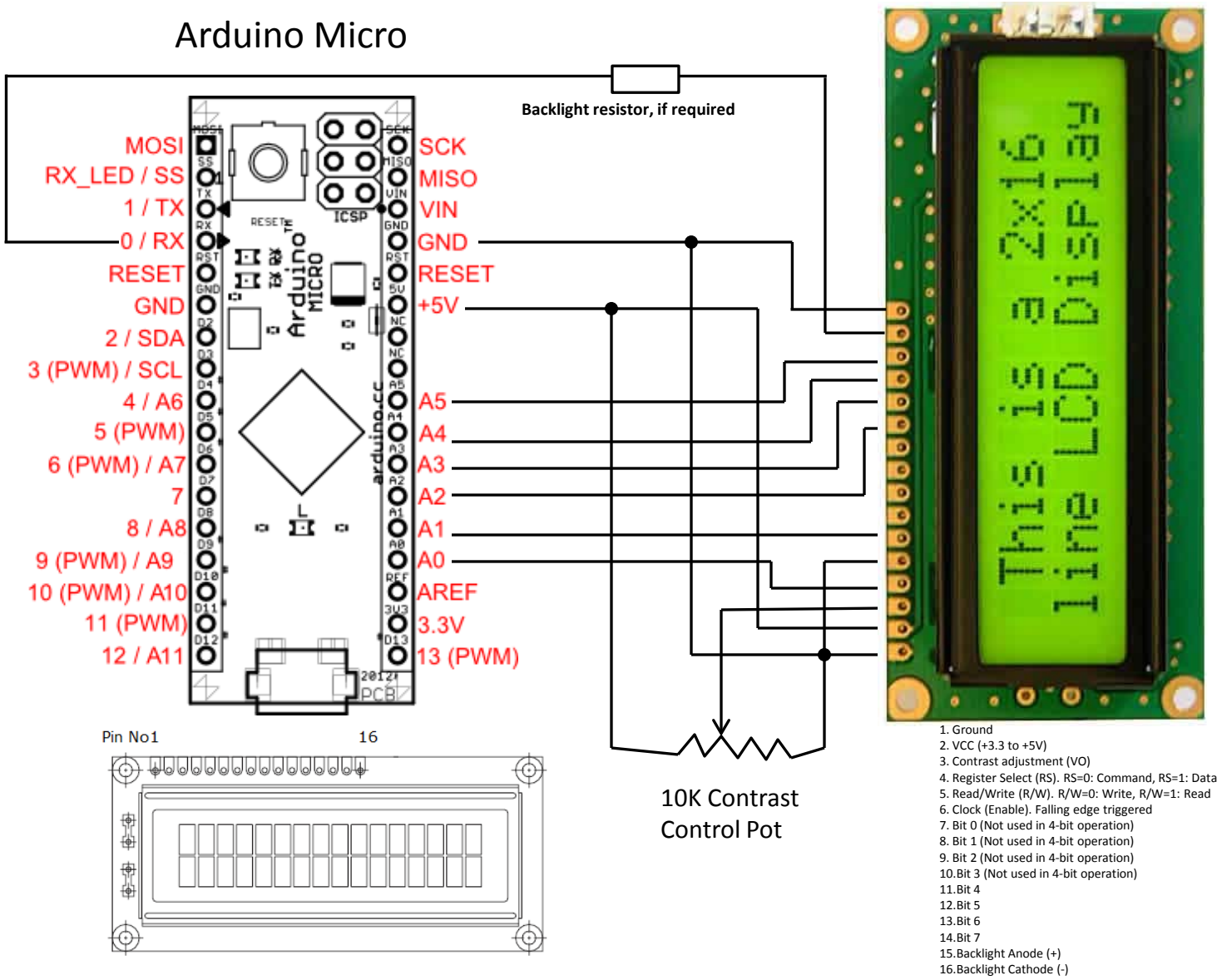
Arduino Blue Box Connections – Arduino Micro Pro
PWM Sine Wave Output , Single-ended Output (lower volume)



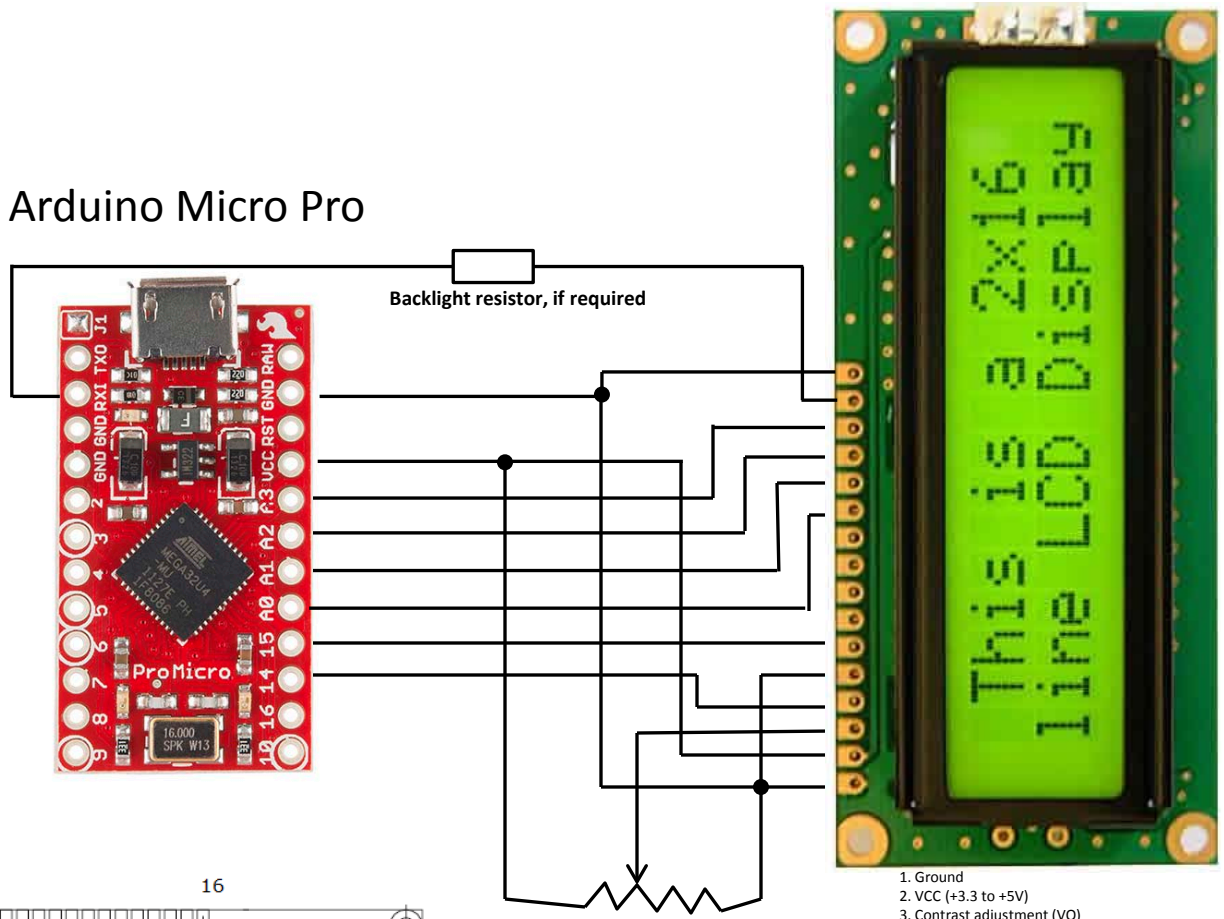
Arduino Blue Box Connections – Arduino Micro Pro
PWM Sine Wave Output , Differential Output (higher volume)

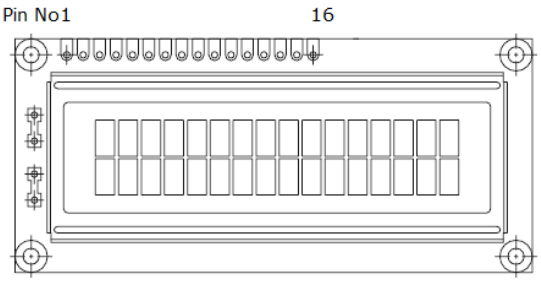


Arduino Blue Box Connections – Arduino Micro
Optional LCD Connections



Arduino Blue Box Connections – Arduino Micro Pro
Optional LCD Connections





1. Ground
2. VCC (+3.3 to +5V)
3. Contrast adjustment (VO)
4. Register Select (RS). RS=0: Command, RS=1: Data
5. Read/Write (R/W). R/W=0: Write, R/W=1: Read
6. Clock (Enable). Falling edge triggered
7. Bit 0 (Not used in 4-bit operation)
8. Bit 1 (Not used in 4-bit operation)
9. Bit 2 (Not used in 4-bit operation)
10. Bit 3 (Not used in 4-bit operation)
11. Bit 4
12. Bit 5
13. Bit 6
14. Bit 7
15. Backlight Anode (+)
16. Backlight Cathode (-)

Arduino Blue Box Operating Instructions

For Firmware v36-LCD

Memory Modes

Each of the 12 digit keys (0-9 , * and #) is associated with a tone sequence memory that can store up to 32 digits each. The current tone mode will also be stored so that a mix of sequences from different signaling systems may be recorded,

To initiate a memory recording, press and hold the B key while in manual mode. A short beep will play after each tone entry as a reminder recording mode is active. Error beeps will sound if more than 32 keys are entered, although the first 32 tones already entered may still be saved. To store the entered digits in a memory, press and hold the digit (or * or #) button that corresponds to the desired memory location until the confirmation beep is heard. Memory recording can be aborted without saving to a memory by pressing and holding the B key again.

Memory locations may be cleared while in recording mode by pressing and holding a memory key without entering any digits, after entering recording mode.

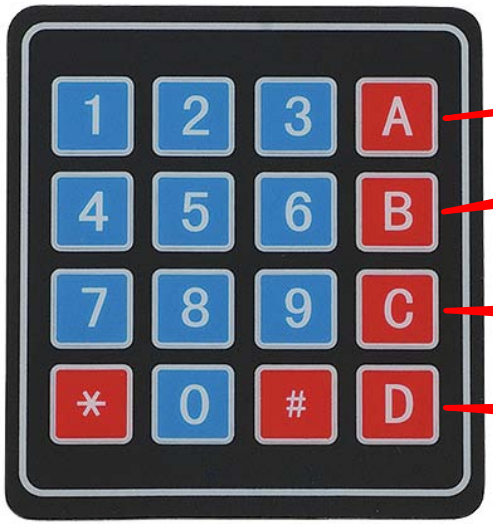
To play back the sequence, press and hold the "A" button to enter memory playback mode and press the button corresponding to the desired memory location.

Digit duration of the played sequence may be changed in playback mode by pressing and holding the "C" key (affects MF, DTMF, C5 and R2 modes only).

Volume/LCD Backlight Control

In Playback mode, the B and C keys increase/decrease volume in 15 steps. The volume setting is stored in EEPROM.

In Playback Mode, the D key toggles the LCD backlight on/off, setting stored in EEPROM.



Press and hold to toggle between normal and memory playback modes

Press and hold to enter memory recording mode. Also aborts memory recording.

Press and hold to toggle between long and short tones (MF/DTMF/C5/R2 modes)

Press and hold to toggle the 5 minute power off reminder beep on and off

Mode Selection

Press and hold keys 0-9, * and # to select signaling system.

1 = MF
2 = DTMF
3 = C5 (CCITT #5)
4 - SS4 (CCITT #4)
5 -2600 Dial Pulse
6 – Pay Phone
7 – R2 (MFC)
8 – AC1
9 – AC9
0 – MTS Dial Pulse
* - IMTS ANI
# - IMTS Dial Pulse

2600 Dial Pulse Keys

D – Clear/Seize

MF Keys

* - KP/KP1 (Terminal)
# - ST
A – ST1P (Code 12)
B – ST2P/KP2 (Transit)
C – ST3P (Code 11)
D – Clear/Seize

C5 Keys

* - KP/KP1
# - ST
A – STP (Code 12)
B – ST2P (KP2)
C – ST3P (Code 11)
D – Clear Forward - Seize

MFC(R2)

* - Cable route/test call
# - End-of-pulsing
A – Code 12
B – Satellite route
C – Code 11
D – Clear/Seize

SS4 Keys

* - Terminal Seize
# - End-of-pulsing
A – Code 12
B – Transit Seize
C – Code 11
D – Clear Forward

IMTS Keys

B – Guard Tone
C – Disconnect Call
D – Seize Radio Channel

MTS Keys

C – Disconnect
D – Connect

AC1 Keys

D – Clear Forward
* - Seize

AC9 Keys

D – Clear Forward
* - Seize

Pay Phone Keys

1 – US Nickel Tone
2 – US Dime Tones
3 – US Quarter Tones
4 – Coin Collect
5 – Coin Return
6 – Ringback
7 – Operator Attached
8 – Operator Released
9 – Operator Released + Coin Collect
* – Canadian Nickel Tone
0 – Canadian Dime Tones
– Canadian Quarter Tones
D – 2600Hz Flash

MF Mode (R1)			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	700Hz + 900Hz	
2	Addressing Digit 2	700Hz + 1100Hz	
3	Addressing Digit 3	900Hz + 1100Hz	
4	Addressing Digit 4	700Hz + 1300Hz	
5	Addressing Digit 5	900Hz + 1300Hz	
6	Addressing Digit 6	1100Hz + 1300Hz	
7	Addressing Digit 7	700Hz + 1500Hz	
8	Addressing Digit 8	900Hz + 1500Hz	
9	Addressing Digit 9	1100Hz + 1500Hz	
0	Addressing Digit 0	1300Hz + 1500Hz	
*****	Key Pulse (KP)	1100Hz + 1700Hz	Indicates start of digit pulsing
#	Start (ST)	1500Hz + 1700Hz	Indicates the end of addressing digits.
A	STP	900Hz + 1700Hz	Special routing functions
B	ST2P	1300Hz + 1700Hz	Special routing functions
C	ST3P	700Hz + 1700Hz	Special routing functions
D	Supervision	2600Hz for 1.25 seconds	Clears trunk when applied, seized when removed

DTMF Mode (Touch-Tone, Autovon)			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	697Hz + 1209Hz	
2	Addressing Digit 2	697Hz + 1336Hz	
3	Addressing Digit 3	697Hz + 1477Hz	
4	Addressing Digit 4	770Hz + 1209Hz	
5	Addressing Digit 5	770Hz + 1336Hz	
6	Addressing Digit 6	770Hz + 1477Hz	
7	Addressing Digit 7	852Hz + 1209Hz	
8	Addressing Digit 8	852Hz + 1336Hz	
9	Addressing Digit 9	852Hz + 1477Hz	
0	Addressing Digit 0	941Hz + 1336Hz	
*****	Special Function	941Hz + 1209Hz	Often a prefix for Vertical Service Codes (VSCs)
#	Special Function	941Hz + 1477Hz	Often an end of digit entry terminator
A	Special Function	697Hz + 1633Hz	Autovon Flash Override (FO) precedence
B	Special Function	770Hz + 1633Hz	Autovon Flash (F) precedence
C	Special Function	852Hz + 1633Hz	Autovon Immediate (I) precedence
D	Special Function	941Hz + 1633Hz	Autovon Priority (P) precedence

CCITT #5 Mode (C5, SS5)			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	700Hz + 900Hz	
2	Addressing Digit 2	700Hz + 1100Hz	
3	Addressing Digit 3	900Hz + 1100Hz	
4	Addressing Digit 4	700Hz + 1300Hz	
5	Addressing Digit 5	900Hz + 1300Hz	
6	Addressing Digit 6	1100Hz + 1300Hz	
7	Addressing Digit 7	700Hz + 1500Hz	
8	Addressing Digit 8	900Hz + 1500Hz	
9	Addressing Digit 9	1100Hz + 1500Hz	
0	Addressing Digit 0	1300Hz + 1500Hz	
*****	KP1 (Key Pulse 1)	1100Hz + 1700Hz	Indicates start of digit pulsing - Terminal Routing
#	ST (Start)	1500Hz + 1700Hz	Indicates the end of addressing digits.
A	Code 12 (STP)	900Hz + 1700Hz	Used to bring a specific operator on the call.
B	KP2 (Key Pulse 2/ST2P)	1300Hz + 1700Hz	Indicates start of digit pulsing - Transit Routing
C	Code 11 (ST3P)	700Hz + 1700Hz	Used to bring the inward operator on the call.
D	Clear Forward-Seizure	2400Hz + 2600Hz, 2400Hz	Clears call from trunk, then re-seizes trunk

CCITT #4 Mode (C4, SS4)			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	2400Hz (0), 2040Hz (1)	Binary code 0001
2	Addressing Digit 2	2400Hz (0), 2040Hz (1)	Binary code 0010
3	Addressing Digit 3	2400Hz (0), 2040Hz (1)	Binary code 0011
4	Addressing Digit 4	2400Hz (0), 2040Hz (1)	Binary code 0100
5	Addressing Digit 5	2400Hz (0), 2040Hz (1)	Binary code 0101
6	Addressing Digit 6	2400Hz (0), 2040Hz (1)	Binary code 0110
7	Addressing Digit 7	2400Hz (0), 2040Hz (1)	Binary code 0111
8	Addressing Digit 8	2400Hz (0), 2040Hz (1)	Binary code 1000
9	Addressing Digit 9	2400Hz (0), 2040Hz (1)	Binary code 1001
0	Addressing Digit 0	2400Hz (0), 2040Hz (1)	Binary code 1010
*****	Terminal seizure	2400Hz - 2040Hz	Seizes trunk for Terminal routing (call ends in-country)
#	End-of-pulsing	2400Hz (0), 2040Hz (1)	Binary code 1111 - End of addressing digits
A	Code 12	2400Hz (0), 2040Hz (1)	Binary code 1100 - Call specific operator
B	Transit Seizure	2400Hz - 2040Hz	Seizes trunk for Transit routing (call ends out of country)
C	Code 11	2400Hz (0), 2040Hz (1)	Binary code 1011 - Call inward operator
D	Clear Forward	2400Hz - 2040Hz	Clears current call from trunk - no re-seizure

2600Hz Dial Pulse Mode			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	2600Hz	10 PPS, 66% /34% Make/Break ratio
2	Addressing Digit 2	2600Hz	10 PPS, 66% /34% Make/Break ratio
3	Addressing Digit 3	2600Hz	10 PPS, 66%/34% Make/Break ratio
4	Addressing Digit 4	2600Hz	10 PPS, 66%/34% Make/Break ratio
5	Addressing Digit 5	2600Hz	10 PPS, 66%/34% Make/Break ratio
6	Addressing Digit 6	2600Hz	10 PPS, 66%/34% Make/Break ratio
7	Addressing Digit 7	2600Hz	10 PPS, 66%/34% Make/Break ratio
8	Addressing Digit 8	2600Hz	10 PPS, 66%/34% Make/Break ratio
9	Addressing Digit 9	2600Hz	10 PPS, 66%/34% Make/Break ratio
0	Addressing Digit 0	2600Hz	10 PPS, 66%/34% Make/Break ratio
*****			
#			
A			
B			
C			
D	Supervision	2600Hz	Clear trunk when applied, seized when removed

Pay Phone Modes			
Key	**Function**	**Tone**	**Notes**
1	US Nickel	1700Hz + 2200Hz	One pulse for 66ms
2	US Dime	1700Hz + 2200Hz	Two pulses for 66ms, 66ms spacing
3	US Quarter	1700Hz + 2200Hz	Five pulses for 33ms, 33ms spacing
4	Coin Collect	700Hz + 1100 Hz, 700ms	Causes pay phone to collect coins in hopper
5	Coin Return	1100Hz + 1700Hz, 700ms	Causes pay phone to return coins in hopper
6	Ringback	700Hz + 1700Hz, 700ms	Causes connected pay phone to ring
7	Operator Attached	1300Hz + 1500Hz, 700ms	Disables pay phone dial pad
8	Operator Released	900Hz + 1500Hz, 700ms	Enables pay phone dial pad
9	Operator Released and Coin Collect	1500Hz + 1700Hz, 700ms	Combined Operator Released and Coin Collect operation
0	Canada Nickel	2200Hz	One pulse for 60ms
*****	Canada Dime	2200Hz	Two pulses for 60ms, 60ms spacing
#	Canada Quarter	2200Hz	Five pulses for 33ms, 33ms spacing
A			
B			
C			
D	Long 2600Hz flash	2600Hz, 425ms – 850ms delay to tone	Preparation for sending pay phone control tone

R2 Mode (MFC)			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	1380Hz + 1500Hz	Forward R2 digit tone set
2	Addressing Digit 2	1380Hz + 1620Hz	Forward R2 digit tone set
3	Addressing Digit 3	1500Hz + 1620Hz	Forward R2 digit tone set
4	Addressing Digit 4	1380Hz + 1740Hz	Forward R2 digit tone set
5	Addressing Digit 5	1500Hz + 1740Hz	Forward R2 digit tone set
6	Addressing Digit 6	1620Hz + 1740Hz	Forward R2 digit tone set
7	Addressing Digit 7	1380Hz + 1860Hz	Forward R2 digit tone set
8	Addressing Digit 8	1500Hz + 1860Hz	Forward R2 digit tone set
9	Addressing Digit 9	1620Hz + 1860Hz	Forward R2 digit tone set
0	Addressing Digit 0	1740Hz + 1860Hz	Forward R2 digit tone set
*****	Cable route/test call	1620Hz + 1980Hz	Selects cable routing or test call
#	End-of-pulsing	1860Hz + 1980Hz	Indicates the end of addressing digits.
A	Code 12	1500Hz + 1980Hz	Used to bring a specific operator on the call.
B	Satellite route	1740Hz + 1980Hz	Selects satellite routing
C	Code 11	1380Hz + 1980Hz	Used to bring the inward operator on the call.
D	Clear Forward-Seize	2280Hz 1250ms - 2280Hz 100ms	Clears and re-seizes trunk

AC1			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	750Hz	10 PPS, 66%/34% Make/Break ratio
2	Addressing Digit 2	750Hz	10 PPS, 66%/34% Make/Break ratio
3	Addressing Digit 3	750Hz	10 PPS, 66%/34% Make/Break ratio
4	Addressing Digit 4	750Hz	10 PPS, 66%/34% Make/Break ratio
5	Addressing Digit 5	750Hz	10 PPS, 66% /34%Make/Break ratio
6	Addressing Digit 6	750Hz	10 PPS, 66%/34% Make/Break ratio
7	Addressing Digit 7	750Hz	10 PPS, 66%/34% Make/Break ratio
8	Addressing Digit 8	750Hz	10 PPS, 66%/34% Make/Break ratio
9	Addressing Digit 9	750Hz	10 PPS, 66%/34% Make/Break ratio
0	Addressing Digit 0	750Hz	10 PPS, 66%/34% Make/Break ratio
*****	Seize	750Hz, 100ms	Seizes trunk
#			
A			
B			
C			
D	Clear Forward	750Hz, 2 seconds – 600Hz, 800ms	Clears trunk

AC9			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	2280Hz	10 PPS, 66%/34% Make/Break ratio
2	Addressing Digit 2	2280Hz	10 PPS, 66% /34%Make/Break ratio
3	Addressing Digit 3	2280Hz	10 PPS, 66%/34% Make/Break ratio
4	Addressing Digit 4	2280Hz	10 PPS, 66%/34% Make/Break ratio
5	Addressing Digit 5	2280Hz	10 PPS, 66%/34% Make/Break ratio
6	Addressing Digit 6	2280Hz	10 PPS, 66% /34%Make/Break ratio
7	Addressing Digit 7	2280Hz	10 PPS, 66%/34% Make/Break ratio
8	Addressing Digit 8	2280Hz	10 PPS, 66%/34% Make/Break ratio
9	Addressing Digit 9	2280Hz	10 PPS, 66%/34% Make/Break ratio
0	Addressing Digit 0	2280Hz	10 PPS, 66%/34% Make/Break ratio
*	Seize	2280Hz, 95ms	Seizes trunk
#			
A			
B			
C			
D	Clear Forward	2280Hz, 1 second	Clears trunk

IMTS - ANI (Mobile Identification)			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
2	Addressing Digit 2	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
3	Addressing Digit 3	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
4	Addressing Digit 4	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
5	Addressing Digit 5	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
6	Addressing Digit 6	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
7	Addressing Digit 7	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
8	Addressing Digit 8	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
9	Addressing Digit 9	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
0	Addressing Digit 0	1633Hz/Silence or 2150Hz	20 PPS, 50%/50% Make/Break ratio, with 2150Hz even parity on Break and inter-digit
*			
#			
A			
B			
C	Hangup	Alternating 1336Hz-2250Hz, 750ms	750 ms of alternating 1336Hz and 2150Hz at 50% make/break at 20 PPS
D	Seize	2150Hz, 350ms - 1633Hz, 50ms - 2150Hz, 2 Seconds	Seizes the radio channel

IMTS - Dialed Digit Pulsing			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
2	Addressing Digit 2	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
3	Addressing Digit 3	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
4	Addressing Digit 4	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
5	Addressing Digit 5	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
6	Addressing Digit 6	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
7	Addressing Digit 7	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
8	Addressing Digit 8	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
9	Addressing Digit 9	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
0	Addressing Digit 0	2150Hz - 1633Hz/2150Hz	250ms of guard tone, then 10 PPS, 66%/34% Make/Break ratio
*****			
#			
A			
B			
C	Hangup	Alternating 1336Hz-2250Hz, 750ms	750 ms of alternating 1336Hz and 2150Hz at 50% make/break at 20 PPS
D	Seize	2150Hz, 350ms - 1633Hz, 50ms - 2150Hz, 2 Seconds	Seizes the radio channel

MTS - Dialed Digit Pulsing (Secode/GE System) - No authentication			
Key	**Function**	**Tone**	**Notes**
1	Addressing Digit 1	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
2	Addressing Digit 2	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
3	Addressing Digit 3	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
4	Addressing Digit 4	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
5	Addressing Digit 5	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
6	Addressing Digit 6	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
7	Addressing Digit 7	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
8	Addressing Digit 8	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
9	Addressing Digit 9	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
0	Addressing Digit 0	1100Hz+1700 Hz/1500Hz+1700Hz	250ms of Connect tone, then 10 PPS, 66%/34% Make/Break ratio
*****			
#			
A			
B			
C	Disconnect	1300Hz+1700Hz, 1000ms	Disconnects the call
D	Connect	1100Hz+1700Hz, 1000ms	Seizes the radio channel and returns dial tone

Operating Notes – Historical Usage of Various Tone Modes

MF/R1 Mode

This is the classic US Blue Box mode. The box generates a 2600Hz tone and the MF (multifrequency) tones needed to simulate the tones used by the old US long distance network. Typical operation was to dial a free phone call that went over the long distance network, such as an 800 toll-free number. Once ringing began, but before the call was answered, the blue box user played a second or so of 2600Hz into the phone. Application of 2600Hz caused the trunk to disconnect the 800 toll free call. Removal of 2600Hz re-seized the trunk and forced the network to re-attach an MF digit receiver. The blue box operator then sent the KP tone, followed by the 10-digit phone number, followed by the ST tone. The call would be re-routed to the new number, but the local billing equipment thought you were connected to the 800 number, so no charge was made for the call.

DTMF/Autovon Mode

DTMF signalling (also known as the formerly trademarked “Touch Tone”) is similar to MF, but the tone pairs are different and arranged by row-column. The * and # keys were added later to allow special dialing codes. Telephone switches often use the * key as a prefix for 2-digit “Vertical Service Codes” that activate or deactivate custom calling features, like call waiting. The # key is often used to terminate a string of numbers when the switch or connected system does not know how many digits to expect. The Autovon system was a military telephone system that ran in parallel to the regular public phone system. If you were on a military base, you would dial “8” or “88” for Autovon network access, then optionally select a call priority with one of the fourth column buttons. Then, a normal-style 10-digit phone number would be dialed, corresponding to the area codes and special exchanges in the Autovon system, typically at military bases. Calls with a lower priority would be disconnected to make room for your call, if all circuits were in use.

CCITT #5 Mode (C5, SS5)

This mode was very similar to the MF/R1 mode, except additional tone pairs were assigned for special routing functions. C5 circuits were the standard signalling method used to connect trunks internationally between countries. The international trunks did not use the 2600Hz scheme used by MF/R1, but used spurts of single or combined tones to seize or clear trunks and indicate supervisory status (call was answered or not). Typical usage was to dial a free international call, then send the Clear Forward tone followed immediately by a spurt of seize tone. Key D on the box sends both these tones sequentially. Then, either a KP1 was sent if the call was destined for the country to which the original call was made. If the call was to be routed to a different country from that originally dialed, a KP2 was sent. The KP1 or KP2 was followed by a discriminating digit that allowed special routing of the call. These varied somewhat by country, but common ones were 0 for Cable ; 1 For Satellite ; 2 For Military ; 9 For Microwave. If the call is destined for the same country as was used to originate the call (KP1), the discriminating digit was followed by the city code, local phone number, and ST ot start tone. If the call was destined for another country (KP2), the discriminating digit was preceeded by the country code. The discriminating digt was then followed by the city code, phone number, and ST.

Local routing: KP1-discr_digit-areacode-number-ST

Transit routing: KP2-CC-discr_digit-areacode-number-ST (some countries require the position of the CC and discriminating digit to be reversed)

The “Code 11” tone can be used to bring an “inward” operator on the line to assist with call completion. The discriminating digit becomes a language digit, specifying the language spoken by the inward operator.

Local routing: KP1-lang_digit-Code 11-ST

Transit routing: KP2-CC-lang_digit-Code 11-ST

The “Code 12” tone can be used to bring a specific operator on the line to assist with call completion. The discriminating digit becomes a language digit, specifying the language spoken by the inward operator.

Local routing: KP1-lang_digit-Code 12-Operator_Number_ST

Transit routing: KP2-CC-lang_digit-Code 12-Operator_Number-ST

CCITT #4 Mode (C4, SS4)
C4 uses two tones to create a 4-bit sequence that identifies each digit or control code. Other combinations and sequences of the same tones are used for other signals. C4 works exactly like C5 in terms of dialing. The D key plays the clear forward. There are separate tones for Terminal Seizure (C5 KP1 equivalent), Transit Seizure (C5 KP2 equivalent) and End-of-pulsing (C5 ST equivalent). Code 11 and Code 12 operator codes are used in the same way as C5.

2600Hz Dial Pulse Mode
This mode predates the US R1/MF signalling system. The 2600 tone is used exactly as in the R1/MF system to clear and seize a trunk. Instead of MF digits, pulses of 2600Hz with the same timing as a standard US telephone dial are used to send the digits. There is no KP or ST tone to indicate the start or end of dialing. That is determined by delay timing at the switch.

Pay Phone Modes
This mode actually combines three separate modes into one. The first three tones (1,2,3) play the US pay phone nickel, dime, and quarter tones as used by operators and the automated ACTS system to determine the amount of money deposited. Typical usage is to place a long distance call at a pay phone, wait until ACTS or an operator requests an amount, deposit one coin to satisfy the DC coin test by the local office, and use the box to play the balance of the deposit with the tones. The Canadian tone set is also included (*, 0, #) for nickel, dime, and quarter.

The remaining digit keys play US Green Box tones. These were used by centralized operators that were remote from the switching system to which the pay phone was connected to control functions such as coin collect and coin return. These tones could only be used by the person CALLED by a pay phone user. The called party could then trigger the coin return function to return the coins deposited by the pay phone user (assuming he used real coins, not the tones!). Each control code (see manual) had to be preceeded by a 2600Hz long wink signal (played by the D key). Other control functions, not as useful as the coin return, could be performed.

R2 Mode (MFC)
This mode uses a set of MF tones different from C5, but otherwise work the same. As used in the UK, where the mode was known as MF2, a 2280Hz tone was used to clear and then seize the trunk (the D key on the box). In the UK, a Code 14 digit (B key on the box) needed to preceed each digit dialed.

AC1
This is a very old pulse dialing tone system used in the UK. In general, UK trunk systems used short spurts of tone to signal supervision, rather than the continuous 2600Hz tone used in the US. The AC1 system clears the trunk by sending two sequential tones (the D key on the box), then reseizes the trunk with a short burst of one of the tones (the * key on the box). Thereafter, digits are sent using pulses of tone. There is no KP or ST tone equivalent. The end of dialing is determined at the switch by timing the delays. In the UK, the system would split the line during trunk signalling so that the caller's forward audio was blocked from the system during trunk signalling. However, hybrid circuit leakage was usually sufficient to allow the tones to be heard by the distant switch.

AC9
This is a somewhat newer pulse tone dialing system used in the UK. It uses a single tone for all signals, unlike the AC1 system which used two tones. Otherwise, operation is identical to the AC1 system.

IMTS - ANI (Mobile Identification)

This was the system used by the pre-cellular IMTS system to authenticate a mobile to the base station, which would then return a dial tone to the phone. The user would then used the IMTS Dialed Digit Pulsing mode to dial the number. The authentication number was simply the area code plus the last four digits of the mobile's telephone number. In some areas, this was changed to use all ten digits of the mobile's number. The system used a parity systen, encoded into tones, which allowed for error checking of the ANI sequence by the base station. On an error, the caller would be routed to an operator. Spoofing an IMTS system involved playing the tones into a radio transmitter microphone at the correct times. Typically, one would tune his radio transmitter to the receive frequency of the IMTS base station channel that was transmitting an idle tone on its transmit frequency (the system was full-duplex, with separate frequencies for receive and transmit – no push to talk operation). He would then key his transmitter, transmit the ANI sequence, unkey, and listen for a dial tone. He would then re-key the transmitter and send the dialed digit tones to complete the call. After the call, the user would send the disconnect tone (C key on the box) to hang up.

It is almost impossible to manually dial an IMTS ANI sequence manually with acceptable timings. Therefore, it is necessary to store the sequence to a box memory. When played back, the box assures all timing are correct. The sequence to store is D+7 or 10 digit ANI number.

MTS - Dialed Digit Pulsing (Secode/GE System) - No authentication

This was the half-duplex, push to talk pre-IMTS radio telephone system. It was completely unauthenticated. The user simply keyed the radio and played the connect tone (D key on the box). The base station then returned a dial tone. The user would then key the transmitter and dial the digits. When the call was finished, the mobile user could send a disconnect tone (C key on the box) to end the call.

IMTS - Dialed Digit Pulsing

This is the mode used to send the dialed digits after IMTS authentication, as described above. The D key plays the channel seizure sequence (not really useful except when played before an ANI sequence). The C key plays the disconnect tones, which will end the call.