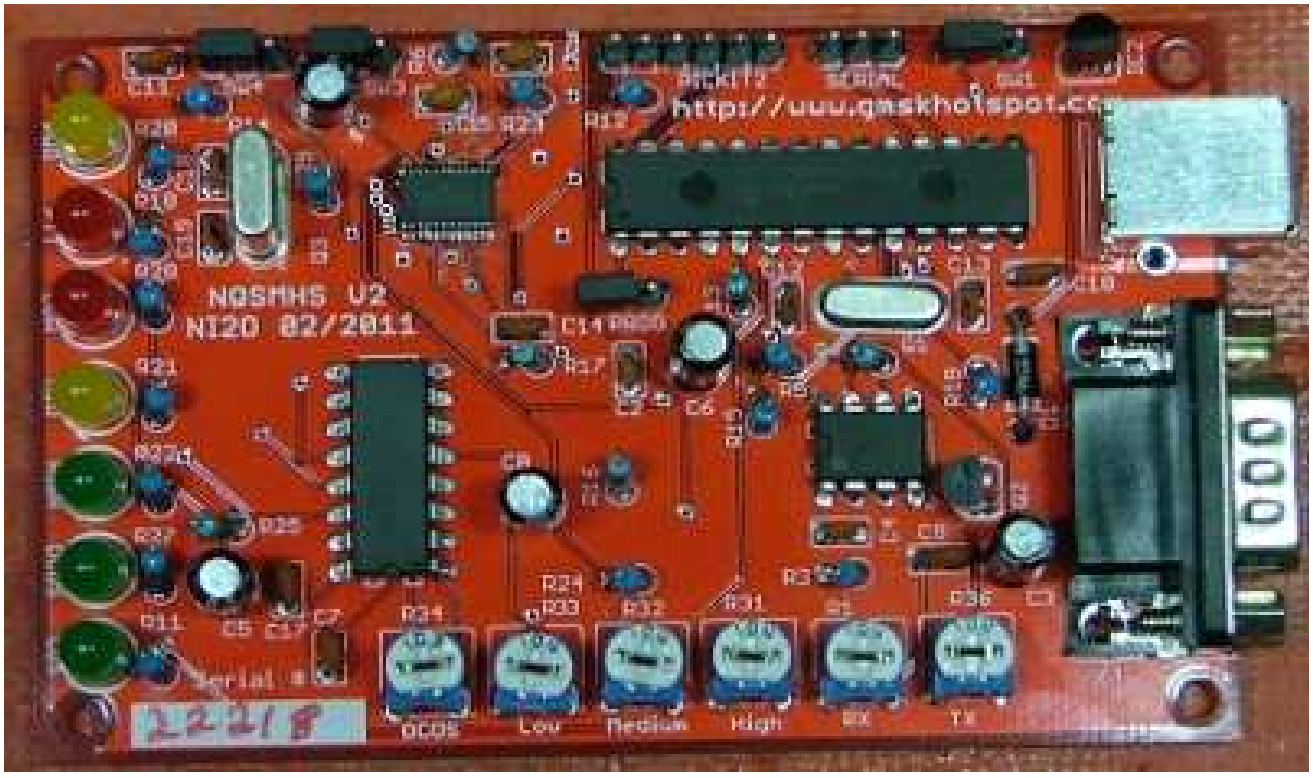
Not Quite So Mini-HotSpot V2



Schematic diagram and notes for version V2

Mark A Phillips G7LTT/NI2O
http://www.gmskhotspot.com

ENIcommunications Corp
70 Brookside Road
Randolph
NJ 07869
973 828 1625

Copyright 2011 ENIcommunications Corp. All Rights Reserved

Installation Notes

Thank you for purchasing the G7LTT/NI2O GMSK Not Quite So Mini-HotSpot V2. For updates to this document visit http://www.gmskhotspot.com/nqsmhs-v2.html

Your NQSMHS-V2 comes complete with a PIC micro controller which has been pre-programmed with the DUTCH*Star PICboot boot loader for USB. This along with the supplied license key will allow you to install and run the DUTCH*Star HSA firmware which can be found at http://www.dutch-star.eu.

You may also choose alternative firmware. Running such firmware will require you to reprogram the supplied PIC. Your board has facilities for a PICKit2 style ICSP.

Before attaching your NQSMHS-V2 to your PC for programming please ensure that the jumper settings for the installation of the DUTCH*Star HSA firmware into the board are as follows (sockets facing right);

SW1	**left**	**(USB powered)**
PROG	**installed**	**(force boot loader enable)**
SW3	**removed**	**(RSSI disabled)**
SW4	**right**	**(RSSI disabled)**

When attached to the PC for programming the COS LED will illuminate indicating that the board is ready to be programmed. Once programmed disconnect your board and remove the PROG jumper (if installed). Re-attach the board for normal operation.

The GMSK Not Quite So Mini HotSpot V2 comes as a kit of parts for self construction so you'll need to follow the basic instructions below. This kit should take an average builder a little over an hour to complete. Your NQSMHS-V2 is supplied with an SMD CMX589A GMSK modem chip. All the other parts are regular sized components.

Unlike other kits you may have built where one would first add all the mechanical parts (connectors, jumpers etc) followed by the passive parts (resistors, capacitors etc) followed by the semiconductors (IC's, diodes, crystals etc) it has been found that the easiest way to construct the NQSMHS V2 is to take a vertical approach – build the board from the bottom up. Construction in the following manner will greatly speed up the process and also provide a stable platform onto which you'll apply your iron.

Construction

Solder the SMD GMSK modem chip (U1) to the board.

Copyright 2011 ENIcommunications Corp. All Rights Reserved

Next comes the jumpers and headers. Take care to ensure that the pins are as straight as possible. Things can get a bit crowded around the pins later on.

Solder in all the electrolytic capacitors ensuring their correct polarity. The stripe on the body of the capacitor is inserted into the round hole on the board.

At this point you should see that the board will be stable when standing up-side-down on your bench. This will make for a much easier soldering platform as we progress.

Install the 2 crystals, voltage regulator, transistor and diode. Again, be sure to follow the outlines on the board as to how to orientate the parts.

Now its time to install and solder the USB and DB9 connectors. Make sure that they are pressed flush to the board.

Populate the remaining capacitors.

Install the variable resistors.

Install the LED's.

Install the resistors.

DO NOT INSTALL/SOLDER THE REMAINING CHIPS!

Double check your work looking for solder bridges and correct component placement etc.

Testing

Now we need to check a few voltage levels as well as configure the jumpers for V4 operation. Check the circuit diagram for the correct jumper positions. The settings at the beginning of this document are correct for V4 operation.

Connect the board to your PC via a USB cable. The first thing you should note is that there is no smoke rising from your board and that the PWR LED is lit. If the row of LED's is lit up then you haven't correctly soldered the SMD GMSK chip. Triple check your work with a magnifying glass.

When you are satisfied with your initial power-up test break out your voltage meter and check for +5V at the following locations;

Copyright 2011 ENIcommunications Corp. All Rights Reserved

U1 pins 3/4/15/17/24
IC6 pin 20
IC5 pin 8
IC1 pins 15/16

Assuming the above voltages are correct unplug the board and install the remaining chips.

Initial setup

Reconnect your board to the USB cable. You should now note that both the PWR and COS LED's are lit. The COS LED indicates that the PIC is ready to receive the DUTCH*Star firmware. Refer to the DUTCH*Star instructions for details on this operation.

If you choose to use other firmware you'll have to reprogram the supplied PIC by either connecting your PICKit2 programmer to the 6 pin header on the board or remove the PIC to program externally.

With the board sockets facing to the right, turn all the variable resistors EXCEPT RX and TX to the 10 o'clock position. These settings are approximate. The only "pot" that does any real work is the DCOS which sets the level at which the digital "squelch" opens thus activating the COS. The remaining 3 set the levels at which the LED bar graph operates.

Set the TX and RX resistors to the middle of their range. This should be sufficient for most all TRX's on the market today. Adjustment of these parts will be by trial and error. If you have access to some proper test gear you should adjust TX for 1.5KHz deviation and adjust RX for 0.8vP-P at pin 10 of U1 upon receipt of a GMSK signal.

Operation

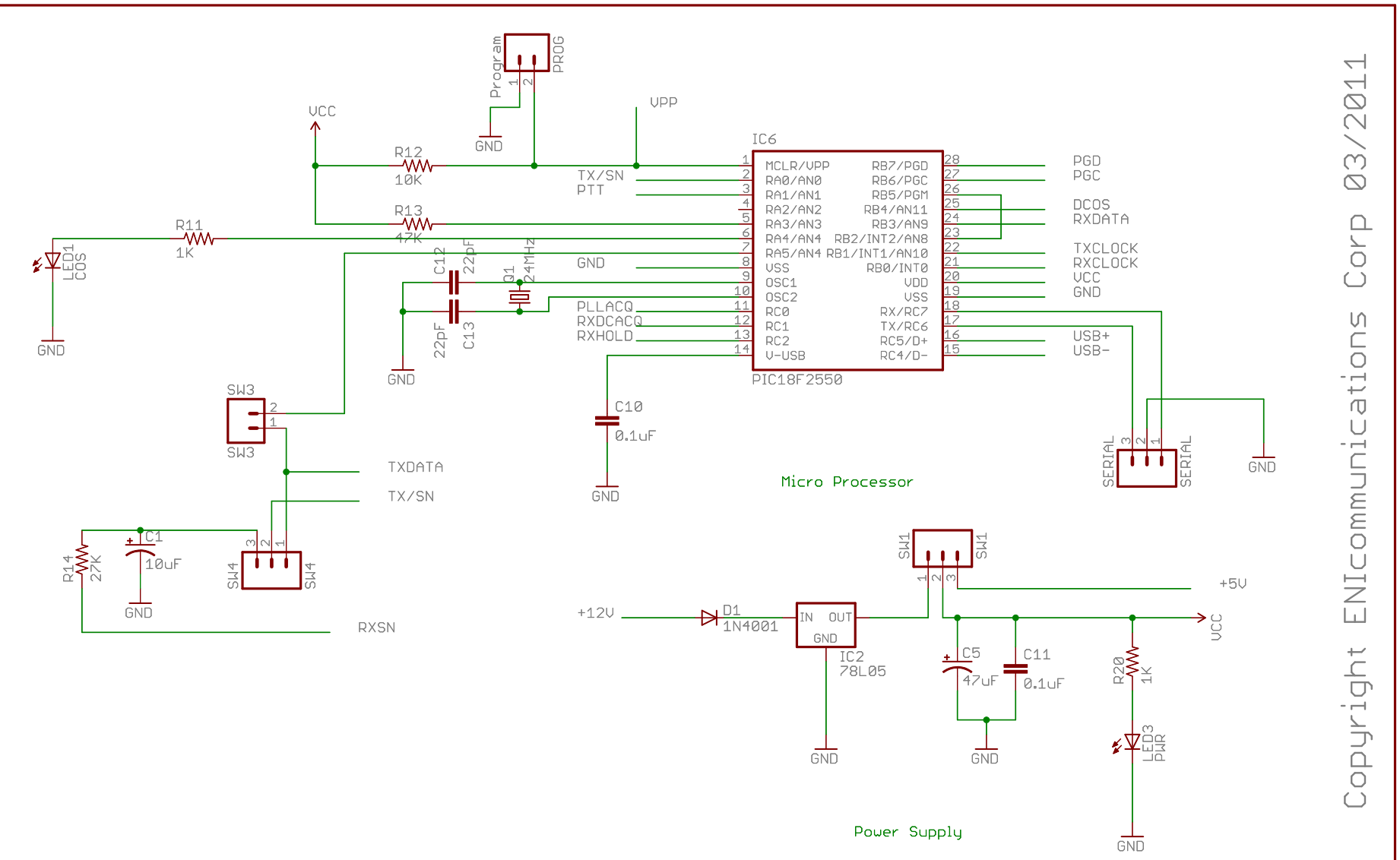
Operation of your NQSMHS-V2 will vary according to the firmware you are running, chosen software application and a few other things. Please refer to their relevant documents for instructions.

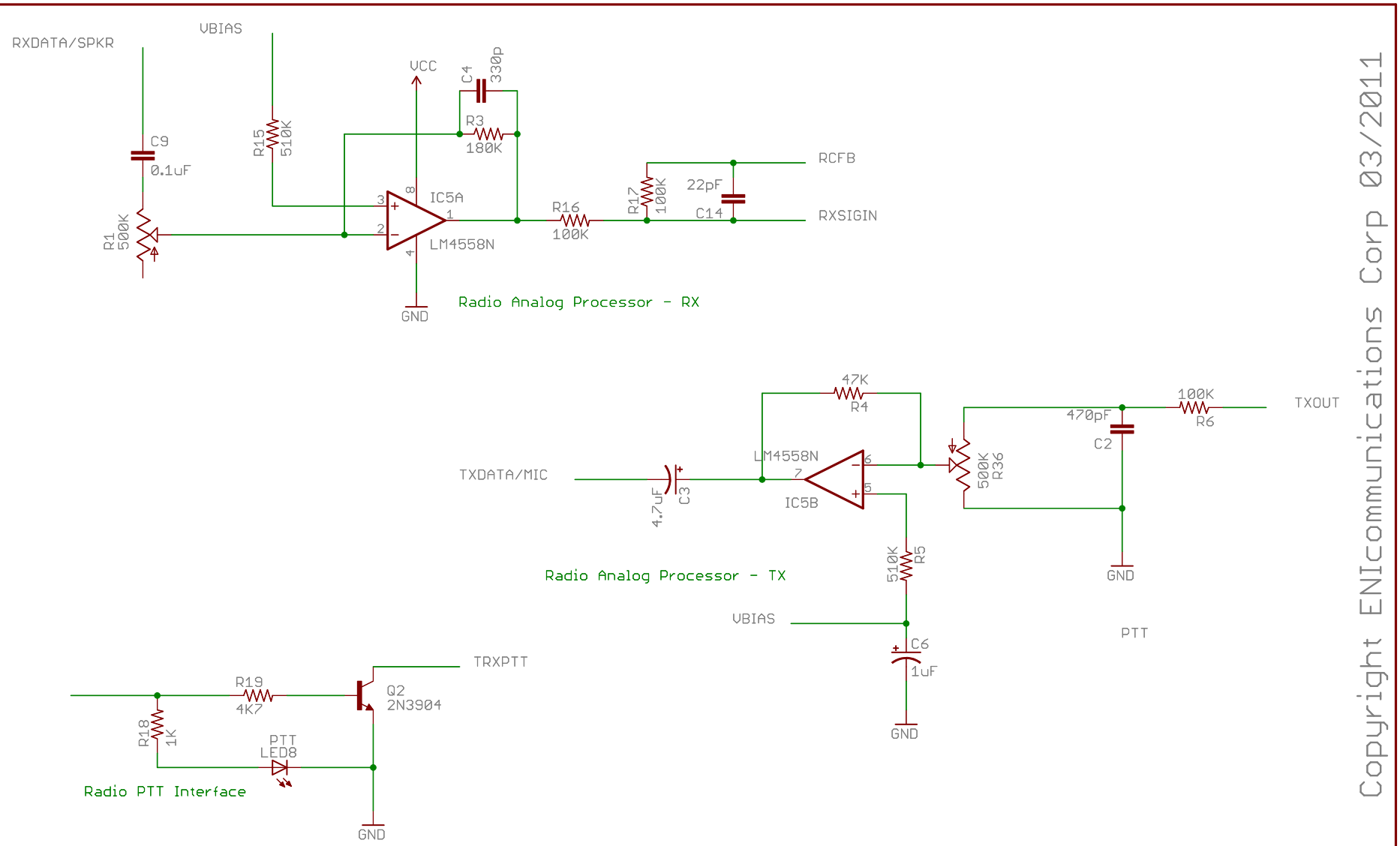
Jumpers

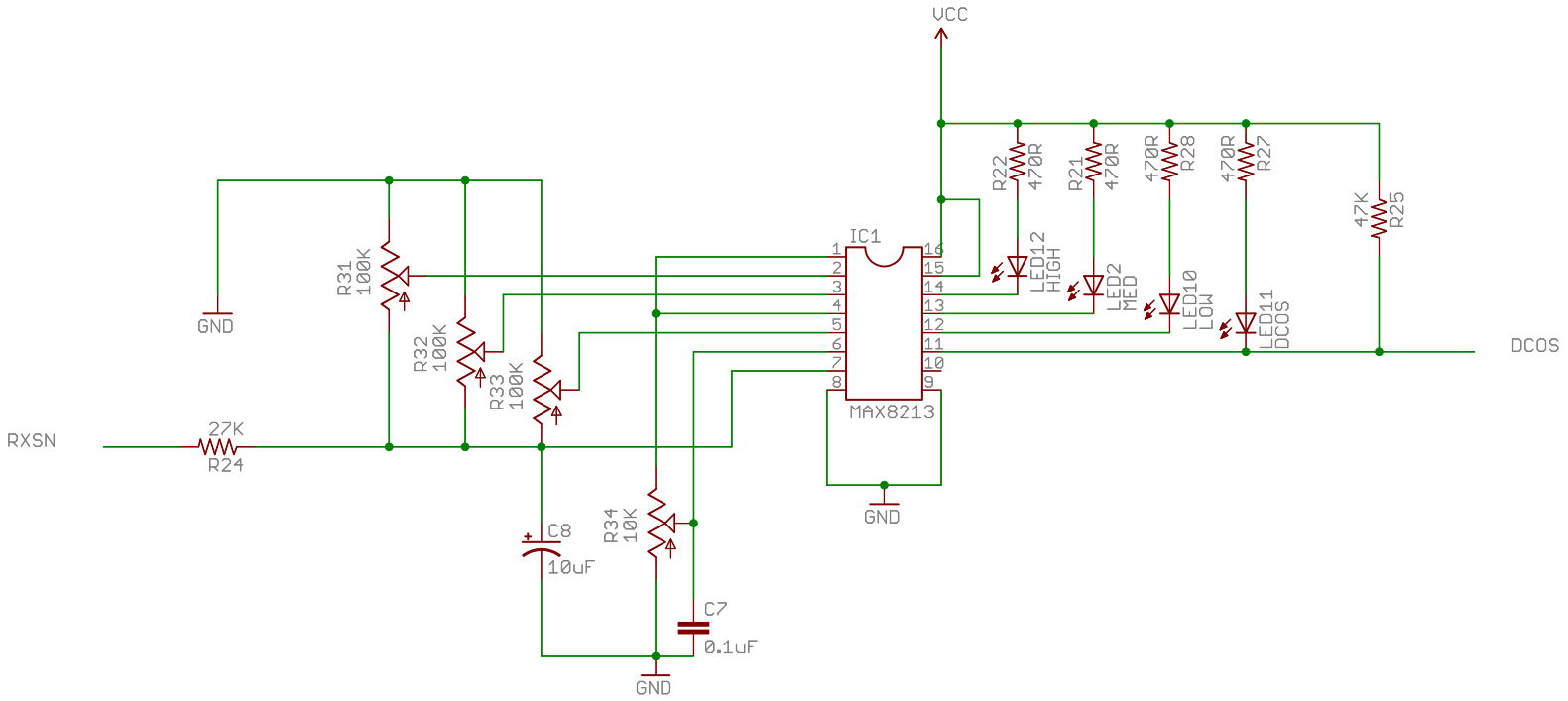
Set the jumpers as follows for either V4 (RSSI disabled) or V5 (RSSI enabled) operation;

V4	**SW3**	**off**	**SW4**	**right**
V5	**SW3**	**on**	**SW4**	**left**

Copyright 2011 ENIcommunications Corp. All Rights Reserved


Program
PROG
VCC
VPP
GND
R12
10K
IC6
TX/SN
PTT
MCLR/VPP
RA0/AN0
RA1/AN1
RA2/AN2
RA3/AN3
RA4/AN4
RA5/AN4
VSS
OSC1
OSC2
RC0
RC1
RC2
V-USB
RB7/PGD
RB6/PGC
RB5/PGM
RB4/AN11
RB3/AN9
RB2/INT2/AN8
RB1/INT1/AN10
RB0/INT0
VDD
VSS
RX/RC7
TX/RC6
RC5/D+
RC4/D-
PIC18F2550
PGD
PGC
DCOS
RXDATA
TXCLOCK
RXCLOCK
VCC
GND
USB+
USB-
R13
47K
R11
1K
LED1
COS
C12
22pF
C13
22pF
Q1
24MHz
PLLACQ
RXDCACQ
RXHOLD
C10
0.1uF
SERIAL
SW3
TXDATA
TX/SN
Micro Processor
R14
27K
C1
10uF
SW4
RXSN
SW1
+5V
+12V
D1
1N4001
IC2
78L05
C5
47uF
C11
0.1uF
R20
1K
LED3
PWR
Power Supply
PICKIT2
PGC
PGD
GND
VCC
VPP
USB
GND
VBUS
D-
D+
GND
+5V
USB-
USB+
Micro Processor & PSU
TITLE: NQSMHS-V2_final
Document Number:
REV: A
Date: 5/11/11 8:51 AM
Sheet: 1/4
Copyright ENIcommunications Corp 03/2011


RXDATA/SPKR
VBIAS
VCC
C4
330p
R3
180K
C9
0.1uF
R15
510K
R1
500K
IC5A
LM4558N
R16
100K
R17
100K
22pF
C14
RCFB
RXSIGIN
GND
Radio Analog Processor - RX
47K
R4
LM4558N
IC5B
TXDATA/MIC
4.7uF
C3
500K
R36
470pF
C2
100K
R6
TXOUT
510K
R5
VBIAS
C6
1uF
GND
PTT
Radio Analog Processor - TX
TRXPTT
R19
4K7
Q2
2N3904
R18
1K
PTT
LED8
Radio PTT Interface
GND
DB9M
GND
TRXPTT
RXDATA/SPKR
COS/COR/SQL
TXDATA/MIC
GND
+12V
GND
X2
Copyright ENIcommunications Corp 03/2011
Analog Front End
TITLE: NQSMHS-V2_final
Document Number:
REV:
A
Date: 5/11/11 8:51 AM
Sheet: 2/4



Copyright ENIcommunications Corp 03/2011

Digital COS

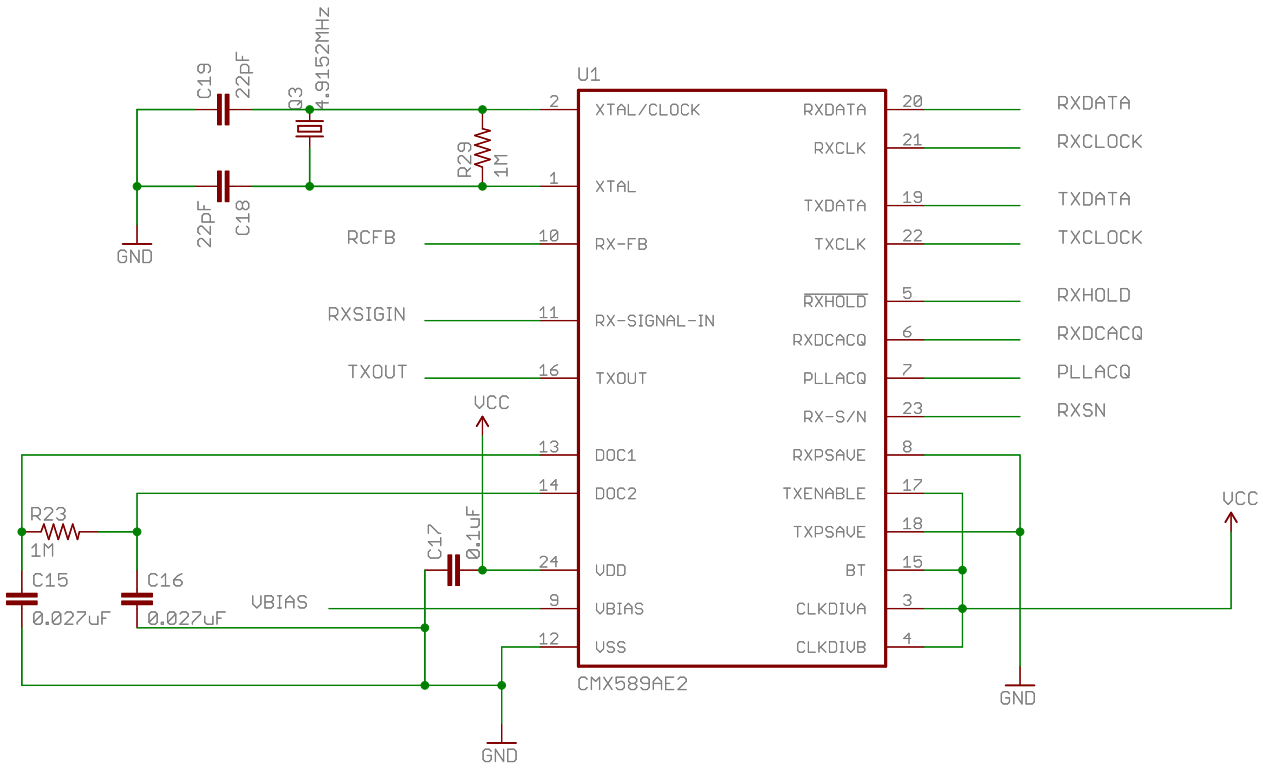
TITLE: NQSMHS-V2_final

Document Number:

REV: A

Date: 5/11/11 8:51 AM

Sheet: 3/4



Copyright ENIcommunications Corp 03/2011

GMSK Modem

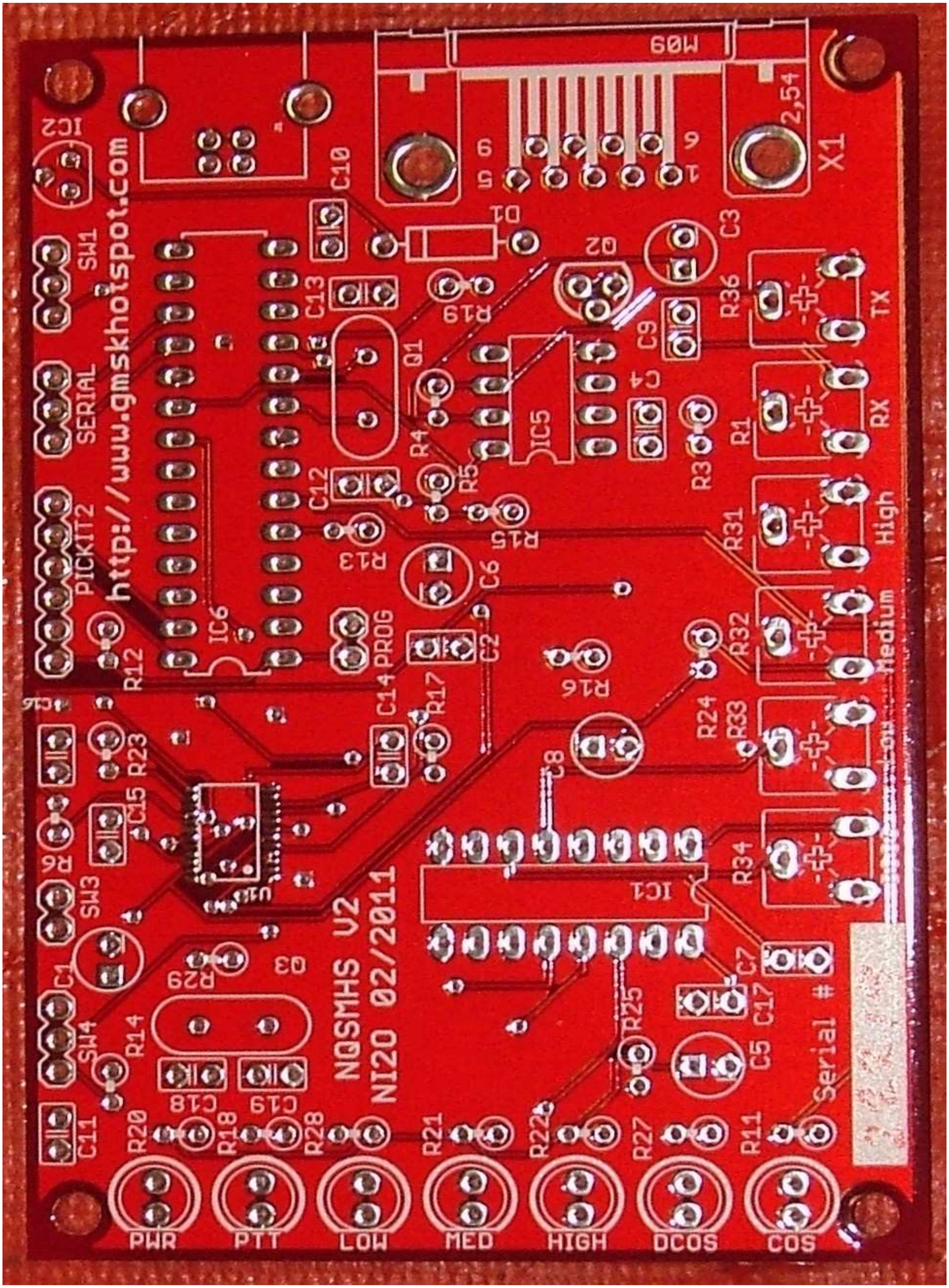
TITLE: NQSMHS-V2_final

Document Number:

REV: A

Date: 5/11/11 8:51 AM

Sheet: 4/4

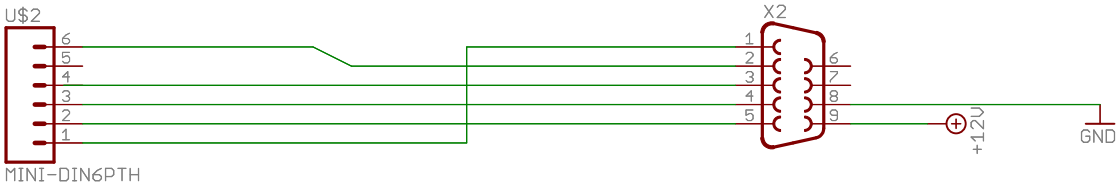

http://www.gmskhotspot.com
N0SMHS V2
NI2O 02/2011
PWR
PTT
LOW
MED
HIGH
DCOS
COS
TX
RX
High
Medium
Serial #
PICKIT2
SERIAL
PROG
X1

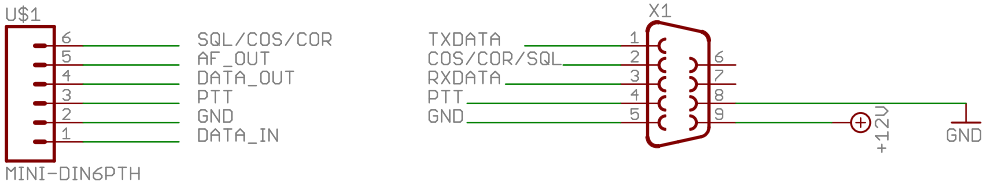
Part	Value	Marking
C1	10uF	10uF
C2	470pF	471
C3	4.7uF	4.7uF
C4	330p	331
C5	47uF	47uF
C6	1uF	1uF
C7	0.1uF	104
C8	10uF	10uF
C9	0.1uF	104
C10	0.1uF	104
C11	0.1uF	104
C12	22pF	22
C13	22pF	22
C14	22pF	22
C15	0.027uF	273
C16	0.027uF	273
C17	0.1uF	104
C18	22pF	22
C19	22pF	22
D1	1N4001	1N4001
IC1	MAX8213	MAX8213
IC2	78L05	78L05
IC5	LM4558N	4558
IC6	PIC18F2550	PIC18F2550
J1	USBPTH	
LED1	COS	Green
LED2	MED	Yellow
LED3	PWR	Yellow
LED8	PTT	Red
LED10	LOW	Red
LED11	DCOS	Green
LED12	HIGH	Green
PICKIT2	PICKIT2	
PROG	Program	
Q1	24MHz	24MHz
Q2	2N3904	2N3904
Q3	4.9152MHz	4.9152MHz
R1	500K	504 or 104
R3	180K	brown/grey/black/orange/brown
R4	47K	yellow/violet/black/red/brown
R5	510K	green/brown/black/orange/brown
R6	100K	brown/black/black/orange/brown
R11	1K	brown/black/black/brown/brown
R12	10K	brown/black/black/red/brown
R13	47K	yellow/violet/black/red/brown
R14	27K	red/violet/black/red/brown
R15	510K	green/brown/black/orange/brown

R16	100K	brown/black/black/orange/brown
R17	100K	brown/black/black/orange/brown
R18	1K	brown/black/black/brown/brown
R19	4K7	yellow/violet/black/brown/brown
R20	1K	brown/black/black/brown/brown
R21	470R	yellow/violet/black/black/brown
R22	470R	yellow/violet/black/black/brown
R23	1M	brown/black/black/yellow/brown
R24	27K	red/violet/black/red/brown
R25	47K	yellow/violet/black/red/brown
R27	470R	yellow/violet/black/black/brown
R28	470R	yellow/violet/black/black/brown
R29	1M	brown/black/black/yellow/brown
R31	100K	104
R32	100K	104
R33	100K	104
R34	10K	103
R36	500K	504 or 104
SERIAL	SERIAL	
SW1	SW1	
SW3	SW3	
SW4	SW4	
U1	CMX589AE2	SMD Part
X2	DB9M	

Not Quite So Mini-HotSpot V2 Addendum Page

1) Some users report very low transmit data levels emitting from the board. A quick fix for this is to cut the right leg of the TX pot.
2) Some users have reported that the PTT remains keyed long after the data has gone. This appears to be RF feedback holding the PTT transistor open. Place a 100pF (101) cap between the base of Q2 and ground.





NQSMHS to 6 pin Mini DIN

TITLE: 6pin-minidin_to_MHS	
Document Number:	REV:
Date: 3/15/11 11:04 PM	Sheet: 1/1

6-Pin MiniDIN
Packet Connector

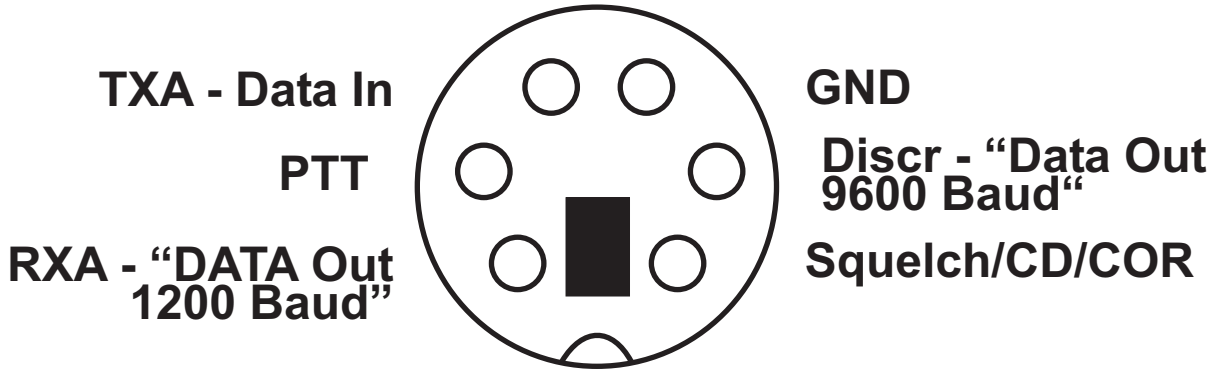
The 6-Pin MIniDIN “PS/2” jack is a standard used by all the Japanese ham manufacturers.

This jack is variously called "data", "packet", "auxiliary", etc, but actually there are no data connections on this connector. This ***IS NOT*** a serial data or RTTY direct FSK port; only various forms of RX and TX ***audio*** are present. The connector provides **receive audio** output at about 100-300mV, **transmit audio** input at about the same level, transmit **PTT** keying, receiver **squelch status** (COR), and **ground**/common.

The normal RX audio line, which is live on both FM and SSB in multimode transceivers, is sometimes labeled "1200 baud packet" but it is just standard receiver audio (de-emphasized on FM) similar to what comes out the radio’s speaker. However, it is at a fixed level unaffected by the volume control. The jack is suitable for any voice-frequency band application such as SSTV, Echolink/IRLP interfaces, PSK31, RTTY, 1200 baud packet TNCs, APRS trackers, DTMF and paging encoders/decoders/selective calls, etc.

The audio levels into and out-of this connector are similar to RCA-jack home audio “line level” connections on amplifiers, tuners, CD & DVD players, etc. They are also a nearly perfect match for the levels on 3.5mm computer sound card “Line Out” and “Line In” (not Mic input!) jacks. No attenuator pads or voltage dividers are required.

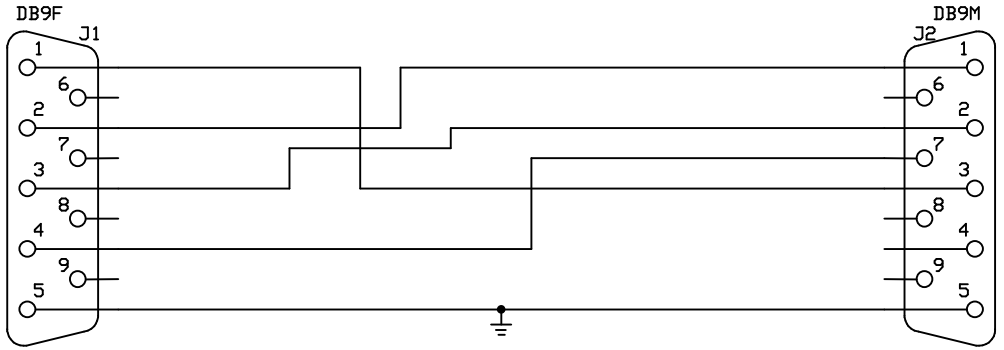
On radios with FM, the 6th pin is a DC-coupled connection directly to the receiver FM discriminator. The NON-demphasized wide-band audio at this point is normally used by 9600 baud or higher packet modes.



Viewed Looking Into FEMALE (Panel) Socket
(Soldering End of MALE Plug)

This is the same jack as the standard computer PS/2 mouse/keyboard connector. A PS/2 mouse/keyboard extension cord, available at most computer stores, is an excellent source of a cable for this jack. Note that cables salvaged from dead keyboards or mice often only have 4 of the 6 conductors present.

Stephen H. Smith WA8LMF 02 Nov 2002 Revised 6 Aug 2009



NQSMHS

Alinco

DB9F

1 = White
2 = Red
3 = Green
4 = Black
5 = Braid

DB9M

1 = Red
2 = Green
3 = White
5 = Braid
7 = Black

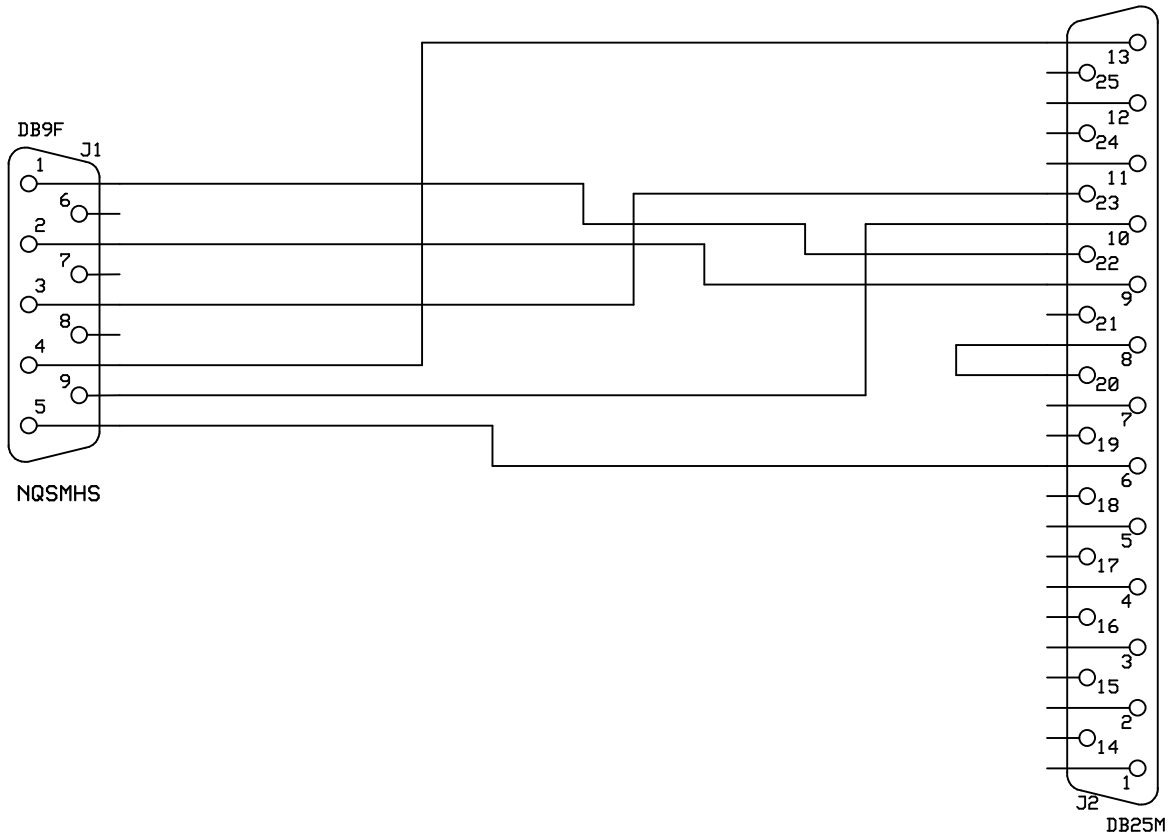
NQSMHS

1 = TX audio to radio (to Data In)
2 = COS/COR/SQL
3 = RX audio from radio (from Data Out)
4 = PTT
5 = GND
9 = +12VDC

Alinco

1 = COS/COR/SQL
2 = 9600bd out (Discriminator)
3 = 9600bd in (Modulator)
4 = 1200bd out (Speaker)
5 = GND
6 = NC
7 = PTT
8 = +5VDC
9 = 1200bd in (Mic)

ENIcommunications Corp		
CAB Alinco		
Mark Phillips	Rev 1.0 10/12/2010	Page 1 of 1



DB9F

1 = White
2 = Red
3 = Green
4 = Black
5 = Braid
9 = Purple

DB25M

6 = Braid
8 = Bridged to 20
9 = Red
10 = Purple
13 = Black
20 = Bridged to 8
22 = White
23 = Green

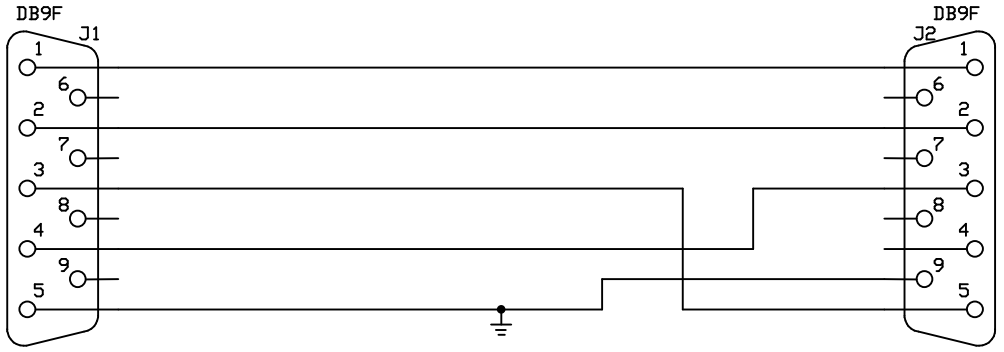
NQSMHS

1 = TX audio to radio (to Data In)
2 = COS/COR/SQL
3 = RX audio from radio (from Data Out)
4 = PTT
5 = GND
9 = +12VDC

DeskTrac

1 = GND
2 = NC
3 = B+ (13.8VDC @ 750mA)
4 = PCC TEL
5 = MIC TEL
6 = GND
7 = DRXA TEL
8 = GND
9 = CHAN MON (COS/COR/SQL)
10 = B+ (13.8VDC @ 750mA)
11 = EXT ALARM
12 = PL CHAN MON
13 = PTT
14 = LINE PTT
15 = DRXA EXT LCL
16 = TXA EXT LCL
17 = TX CTCSS
18 = MONITOR
19 = PTT EXT LCL
20 = RPTR DIS
21 = TX PL INH
22 = TXA (DATA IN)
23 = RXA (DATA OUT)
24 = PTT PAGER
25 = MIC PAGER

ENIcommunications Corp		
CAB DeskTrac		
Mark Phillips	Rev 1.0 10/26/2010	Page 1 of 1



NQSMHS

Kantronics

DB9F
1 = White
2 = Red
3 = Green
4 = Black
5 = Braid

DB9F
1 = White
2 = Red
3 = Black
5 = Green
9 = Braid

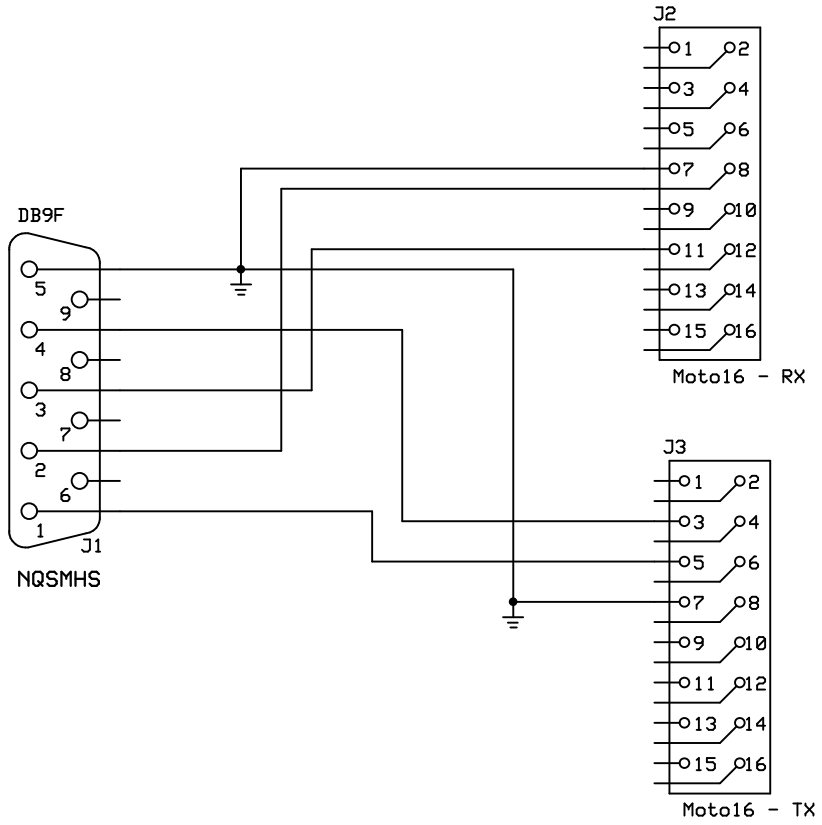
NQSMHS

1 = TX audio to radio (to Data In)
2 = COS/COR/SQL
3 = RX audio from radio (from Data Out)
4 = PTT
5 = GND
9 = +12VDC

Kantronics

1 = Data In (Modulator)
2 = COS/COR/SQL
3 = PTT
4 = NC
5 = Data Out (Discriminator)
6 = GND
7 = NC
8 = Speaker Out
9 = GND

ENIcommunications Corp		
CAB Kan		
Mark Phillips	Rev 1.0 10/12/2010	Page 1 of 1



DB9F
1 = White
2 = Red
3 = Green
4 = Black
5 = Braid

Moto16 - RX
7 = Braid
8 = Red
11 = Green

Moto16 - TX
3 = Black
5 = White
7 = Braid

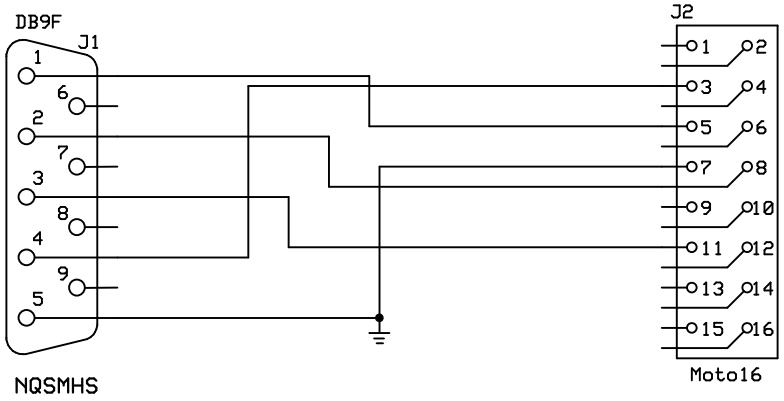
NQSMHS

1 = TX audio to radio (to Data In)
2 = COS/COR/SQL
3 = RX audio from radio (from Data Out)
4 = PTT
5 = GND
9 = +12VDC

Motorola 16 pin (Maxtrac/GM300/ETC)

1 = External Speaker Negative
2 = Mic
3 = PTT
4 = External Alarm
5 = Flat TX Audio (Modulator)
6 = NC
7 = GND
8 = COS/COR/SQL
9 = Emergency Alert Input
10 = Ignition Control Imput
11 = Discriminator Audio Output
12 = NC
13 = Switch A+ Sense
14 = Remote Hook Switch Input
15 = Internal Speaker Positive
16 = External Speaker Positive

ENIcommunications Corp		
CAB Moto16-RPT		
Mark Phillips	Rev 1.0 10/18/2010	Page 1 of 1



DB9F	Moto16
1 = White	3 = Black
2 = Red	5 = White
3 = Green	7 = Braid
4 = Black	8 = Red
5 = Braid	11 = Green

NQSMHS

1 = TX audio to radio (to Data In)
2 = COS/COR/SQL
3 = RX audio from radio (from Data Out)
4 = PTT
5 = GND
9 = +12VDC

Motorola 16 pin (Maxtrac/GM300/ETC)

1 = External Speaker Negative
2 = Mic
3 = PTT
4 = External Alarm
5 = Flat TX Audio (Modulator)
6 = NC
7 = GND
8 = COS/COR/SQL
9 = Emergency Alert Input
10 = Ignition Control Imput
11 = Discriminator Audio Output
12 = NC
13 = Switch A+ Sense
14 = Remote Hook Switch Input
15 = Internal Speaker Positive
16 = External Speaker Positive

ENIcommunications Corp		
CAB Moto16		
Mark Phillips	Rev 1.0 10/12/2010	Page 1 of 1