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NBEK

Issue 1, 30 July 2012

Narrow Band Module Evaluation Kit

Narrow Band Evaluation Kit (NBEK) can be used to evaluate all Narrow Band Multi-channel and Single frequency DIL version modules. Radio modules can be assessed for their suitability in terms of wireless operating range, functionality, reliability and robustness in a multi-user environment with several other modules on different channels. Built in Control44, I1200 modes allow user to evaluate the performance of Radiometrix narrow band modules in a typical Remote Control and data transmission application in an industrial environment.

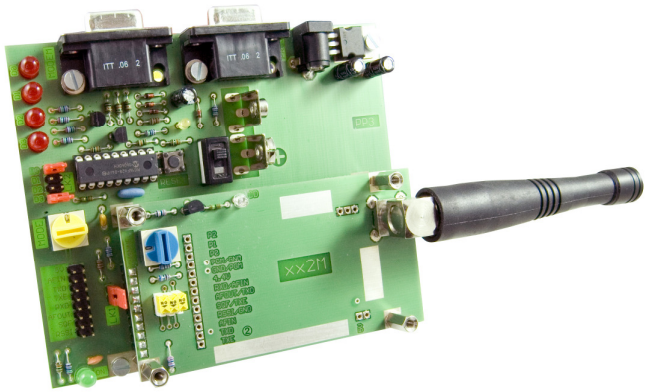


Figure 1: Main controller board + xx2M series carrier board

Features

- RF module range testing
- Noise and interference identification
- Antenna type evaluation
- Analogue and digital data transmission
- 4 Data channel remote control
- 1200 baud dumb modem
- Setup is simple as Plug-and-Play
- RS232 Serial port interface for frequency/channel configuration
- RS232 Serial port interface for 1200 baud dumb modem
- Access to internal diagnostic/Test modes using HyperTerminal
- Access to each data/control pins for external interface or testing

Contents

- 2 Controller board
- 2 Carrier boards according to modules ordered separately
  - BiM/SMX series (BiM1, NiM2, BiM2A, BiM3B, SMX1 and SMX2) carrier board
  - xx2M series (TX1M/RX1M, TX2M/RX2M, TR1M and TR2M) carrier board
  - LM series (LMT1/LMR1 and LMT2/LMR2) carrier board
  - TLC2H /RLC2H and HVR2 carrier board
  - SIL series modules (e.g. HX1, NTX2 / NRX2, TX3H/RX3A etc.) carrier board
  - USX / UHX carrier boards

- 1 Pair of Radiometrix multichannel or single frequency TX/RX or transceivers (ordered separately)
- 2 9V alkaline battery (PP3)
- 10 Jumpers
- 1 Narrow Band Evaluation Kit manual
- 1 Data sheet of Radio module ordered
- 2 1/4 wavelength monopole antenna with BNC connector for 433MHz operation
- 2 Helical antennas with BNC connector for 151MHz / 173MHz (optional)

Configuring the Narrow Band Multi-channel Evaluation Kit

One of the Evaluation Kit should be assigned as transmitter and other as receiver.

Jumpers on the main controller board

LK1	Connects R1=2.2kΩ across TXD and GND pins R18=1.5kΩ in series with TXD.
Inserted	3V CMOS Data Input to Transmitter. Only being fitted for $3V_{Pk-Pk}$ input only modules (BiM1, NiM2, TX1, NTX2 etc)
Removed	5V CMOS Data Input to Transmitter
LK2	**Jumper inserted: 0V (logic '0') and LED ON; Jumper removed: 5V (logic '1')**
D0	Selects Data Bit0 value during Control44 encoder mode
D1	Selects Data Bit1 value during Control44 encoder mode
D2	Selects Data Bit2 value during Control44 encoder mode
D3	Selects Data Bit3 value during Control44 encoder mode

Jumpers on the carrier board:

XX2M series

	Slide yellow coloured switches to ON position marked by arrow for TX1M, TX2M Remove for RX1M, RX2M, TR2B, TR2M
LK3	TXE from controller routed to TXE pin on TX2M (SQF pin on RX2M, TR2M)
LK4	TXD from controller routed to TXD pin on TX2M, (AFOUT pin on RX2M, TR2M)
LK5	AFIN from controller routed to AFIN pin on TX2M (RXD pin on R2M, TR2M)

Switches

MODE (yellow)	**H=VDD L=0V (inverted logic) M3 M2 M1 M0**	
0	HHHH	Receiver ON
1	HHHL	Un-modulated Transmission for testing carrier frequency, power, spurii
2	HHLH	250Hz (500bps) square wave Modulated Transmission
3	HHLL	1250Hz (2.5kbps) square wave Modulated Transmission
4	HLHH	Pseudorandom NRZ stream modulated Transmission
5	HLHL	Transmitter and Receiver turned ON and OFF periodically at 100ms interval
6	HLLH	RESERVED for future use
7	HLLL	RESERVED for future use
8	LHHH	Continuous Control44 Transmission of Address=0 and Data=D3, D2, D1, D0
9	LHHL	Control44 Transmission of Address=0 and Data=D3, D2, D1, D0 If either Data is changed or RESET (Trigger) switch is pressed.
A	LHLH	Control44 Reception with Momentary Output. (paired with Mode 8)
B	LHLL	Control44 Reception with Latched Output. (paired with Mode 9)
C	LLHH	Transmits CTR44 Test Packet, Receive Echoed Packet (Radar Mode – Master)
D	LLHL	Receive CTR44 Test Packet, Re-transmit it back to Sender (Echo Mode – Slave)
E	LLLH	I1200 type 1200 baud Dumb Modem for bit balanced serial data transmission
F	LLLL	RESERVED for future use

Notes:

1. Mode C, D require Transceiver
2. In Mode C, a test packet is transmitted, then the unit switches to Receive mode for 100ms before repeating.
3. Data sequence of 8 (D3=L, D2=H, D1=H, D0=H), 4, 2, 1 (D3=H, D2=H, D1=H, D0=L) is cycled through with each transmission.
4. In Mode D, the unit idles in Receive mode. When a valid CTR44 burst is received the unit keys up the Transmitter and re-transmits this CTR44 burst back to sender in Mode C.
5. The 'modem' mentioned (Mode E) is a 1200 baud RS232 semi-intelligent unit (Transmit keyed when valid serial data is present, so no separate TX control needed. Coding in the datastream also permits the receiver to ignore noise and only output valid serial data). This is a half duplex unit, so collisions between transmitted and received packets must be dealt with by the user.

CHANNEL (blue)	xx2M, SMX H=4V, L=0V Hex Switch	LM Series Units H=3V, L=0V Hex Switch	TLC/RLC/HVR H=3.5V, L=0V Hex Complement Switch
0	P2=H, P1=H, P0=H	P3=H P2=H, P1=H, P0=H	P3=L, P2=L, P1=L, P0=L
1	P2=H, P1=H, P0=L	P3=H, P2=H, P1=H, P0=L	P3=L, P2=L, P1=L, P0=H
2	P2=H, P1=L, P0=H	P3=H, P2=H, P1=L, P0=H	P3=L, P2=L, P1=H, P0=L
…..	……		
7	P2=L, P1=L, P0=L	P3=H, P2=L, P1=L, P0=L	P3=L, P2=H, P1=H, P0=H
8	Not in Use (Appears as Channel 0)	P3=L, P2=H, P1=H, P0=H	P3=H, P2=L, P1=L, P0=L
……			
E (14)	Not in Use (Appears as Channel 6)	P3=L, P2=L, P2=L, P0=H	P3=H, P2=H, P1=H, P0=L
F (15)	Not in Use (Appears as Channel 7)	P3=L, P2=L, P1=L, P0=L	P3=H, P2=H, P1=H, P0=H

***Note**:* channel switch to be set to 0 (LMR, LMT) or F (RLC, TLC, HVR) when serial (RS232) programming the unit, as 'P0' is also 'serial program in'.

User Test Points

Pin	Description
5V	5V, 1A Low Dropout Voltage Regulator Output
AFIN	Transmit Input for $1V_{pk-pk}$ Audio Frequency (Analogue) Signal using TX1M, TX2M, TR2M Set to MODE 1, to feed external Analogue Signal
TXD	Transmit Input for Digital (Binary) Data driven by onboard microcontroller Set to MODE 1, to feed external 5V CMOS level Digital Data
TXE	Active Low Transmit Enable driven by onboard microcontroller
RXD	Received (Digital) Data Output from Radio Module Open Collector output from module pulled up to 5V using R4=10kΩ
AFOUT	Audio Frequency (Demodulated Buffered Analogue) Signal
SQF	Active Low Squelch Function when RF Carrier is not present Open Collector output pulled up to 5V using R1=22kΩ on RX1M, RX2M, TR2M Carrier Board Connected to Q5 (NPN transistor) via R4=330kΩ base resistor to turn on Carrier Detect LED.
RSSI	Received Signal Strength Indicator

Visual Indicators

LED	Colour	Description
D0	Red	Data Bit0 output indicator during Control44 decoder mode
D1	Red	Data Bit1 output indicator during Control44 decoder mode
D2	Red	Data Bit2 output indicator during Control44 decoder mode
D3	Red	Data Bit3 output indicator during Control44 decoder mode
STATUS	Bright Yellow	STATUS indicator – Transmitter Active or Valid Data received
ON	Green	Evaluation Kit powered with correct polarity power supply
CD	Bright Orange	Carrier Detect indicator for RX1M, RX2M or TR2M derived from SQF output

Connectors

Pin	Description
DC socket	2.1mm power socket; when a power supply jack is inserted, a mechanical switch disconnects the battery negative
PROG	Connect to COM port of a PC using straight DB9M-DB9F serial cable to configure the channel and frequency of a multichannel module Hyper Terminal setting: 2400 baud, none parity, 8 data bits, 1 stop bit, none flow control
MODEM	Connect to COM port of a PC using straight DB9M-DB9F serial cable to evaluate serial data transmission through a radio module using onboard 1200 baud dumb modem. Hyper Terminal setting: 1200 baud, none parity, 8 data bits, 1 stop bit, none flow control
PP3 SNAP	8.4V NiMH or 9V Alkaline PP3 type battery
SIL socket	Appropriate radio module carrier board is inserted into the socket and secured with 4 short spacers

***Note**: The carrier board should always be firmly bolted down to the main controller board mounting studs at all four corners, or the grounding of the carrier board will be compromised.*
This is especially important when high power transmitters are used with the aerial connected directly onto the BNC. In this case, any mismatch will cause significant ground currents to flow.

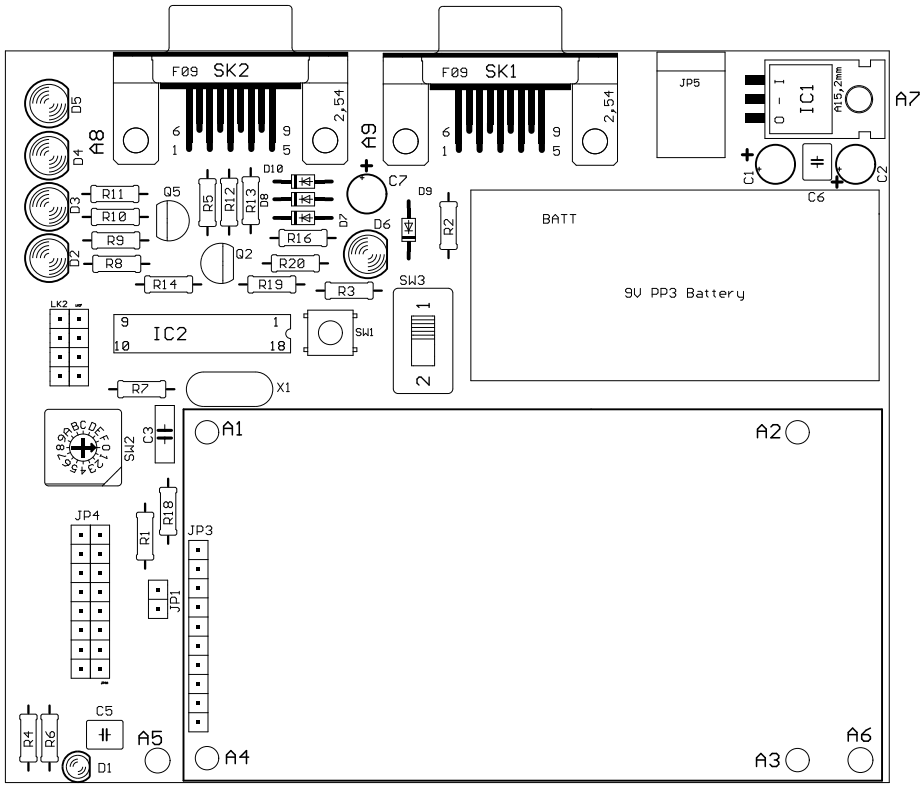


Figure 2: Main controller board component layout

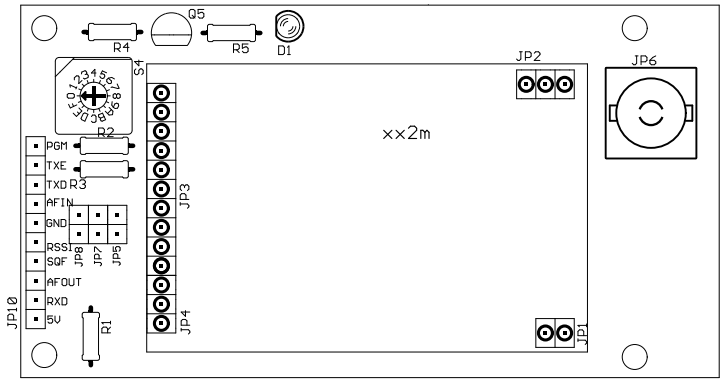


Figure 3: xx2M series carrier board

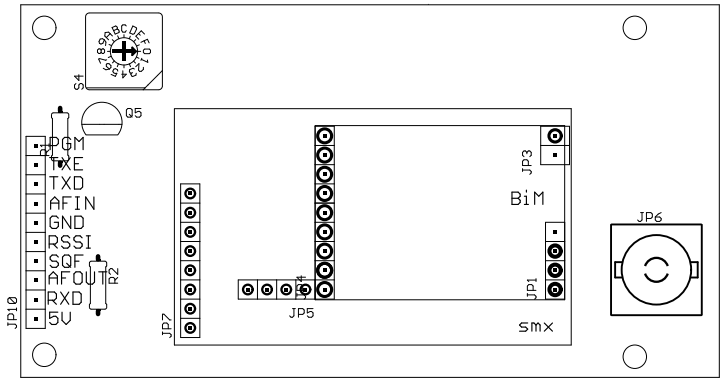


Figure 4: BiM / SMX series carrier board

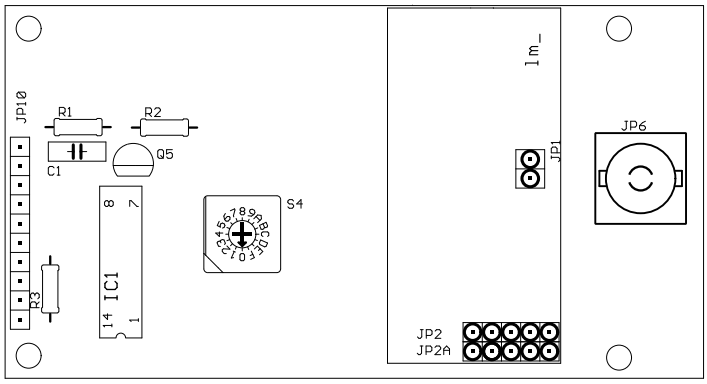


Figure 5: LM series carrier board

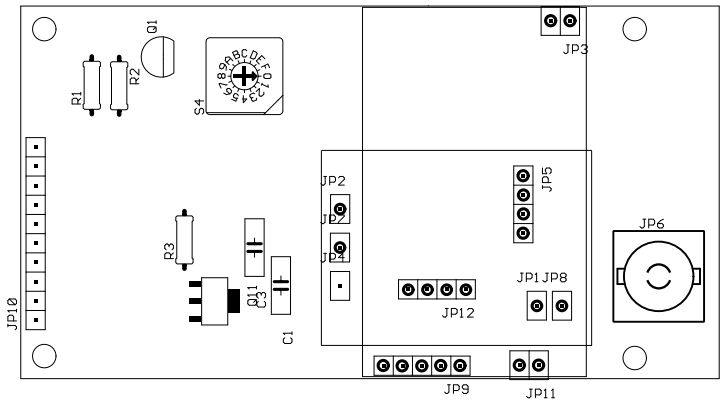


Figure 6: TLC2H/RLC2H and HVR2 carrier board

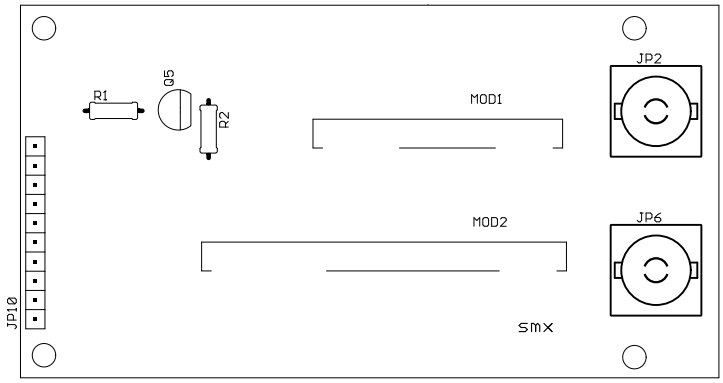


Figure 7: SIL series module carrier board

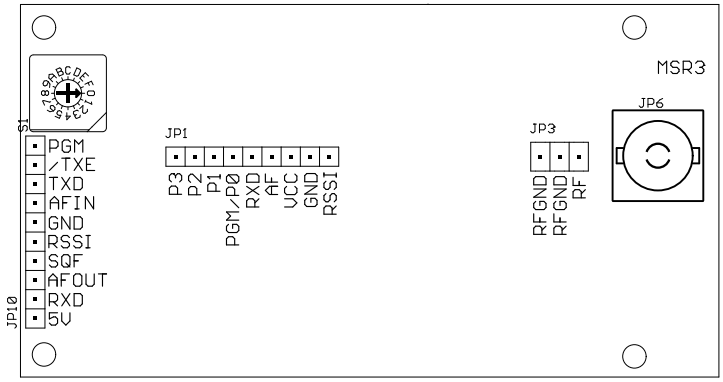


Figure 8: MSR or COR series module carrier board

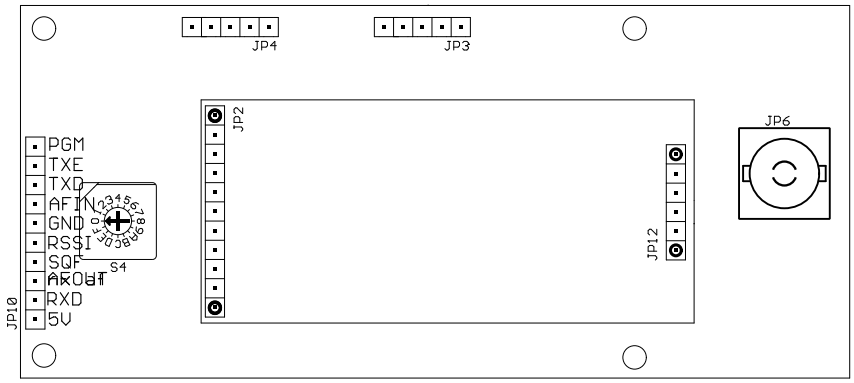


Figure 8: UHX1 module carrier board

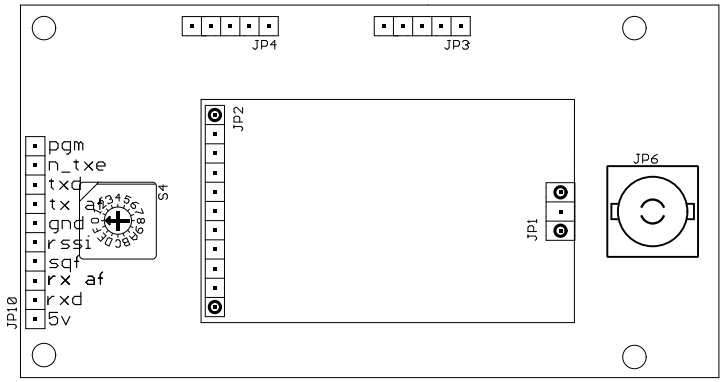
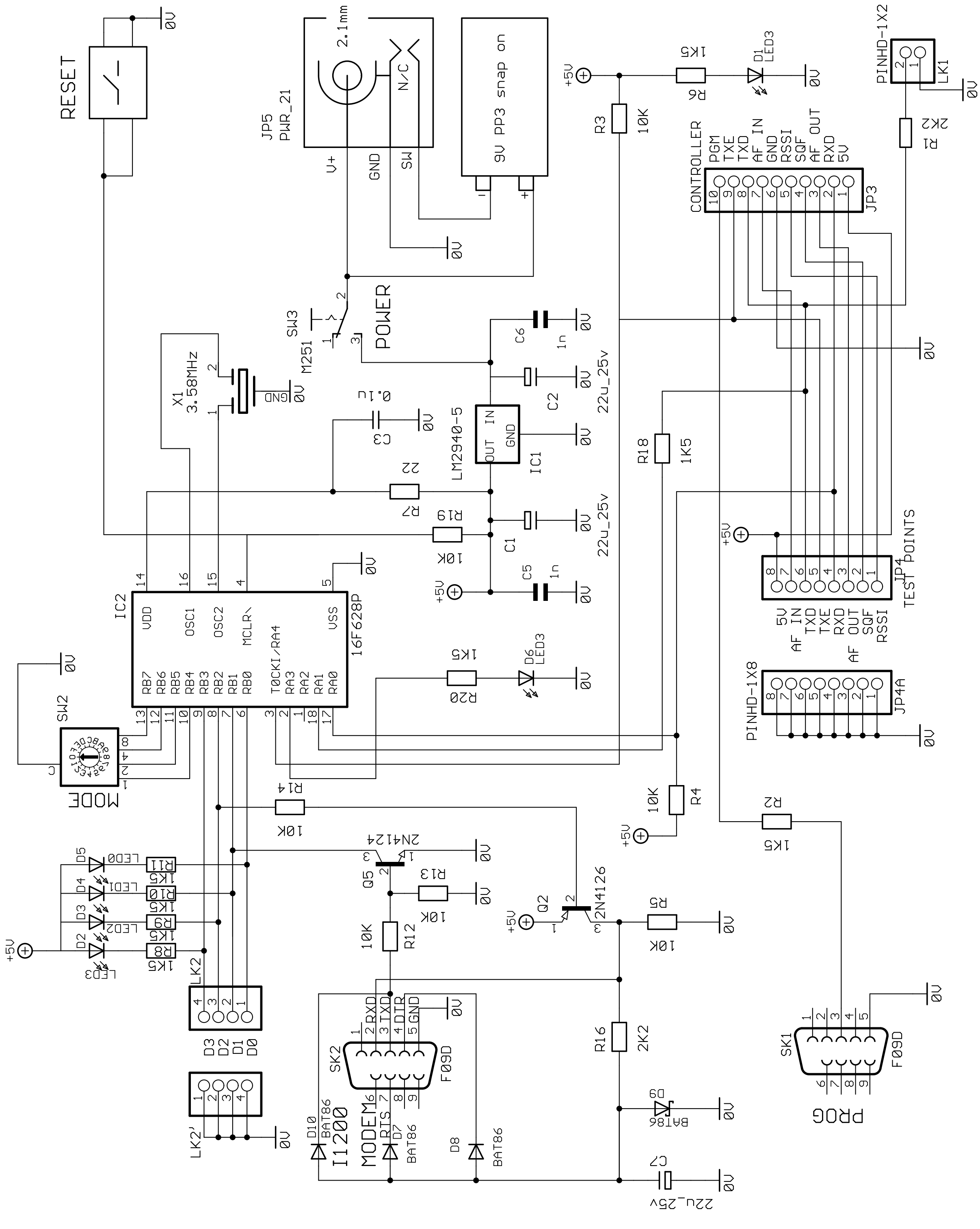


Figure 9: USX2 module carrier board


RESET
JP5
PWR_21
2.1mm
N/C
9V PP3 snap on
SW3
M251
POWER
X1
3.58MHz
LM2940-5
IC1
IC2
16F628P
CONTROLLER
JP3
JP4
TEST POINTS
PINHD-1X8
JP4A
PINHD-1X2
LK1
MODE
SW2
LK2
LK2'
SK2
F09D
MODEM
I1200
SK1
F09D
PROG
2N4124
2N4126

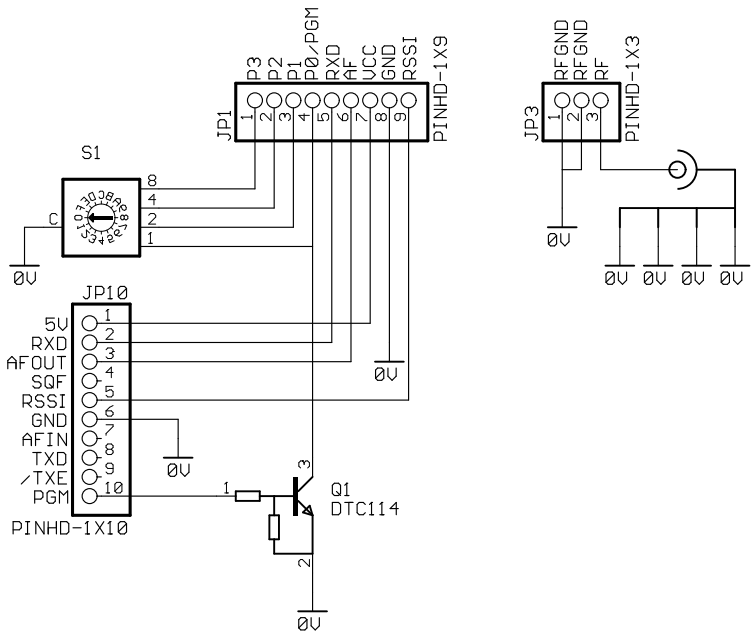


Figure 10: Schematics of main controller board

Narrow band Eval Kit controller IC

The NBEK controller IC can also be ordered separately with equal number of radio modules.

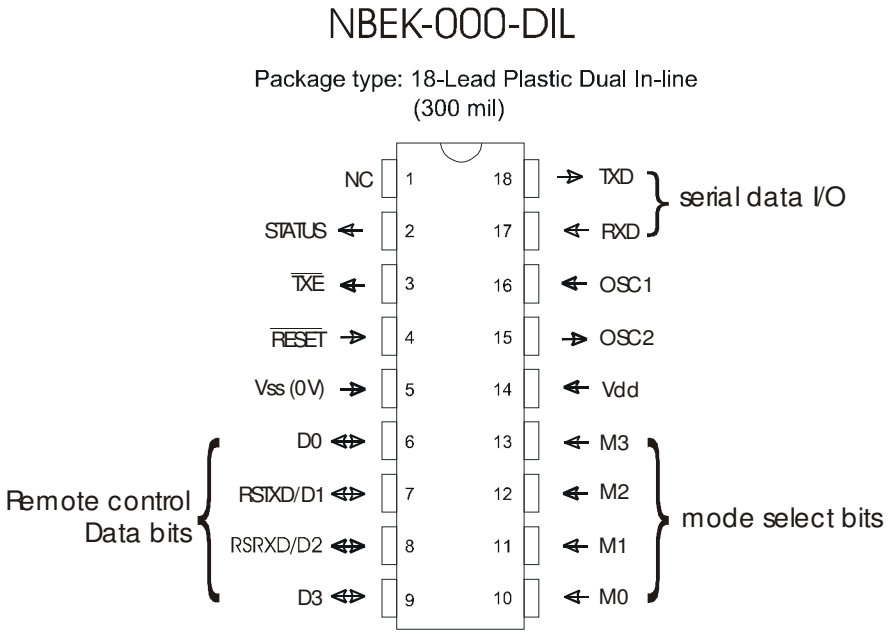


Figure 11: NBEK-000-DIL pinouts

Ordering Information (IC):

NBEK-000-SS - Shrink Small Outline
NBEK-000-SO - Small Outline
NBEK-000-DIL - Plastic Dual In Package

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The Intrastat commodity code for all our modules is: 8542 6000

R&TTE Directive

After 7 April 2001 the manufacturer can only place finished product on the market under the provisions of the R&TTE Directive. Equipment within the scope of the R&TTE Directive may demonstrate compliance to the essential requirements specified in Article 3 of the Directive, as appropriate to the particular equipment.

Further details are available on The Office of Communications (Ofcom) web site:

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