Serial / SPI or I2C Controller

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This module forms an interface between an RS232 serial communications port and any serially programmed chip using a two or three wire interface; primarily SPI and I2C devices.   It consists of a 12F629 PIC that needs to be programmed with firmware specific to the target chip.   EEPROM registers can be programmed to act as a standalone boot-up without having to send additional RS232 data.

Some synthesizer modules have included a PIC carrying an operating system.   This module is functionally identical to that, and useable with the same PIC code. The LMX2541 Synthesizer module is the first one that does not have its own PIC onboard.

Most firmware available uses simple ASCII text based commands to send values expressed in hexadecimal for immediate update, or for storing in EE for immediate boot up ,

The circuit is shown below. (A higher resolution image is available as *SER_SPI_Circuit.gif*) There is no 5V regulator on board, so the PIC needs to get its power from elsewhere.   The circuit diagram shows how this can be supplied from the RS232 interface itself, (the RTS and DTR signal lines) or if a USB serial port is in use, the 5V present on the USB connector can be tapped-off.   Current consumption is only a few milliamps.

The RS232 interface is connected to the 4 or 5 way header as shown, This connector also serves as the In-Circuit programming connector for changing PIC firmware. The letters against this refer to the [G]round, [D]ata, [C]}ock, [P]rogramming and +5V interfaces for the PIC programmer.
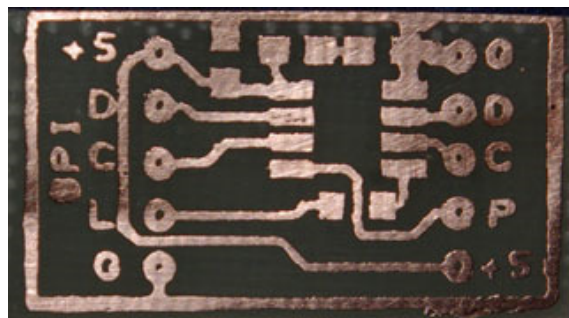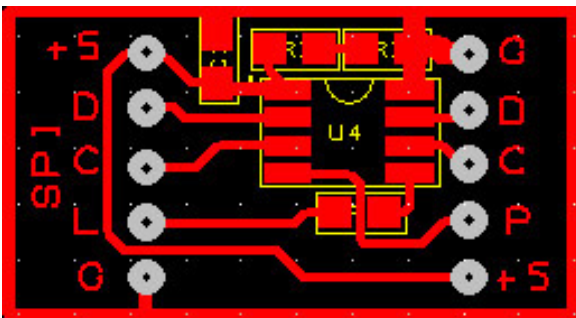
Labels on the SPI interface are [G]round, [L]oad   (or LE), [C]lock, [D]ata and +5V

The four signal SPI pads line up with those on the LMX2541 module. The RS232 / In-Circuit programming header is identical to all other PIC products from the 'JNT stable.

The PCB layout is shown below, with the photograph of a not-quite-perfect one made using Press-N-Peel. Those made using UV-Acetate give better line edge smoothnessof

The resistor shown between pin 5 of the IC and the SPI Load connection is a wire, or zero-ohm, link.   The optional LED and its series resistor are at the top.

Note that the labelling the SPI pads on the board is wrong.   The five pads should be labelled, bottom to top, G D C L +5.   Ie. the positions of L and D should be swapped for use with LMX2470 and 2541 devices. See the note below on connections for other chips.

Use on Other Supply Voltages.

Once programmed, the PIC will run from any supply rail between 2.5 to 5.5V so can be used directly from the Vcc of many synthesizer devices, but take care if going this route.

Firstly, programming the PIC has to be done using a 5V supply – which usually can come from the PIC programmer. If used subsequently on a lower voltage supply make sure all power supply AND data connections are disconnected from the target when device programming.   Secondly, the RS232 interface is specified for 3V minimum. Although the '0' / '1' data slicing threshold in many cases is about 1.8V, this can't always be guaranteed.
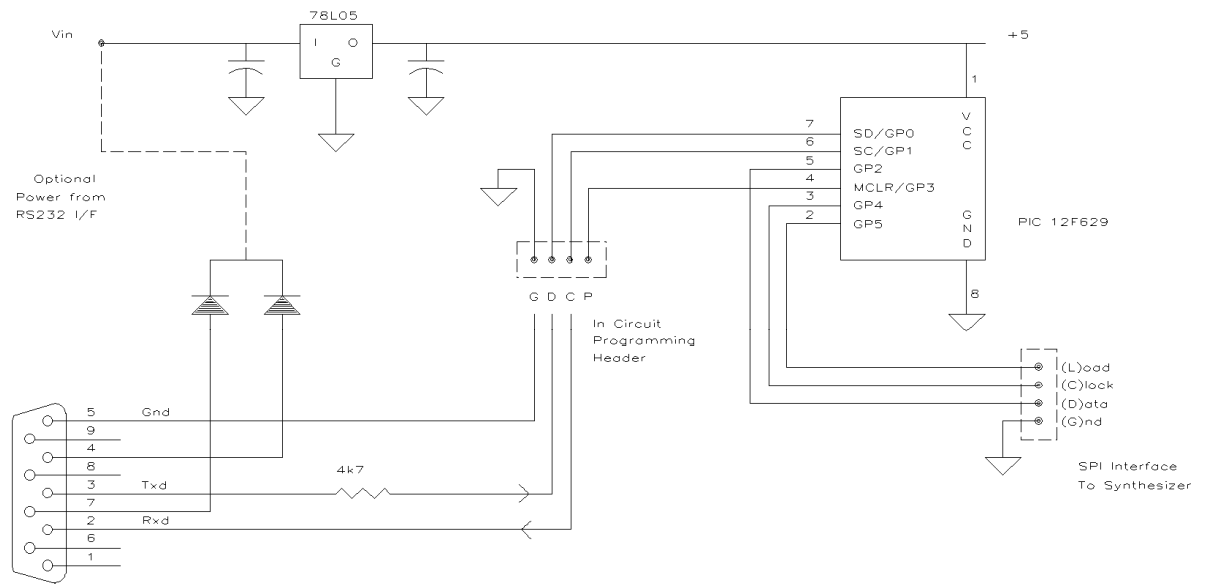

Currently Useable PIC Firmware

Note that not all have the same order of SPI connections. Consult the .ASM file to confirm which is which.   Edit and re-compile this if you wish !   All use the same RS232 interface connection.

Details of the use of each are included with respective synthesizer descriptions, or can be ascertained by examination of the .ASM file. Except where indicated, RS232 speed is 9600 Baud, No parity, 8 bit, 2 stop. 9600-N82

LMX2470CTL2	
LMX2487CTL	
LMX2541CTL	
ADF5355_CTL	
LMX23x6CTL_2	(LE and Data pins swapped)
MC145170CTL	(All pins swapped around),
ADF4150CTL	(LE and Data pins swapped)
SYNTHBLOB02	(For LMX1501 and LMX2310-20, all lines swapped, RS232 1200 baud))
BASICSPI	(Generic SPI firmware, modify .ASM according to needs. LE and Data pins swapped)

At the time of writing, no compatible firmware is available for controlling I2C interfaced devices.

Vin

78L05

I   O

G

+5

Optional
Power from
RS232 I/F

7   SD/GP0
6   SC/GP1
5   GP2
4   MCLR/GP3
3   GP4
2   GP5

1

V
C
C

G
N
D

8

PIC 12F629

G D C P

In Circuit
Programming
Header

(L)oad
(C)lock
(D)ata
(G)nd

SPI Interface
To Synthesizer

5   Gnd
9
4
8
3   Txd
7
2   Rxd
6
1

4k7

RS232 Interface