GPSX
Ubicom Development Board
Data Sheet

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Overview

The GPSX kit allows you to quickly build prototypes or systems with the Ubicom SX. The board has many features, including:

- MAX232/MAX232A RS232 converter with DB-9 connector.
- 7805-compatible regulator circuit.
- In circuit programming connector for the SX-Key
- Ceramic resonator or crystal.
- An edge connector that can plug into a solderless breadboard or connect to other circuitry.

If You Need Help

If you require assistance, please feel free to contact us. The best way to get support is via e-mail (stamp@al-williams.com). However, you may also call between 9AM - 4PM Central Time at (281) 334-4341. You can also fax to (281) 754-4462. Be sure to check out our Web page for updates at www.al-williams.com/awce.

Understanding the Board's Subsystems

The GPSX uses our GPMPU40 PC board which has a hole pattern that supports many different microprocessors. For the SX, you will install a 28 pin socket into the IC2 holes, lining up pin 1 of the socket, with pin 1 of the IC2 pattern (marked IC2A and IC2B).

Each of the 40 pins of IC1 and IC2 connect together. You may use the pins of IC1 and the pins of JP3 and JP4 to make connections to the SX pins. In addition, you may use the unused portion of IC1 and IC2 to place other circuitry (for example, an 8 pin DIP EEPROM) on the board. Finally, each pin also connects to the JP1 and JP2 connector at the edge of the board. Typically, JP1 and JP2

are used to plug into a solderless breadboard, although you can also use it to connect to another circuit board or external circuitry.

None of the pins on the IC sockets are committed. You customize the board for the SX by connecting the board's subsystems (see below) to the appropriate pins on IC1, JP3 and JP4.

The board has several supporting subsystems that make it easy to connect virtually any microprocessor. Depending on your goals, you may or may not need all of the subsystems. The subsystems are:

- Power – A 7805 or compatible regulator provides a 5V power supply on the Vcc and Ground headers.

- Clock – A hole pattern suitable for a ceramic resonator or crystal is present on the CLK header. The GPSX includes a 50MHz ceramic resonator with built-in capacitors.

- Reset – A reset jumper or switch with pull up resistor and a pattern for an optional 3-terminal reset controller are present on the RST header.

- RS232 – A MAX232 provides an RS232 port on the RS header (JP5 and JP6 allow you to customize the RS-232 port).

- Auxiliary Connector (JP7) – This connector allows you to connect the SX Key to the board.

If you are building the board to use with a solderless breadboard, you should install the headers at JP1 and JP2 on the bottom of the board and solder them at the top of the board. This allows you to plug the board directly into a solderless breadboard.

Selecting C1-C4: If you are installing a MAX232, you need 1uF capacitors for C1-C4. If you are installing a MAX232A, then you

need .1uF capacitors instead. If you are not installing IC3, there is no need to install C1-C4.

Special note about electrolytic capacitors: If you use electrolytic capacitors for C1-C4, you must insert them correctly as indicated on the PCB silk screen.

Testing

It is possible to build the board in sections, testing as you go (although this will certainly cause you to violate the tall components last rule). The suggested order of construction is:

- Power supply – install IC4, C5 and C6. Assemble the heat sink (if any) on IC4. Connect a DC supply (unregulated) that supplies 8 to 12 volts between the Vin and Ground pins (or the optional coaxial connector at J2). You should be able to measure 5V between the Vcc and Ground headers with a volt meter. If this does not work, check your connections and make sure IC4 is not backwards.

- RS232 section – Install J1, IC3, and C1-C4. You can test this section using a PC with Hyperterminal and an appropriate cable. First start Hyperterminal and create a connection to the port you are using. Set the serial parameters to 19200 baud, 8 bits, no parity, and one stop bit. Set handshaking to none (very important). You'll also want to disable local echo (in the ASCII setup options).

  The next step is to make sure you have Hyperterminal working properly. Connect the cable to your PC but **not** the GPMPU. Using a test jumper, short pin 2 and 3 of the cable together. When you type into Hyperterminal, you should see what you are typing when the jumper is present and not see anything when you remove the jumper. If you see each character twice, you have local echo enabled (turn it off, or remember that you have it on, it doesn't really matter). If you don't see any characters then you have the wrong port,

or a port conflict with another serial port. You must fix this before you can test the board (or use it with the serial port, for that matter).

Now remove the test jumper from the serial cable. Using a test lead, short pins 11 and 12 of IC3. Plug the serial cable into the GPMPU and apply power to the board (either via the power supply or, if you don't have the power supply, with a 5V regulated supply). When you type in Hyperterminal, you should see what you are typing if everything is functioning (unless you have local echo on, in which case you should see each character *twice*). If this does not work, check for proper insertion of IC3. You should read about +/- 8V on IC3 pins 2 and 6, respectively. If using electrolytic capacitors for C1-C4, check the polarity carefully.

- Processor, clock and reset sections – There isn't much you can do to test the processor-related section other than use them for something. It is a good idea to program a very simple test program to blink an LED, for example, until you are certain the board is assembled properly. Common errors include setting the wrong oscillator fuse bits, or using an unprogrammed processor.

Customization

As explained previously, you must customize the connections between the processor and the various subsystems. Many common processors configurations are described on our Web site. You may find it convenient to wire the customizing jumpers under the board so they do not obstruct the socket and silk screening of the board.

Another method for customizing the board involves replacing components with other components. For example, suppose you don't want to install a MAX232, and you need to do TTL-level serial output. You can fit a wire between IC3 pins 12 and 13 along with another wire between pins 11 and 14.

You can also fit different components in the resonator or crystal holes. For example, a two pin resonator or crystal will fit in the pattern provided.

There are also many substitutions you can make for IC4. For example, you may wish to use a low dropout regulator (a LM2940-CT5.0) or a 78L05 in these holes. I43 faces the inside of the board so that you may fit a heat sink or heat sink the chip to a metal case, if desired.

Normally, the reset jumper is simply two pins and a jumper cap. However, it is possible to insert a small switch (for example, Radio Shack 275-1571) in these holes to create a reset button.

Powering the GPSX

If you have the power supply installed, you simply feed DC voltage into the Vin (+) and Ground (-) terminals. Alternately, you can use a 2mm coaxial connector (center positive). In either case, you must not use an AC voltage. With a standard 7805, you should feed at least 8V to produce a stable 5V supply. A 12 to 15V supply is ideal. Do not exceed the voltage rating of C6 (it is OK to replace C6 with a higher voltage capacitor if you are using a regulator that can handle more voltage).

Be aware that common wall transformers often put out much more than their rated voltage at low loads. A 12V 1A transformer may put out 18V or more at 100mA. Conversely, you may be able to use a transformer rated at a lower voltage (say, 6V) if you are drawing less current than the transformer expects to supply.

With a 12V input and a standard 7805, you should be able to draw at least 1A (although you will probably need to add a heat sink if you draw too much current).

If you don't build the power supply, you can also feed **regulated** 5V directly to the board's power buss. In particular, you can feed

+5V into the Vcc and Ground headers. You can also feed +5V into the hole for IC4 pin 3 and the ground connection to IC4 pin 2.

Even if you aren't using the onboard power supply, you should install C5. This filters noise from the power supply. You can also install a jumper from IC4 pin 1 to IC4 pin 3 and use C6 as a larger filter capacitor if you aren't using IC4.

About the RS232 Interface

The DB9 connector has two levels of customization available. First, the T R t and r terminals on the RS header allow you connect to the MAX232 level converter. The T and R terminals are the main transmit and receive lines, respectively. The t and r terminals connect to the auxiliary transmitter and receiver.

JP5 allows you to route the main transmit and receive signals to pins 2 and 3 of the DB9. Near the edges of JP5 you'll see T R 3 and 2 marked. If you place jumpers from 3 to T and 2 to R, the DB9 will be suitable for connecting to a PC (that is, it will be wired DCE). On the other hand, you can jumper between 3 and R and T and 2 to get a DTE connection suitable for a modem, for example. If you wish, you can install pins in these locations and switch on the fly with jumper caps.

Pin 5 of the DB9 is always connected to ground. The remaining pins appear on JP6 as follows:

JP6-1 J1-1

JP6-3 J1-4

JP6-5 J1-6

JP6-7 J1-7

JP6-9 J1-8

JP6-11 J1-9

In addition, JP6-2, JP6-4, and JP6-6 connect to the MAX232's auxiliary receiver (which eventually winds up at the r terminal of the RS header). JP6-8, JP6-10, and JP6-12 connect to the MAX232's auxiliary transmitter (which winds up at the t terminal of the RS header). By using short jumper wires, you can connect one input and one output to the MAX232. For example, you could connect RTS and CTS. You would also connect r and t to the pins of JP3 and JP4 that match the I/O port on your processor that you wish to use for these signals.

Using JP7

JP7 simply connects to JP8. If you follow the directions, you can use these holes to connect an SX Key. Because the Key is not polarized, be careful not to reverse the Key when inserting it into the headers.

JP1/2 Mapping

Since the SX only uses 28 pins, you will have room to place other devices in the remaining pins of IC1/IC2. Keep in mind that the JP2 header numbers will not match up as you would expect. For example, pin 28 of the SX chip appears at pin 40 on IC1/IC2..

Use this table to help you decode the correct pin numbers

JP2 Pin	SX
20	28
19	27
18	26
17	25
16	24
15	23
14	22
13	21
12	20
11	19
10	18
9	17
8	16
7	15
6	
7	

Bill of Materials

C1, C2, C3, C4 – If IC3 is a MAX232, then 1uF; if IC3 is a MAX232A, then .1uF, 16V minimum

C5 – .1uF capacitor, 16V minimum

C6 – 220uF (or larger) capacitor, 35V minimum

IC1/IC2 – 28 pin socket with SX28 IC

IC3 – Maxim MAX232 or MAX232A

IC4 – 7805 regulator (or equivalent, see text)

J1 – Right angle female DB9 (short reach style)

R1 – 10K to 22K resistor

X1 – 50MHz resonator

Optional:

Header pins or connectors for interface holes

Heat sink and hardware for IC4

Configuration

The GPMPU40 board requires jumpers to connect the various subsystems to the SX chip. Make the connections as described in this table:

First Connection	Second Connection	Notes
JP3-2	Vcc	+5V
JP3-4	Ground	Ground
JP4-20	RST-1	Reset
JP4-19	CLK-1	Clock
JP4-18	CLK-2	Clock
JP4-19 (use IC1 pin 39)	JP8-1	SXKey connection on JP7
JP4-18 (use IC1 pin 38)	JP8-2	SXKey connection on JP7
Vcc	JP8-3	SXKey connection on JP7
Ground	JP8-4	SXKey connection on JP7

Note: The SX does not have a dedicated serial port. However, it is possible to connect the RS232 port to any general purpose I/O pins with the appropriate softwater (e.g., a virtual peripheral UART) driving those pins.

Figure 1. Circuit Diagram

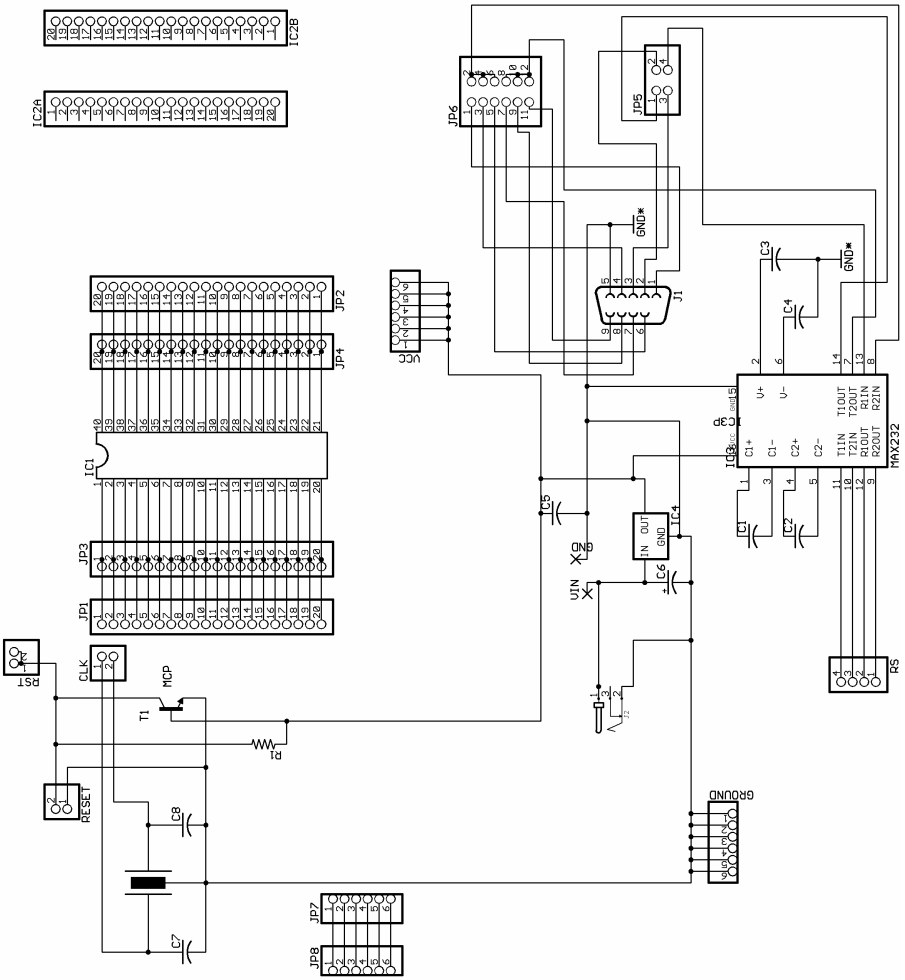

Figure 2. Board Layout