ServoPod-USB™

User's Manual

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Internet Access

Web site: http://www.newmicros.com

This manual: http://www.newmicros.com/store/product_manual/ServoPod-USB.zip

Email technical questions: techsupport@newmicros.com

Email sales questions: nmisales@newmicros.com

Internet ServoPod-USB™ Discussion List

We maintain the ServoPod-USB™ discussion list on our web site. Members can have all questions and answers forwarded to them. It's a way to discuss ServoPod-USB™ issues.

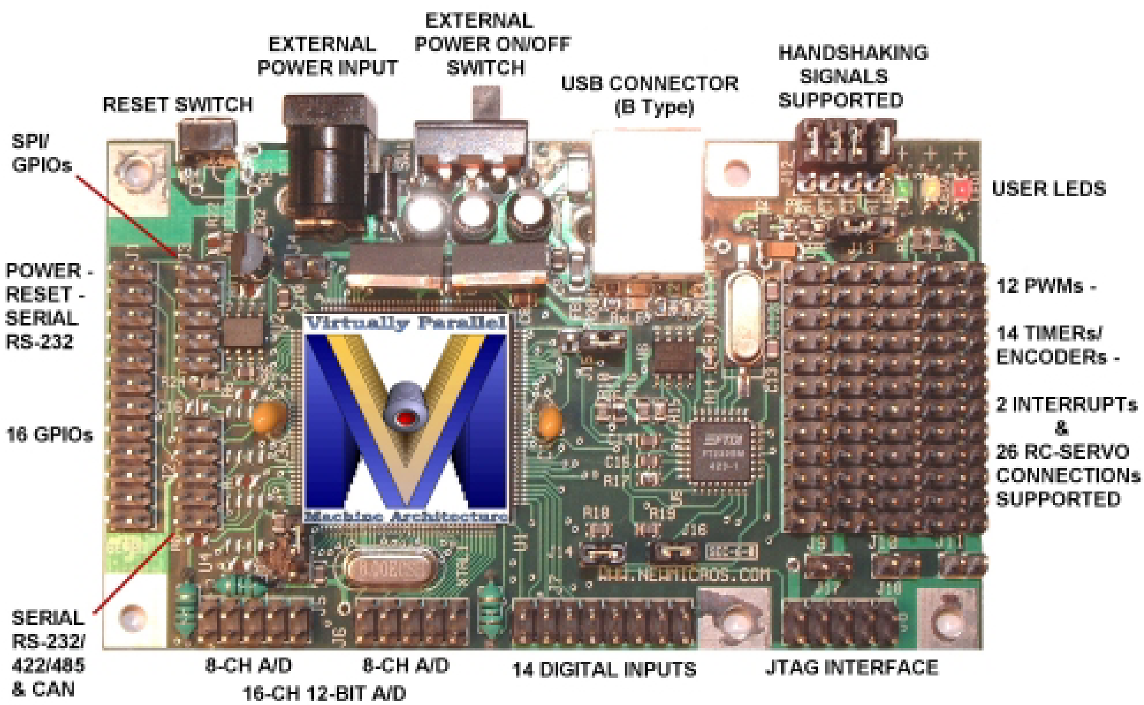
To subscribe to the ServoPod-USB™ list, visit the Discussion section of the New Micros, Inc. website.
http://www.newmicros.com/discussion/

This manual is valid with the following software and firmware versions:
IsoMax™ V 0.6 or newer.

If you have any questions about what you need to upgrade your product, please contact New Micros, Inc.

GETTING STARTED

Thank you for buying the ServoPod-USB™. We hope you will find the ServoPod-USB™ to be the incredibly useful small controller board we intended it to be, and easy to use as possible.

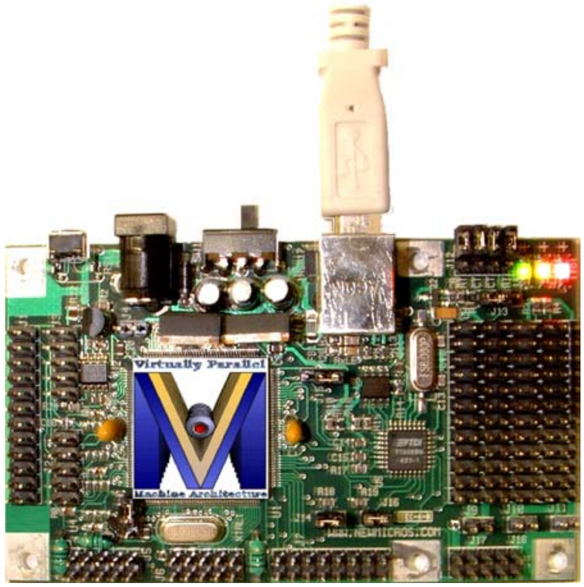


If you are new to the ServoPod-USB™, we know you will be in a hurry to see it working. Once we've got communications, then we can make some lights blink and know for sure we're in business. Let's make this "Pod" talk to us!

First, you need to download and install the following driver and program on your PC,

- Download the Virtual COM Port (VCP) USB driver from the link below,
http://www.ftdichip.com/FTDriver.htm

- Terminal Program, NMITerm
http://www.newmicros.com/download/software/NMI/NMITerm.zip



Connect the provided USB (A to B type) cable from the PC to the ServoPod-USB™.
All three LED's should come on within a short delay after the USB cable is plugged in.
If the LED's don't come on after more than a few seconds, unplug the USB cable quickly. Please see the trouble shooting section of this manual or contact NMI technical support for help, before going any further.

As soon as the USB cable is plugged in, the PC will pop up the message: " Found New Hardware". It will ask to install the driver, usually when you install the driver for the first time. You can either let it automatically searches for the USB driver (make sure to unzip the file after downloading), or you can manually browse the window for the USB driver where it was downloaded and unzipped earlier. Once the FTDI USB driver is installed, you can open the communication program, NMITerm. The NMITerm program will open with the default configuration for 9600 baud, 8N1, and the COM port will be automatically detected. Keep in mind, you must first connect the USB cable prior to opening the terminal program in order for the NMITerm to recognize the USB COM port with auto detection. If NMITerm detects other available serial COM port instead of USB COM port, click on the NMITerm Options menu, ***Options>Settings>Serial COM Port,*** change the COM Port along with the new baud rate 115,200. Then click on APPLY, and OK buttons to save the new settings. If you are not sure which COM Port that is used by USB⇔Serial, you can look up under:
Start>Settings>Control Panel>System>Hardware>Device Manager>Ports(COM & LPT)

If everything is setup correctly, pressing the reset button on the ServoPod-USB™ the terminal program should show "***IsoMax™ Vx.x***", and each time you hit an Enter key the NMITerm will respond with "**OK**". Seeing this message means the communication is established.

Congratulations! Now let's do something interactive with the ServoPod-USB™.

Let's try to blink the LEDs. First, make sure the Caps Lock key is ON. At the Terminal prompt enter the following and watch the LEDs respond ,

REDLED OFF <return>
REDLED ON <return>
YELLED OFF <return>
YELLED ON <return>
GRNLED OFF <return>
GRNLED ON <return>

Now you should have a good feeling because you can tell your ServoPod-USB™ is working. It's time for an overview of what your Servopod-USB™ has for features.

FEATURES

- DSP56F807 MPU, 16-bit processor
- Up to 40 MIPS at 80 MHZ core frequency
- Memory & Configuration Modes
  - Mode A (internal only)
    - 60K x 16 Program Flash
    - 2K x 16 Boot Flash
    - 8K x 16 Data Flash
    - 2K x 16 Program ram
    - 4K x 16 Data Ram
  - Mode B (internal & external combine)
    - 32K x 16 Program Flash (internal)
    - 2K x 16 Boot Flash (internal)
    - 8K x 16 Data Flash (internal)
    - 2K x 16 Program ram (internal)
    - 32K x 16 Program ram (external)
    - 4K x 16 Data Ram (internal)
    - 48K x 16 Data Ram (external)
  - Mode 3 (external only) - IsoMax does not support this mode. Assembly, C, Codewarrior, and other Third party compilers are supported. Jtag-cable-10P is required
    - 64K x 16 Program Ram
    - 64K x 16 Data Ram

  Note: Mode 0 is included Mode A & B. Mode 1 & 2 is supported by other member of DSP56800 family, ROM-based MPU's only.

- Two Serial Communication Interface,
  - Jumper configurations:
    - SCI0 default configures for USB⇔Serial, and SCI1 for RS-232
    - or, Both SCI0 & SCI1 for Serial RS-232 interfaces
  - Optional configurations below are only available per special request.
    - SCI0 for USB, and SCI1 for TTL or RS-422/485
    - Or, SCI0 for RS-232, and SCI1 for TTL or RS-422/485
- Serial Peripheral Interface (SPI)
- CAN 2.0 A/B module
  - SN65HVD230, 3V CAN Transceiver
  - Multiple boards can be network (MSCAN)
  - Ideal for harsh or noisy environments, like automotive applications
- Programmable bit rate up to 1Mbit
- Up to 22 GPIO lines, atleast 10 are shared with external memory address/data lines
- Two 8-channel 12-bit ADCs
  - Single Conversion is 1.7us (8.5 ADC cycles)
  - Continuous Conversion is 1.2us (6 ADC cycles)
  - Simultaneous conversion on each ADC
  - Single ended or differential inputs
  - Signed or unsigned results
  - ADC can be sync'd with PWM
  - Optional interrupts:
    - at end of scan

        - out-of-range limit
        - zero crossing
        - Programmable high limit
        - Programmable low limit
        - Programmable offset
- Up to six General Purpose Quad Timers
    - Each channel has its own timebase, 4 16-bit timers
    - Count up/down
    - Cascadable
    - Four channels, each programmable as input capture or output compare
    - Input capture trigger rising edge, falling edge, or any edge
    - Output capture action Set, reset or toggle
    - External sync input
- Two Quadrature Decoder
    - 32-bit position counter
    - 16-bit position counter
    - 16-bit revolution counter (initialize by SW or external event)
    - 40MHZ count frequency (up to)
    - Logic to decoder quadrature signals
    - Configurable digital filter for inputs
    - Watchdog timer to detect stalled shaft
- 12-channel PWM module
    - 15-bit counter with programmable resolutions down to 25ns
    - 12 independent outputs or six complementary pairs of outputs
    - Center aligned or Edge aligned pulses
    - Automatic dead time insertion for complementary outputs
- 6-current sense pins, or Digital Inputs
- 6-fault pins, or Digital Inputs
- JTAG/OnCE port for debugging
- Examine registers, memory, of peripherals
    - Set breakpoints, Step, or trace instructions
    - Full-duplex synchronous operation on four-wire interface, Master or Slave
- WatchDog Timer/COP module
    - COP is CPU clock divided by 16384
- Low voltage, Stop, Wait, and Sleep Modes
- Three user's leds: Red, Yellow, Green
- Onboard 5V & 3V linear regulators
- External Power On/Off switch
- Push Button Reset switch
- Header Connectors for 26 RC-Servos
- Board Size: 2.3"(W) x 4.0"(L) x 0.6"(H)

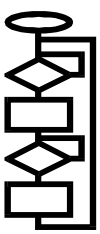
INTRODUCTION

What is neat about the ServoPod-USB™? Several things. First it is a very good micro controller. There is no need for an additional power supply to power the micro-controller for program development other than an USB cable connects from your PC or laptop to the ServoPod-USB™. The ServoPod-USB™ can steal the power directly from the PC or laptop via USB cable. The ServoPod-USB™ was intended to be as small as possible, while still being useable. A careful balance between dense features, and access to connections is made here. Feature density is very high. So secondly, having connectors you can actually "get at" is also a big plus.

What is the use of a neat little computer with lots of features, if you can conveniently only use one of those features at a time?

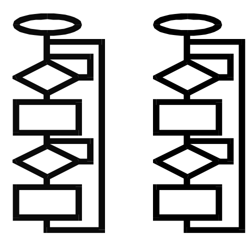
The answer is very important. The neatest thing about the ServoPod-USB™ is software giving Virtually Parallel Machine Architecture!

Virtually Parallel Machine Architecture (VPMA) is a new programming paradigm. VPMA allows small, independent machines to be constructed, then added seamlessly to the system. All these installed machines run in a virtually parallel fashion.



In an ordinary high level language, such as C, Basic, Forth or Java, most anyone can make a small computer do one thing well. Programs are written flowing from top to bottom. Flow charts are the preferred diagramming tools for these languages. Any time a program must wait on something, it simply loops in place. Most conventional languages follow the structured procedural programming paradigm. Structured programming enforces this style.

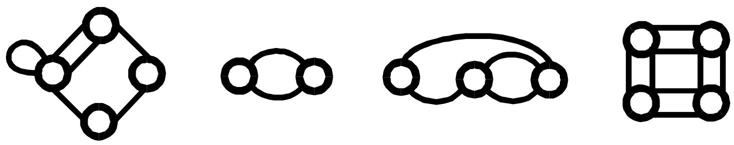
Getting two things done at the same time gets tricky. Add a few more things concurrently competing for processor attention, and most projects start running into serious trouble. Much beyond that, and only the best programmers can weave a program together running many tasks in one application.



Most of us have to resort to a multitasking system. (Windows and Linux are the most obvious examples of multitasking systems.) For a dedicated processor, a multitasking operating system adds a great amount of overhead for each task and an unpleasant amount of program complexity.

The breakthrough in IsoMax™ is the language is inherently "multitasking" without the overhead or complexity of a multitasking operating system. There's really been nothing quite like it before. Anyone can write a few simple machines in IsoMax™ and string them together so they work.

Old constrained ways of thinking must be left behind to get this new level of efficiency. IsoMax™ is therefore not, and cannot be, like a conventional procedural language. Likewise, conventional languages cannot become IsoMax™ like without loosing a number of key features which enforces Structured Programming at the expense of Isostructure.



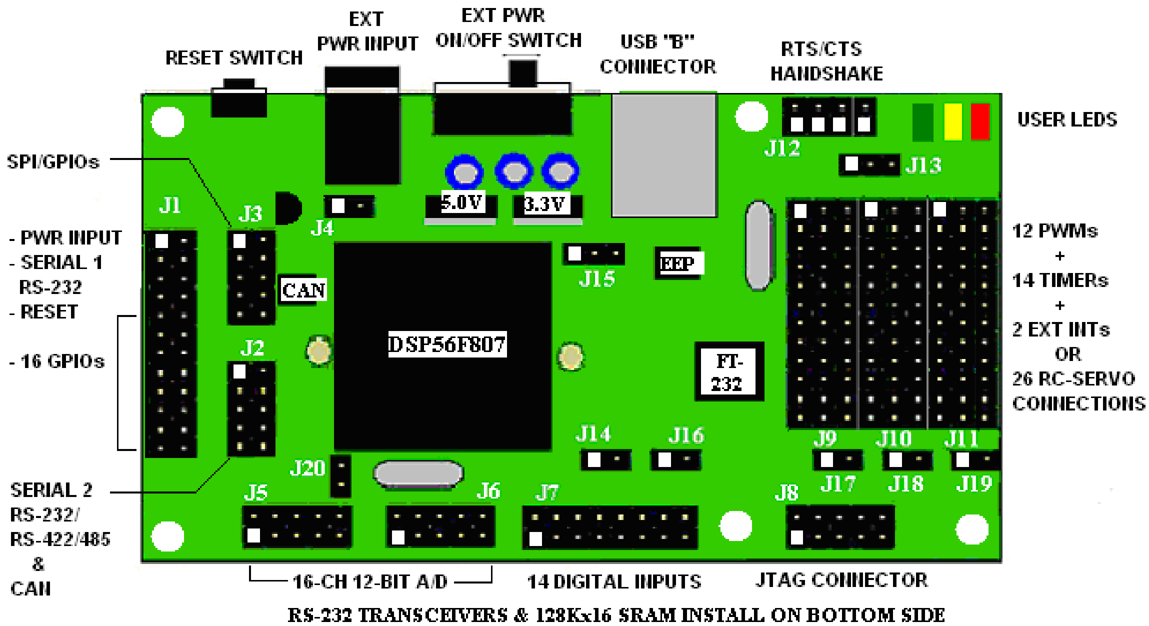
In IsoMax™, all tasks are handled on the same level, each running like its own separate little machine. (Tasks don't come and go, like they do in multitasking, any more than you'd want your leg to come and go while you're running.) Each machine in the program is like hardware component in a mechanical solution. Parts are installed in place, each associated with their own place and function.

Programming means create a new processor task fashioned as a machine, and debug it interactively in the foreground. When satisfied with performance, you install the new machine in a chain of machines. The machine chain becomes a background feature of the ServoPod-USB™ until you remove it or replace it.

The combination of VPMA software and diverse hardware makes ServoPod-USB™ very versatile. It can be used as a stand-alone computer board, deeply embedded inside some project. It can be the controller on a larger PCB board. An ServoPod-USB™ brings an amazing amount power to a very small space, at a very reasonable cost. You'll undoubtedly want to have a few ServoPod-USB™ 's on hand for your future projects.

QUICK TOUR

Start by comparing your board to the diagram below. Most of the important features on the top board are labeled.



The table below gives a brief description of each connector, jumper and the signals involved.

J1	SCI0, Power, General Purpose I/O	Serial, Power, Ports PA0 – PA7, PB0 – PB7
J2	SCI 1, CAN	RS232(or RS422/485), and CANH, CANL
J3	SPI/GPIO's	SCLK, MISO, MOSI, SS, PE2, PE3, RSTO
J4	Alternate Power Input Connector	Vin & Ground, Controller Power Inputs
J5	A/D 0 to 7	First 8 ADC channels
J6	A/D 8 to 15	Second 8 ADC channels
J7	Fault and Status for PWM	FaultA0-3, FaultB0-3, ISA0-2, ISB0-2
J8	JTAG	JTAG Interface
J9	PWM pins	PWMA0-5, PWMB0-5
J10	Motor Encoder x 2/Timers	Phase A, B, Index, Home x 2(or TA0-3,TB0-3)
J11	Timers and Interrupts	TC0, TC1, TD0-3, IRQA, IRQB
J12	Two wire handshaking	RTS, CTS handshaking signals, RI wakeups
J13	Controller powers selection	uP powers by USB bus or external supply
J14	External Memory Disable/Enable	External Ram Chip select Disable/Enable
J15	SCI0 USB/RS-232 selection	USB transmitter/RS-232 Receiver selection
J16	USB chip Self/Bus powered	USB powers by USB bus or external supply
J17	Alternate Servo Power Input Con.	+V & GND
J18	Alternate Servo Power Input Con.	+V & GND
J19	Alternate Servo Power Input Con.	+V & GND
J20	Internal Memory Disable/Enable	Boot from Internal or External Memory

CONNECTOR PIN ASSIGNMENTS

J1, POWER, SERIAL, GPIO's

+VIN	1	2	SOUT
GND	3	4	SIN
RST'	5	6	ATN'
+5V	7	8	GND
PA0	9	10	PB0
PA1	11	12	PB1
PA2	13	14	PB2
PA3	15	16	PB3
PA4	17	18	PB4
PA5	19	20	PB5
PA6	21	22	PB6
PA7	23	24	PB7

Note: In picture above, Pin 1 is at upper left viewing CPU side with J1 at left.
This connector pin out and pin numbering scheme is unique to this one instance. Origin of pin out and numbering is to match stamp-like connection pin outs.

J3, SPI – GPIO's

+5V	1	2	GND
+3V	3	4	SCLK
RSTO	5	6	MOSI
PE2	7	8	MISO
PE3	9	10	SS'

J5, ADC 0-7

VSSA	ANA1	ANA3	ANA5	ANA7
2	4	6	8	10
1	3	5	7	9
VREF	ANA0	ANA2	ANA4	ANA6

J2, CAN – RS-232(or 422/485)

RxD1/+XMT	1	2	+3V
TxD1/-XMT	3	4	GND
GND	5	6	CANL
SIN1/-RCV	7	8	GND
SOUT1/+RCV	9	10	CANH

J6, ADC 8-15

VSSA	ANA9	ANA11	ANA13	ANA15
2	4	6	8	10
1	3	5	7	9
VREF2	ANA8	ANA10	ANA12	ANA14

J7, Various Inputs

+3V	ISA0	ISA1	ISA2	ISB0	ISB1	ISB2	GND
2	4	6	8	10	12	14	16
1	3	5	7	9	11	13	15
FA0	FA1	FA2	FA3	FB0	FB1	FB2	FB3

FAx: FAULT0-3 , FBx: FAULTB0-3

J9, PWM Servo Output

	Sig.	+V	GND
PWMA0	1	2	3
PWMA1	4	5	6
PWMA2	7	8	9
PWMA3	10	11	12
PWMA4	13	14	15
PWMA5	16	17	18
PWMB0	19	20	21
PWMB1	22	23	24
PWMB2	25	26	27
PWMB3	28	29	30
PWMB4	31	32	33
PWMB5	34	35	36

J10, Motor Encoder/Timers

	Sig.	Power	Power
+5V	1	2 +V	3 +3V
GND	4	5 GND	6 GND
PH A 0/TA0	7	8 +V	9 GND
PH B 0/TA1	10	11 +V	12 GND
IND 0/TA2	13	14 +V	15 GND
HM 0/TA3	16	17 +V	18 GND
+5V	19	20 +V	21 +3 V
GND	22	23 GND	24 GND
PH A 1/TB0	25	26 +V	27 GND
PH B 1/TB1	28	29 +V	30 GND
IND 1/TB2	31	32 +V	33 GND
HM 1/TB3	34	35 +V	36 GND

J8, JTAG

+3V	1	2	GND
TDI	3	4	GND
TDO	5	6	TMS
TCK	7	8	DE
RESET	9	10	TRST

J11, Timers & IRQ

	Sig.	Power	Power
+5V	1	2 +V	3 +3V
GND	4	5 GND	6 GND
TC0	7	8 +V	9 GND
TC1	10	11 +V	12 GND
IRQA	13	14 +V	15 GND
IRQB	16	17 +V	18 GND
+5V	19	20 +V	21 +3V
GND	22	23 GND	24 GND
TD0	25	26 +V	27 GND
TD1	28	29 +V	30 GND
TD2	31	32 +V	33 GND
TD3	34	35 +V	36 GND

J12, Handshaking Signals

2 PD0	4 PD1	6 GND	8 PD2
1 RTS	3 CTS	5 CTS	7 RI

J4, Alt. Controller Power Input

1	2
VIN	GND

J18, Servo Power Input

1	2
+V	GND

J17, Servo Power Input

1	2
+V	GND

J19, Servo Power Input

1	2
+V	GND

JUMPER CONFIGURATIONS

J12 , ***Handshaking signal jumper settings:***

- Two wire handshake. Connect pin 1 & 2(RTS ⇔ PD0), and pin 3 & 4(CTS ⇔ PD1). Since the DSP processor does not have the actual handshaking signals, Port PD0 & PD1 are used to implement the CTS & RTS signals.
- Single wire handshake. Connect Pin 1 & 2 (RTS ⇔ PD0), and pin 5 & 6 (CTS⇔ GND).
- PD2 can be used to wake-up the PC through USB Ring Indicator input pin, RI. Connect pin 7 & 8(RI ⇔ PD2). To use this feature, the remote wake-up must be enabled in the serial eeprom, 93C64A. Please see the USB appnotes from the manufacture for details, http://www.ftdichip.com/FTApp.htm or, http://www.ftdichip.com/

  Since port PD0-PD2 are also sharing with the LEDs control signals. Removing the jumpers is suggested for applications which are not required for Handshaking, or waking up the PC.

J13, ***Controller power options:***

- Option 1(default), Controller powers by USB bus powered. Pin 1 & 2 are connected. Also J15 pin 2 & 3 are connected.
- Option 2, Controller powers by external supply. Pin 2 & 3 are connected.

Warning, if you are intending to use option 2, external supply with USB cable connection for program development then you must power the ServoPod-USB™ with the external supply prior to plugging in the USB cable to prevent the PC power shutting down due to the use of exceeding the power limitation by USB bus during power up condition.

J14, ***Enable/Disable the external memory with the jumper Close/Open respectively.***

J15, ***SCI0, Primary Serial interface configurations:***

- Default configuration for USB⇔Serial interface, pin 2 & 3 are connected.
- For RS-232 interface, pin 1 & 2 are connected.

J16, ***USB chip powers by USB bus (close), or powers by external supply (open).***

J20, ***Program boots from internal memory (open), or external memory (close).***

- IsoMax™ language is required to boot from the internal flash program memory. It only supports Mode 0 (A & B).
- CodeWarrior & other third party compilers can support Mode 0, and Mode 3 only.

CONTROLLED I/O's

Port line PD0 controls the RED LED. At reset PD0 signal is tri-state, it forces the inverter output, AC05 goes low, this makes the RED LED come on. When the port pin is configured for output, a low signal will turn off the LED, and vice versa.

Port line PD1 controls the YELLOW LED. At reset PD1 signal is tri-state, it forces the inverter output, AC05 goes low, this makes the YELLOW LED come on. When the port pin is configured for output, a low signal will turn off the LED, and vice versa.

Port line PD2 controls the GREEN LED. At reset PD2 signal is tri-state, it forces the inverter output, AC05 goes low, this makes the GREEN LED come on. When the port pin is configured for output, a low signal will turn off the LED, and vice versa.

Port line PD3 controls the RS-485 transceiver. A pull down resistor normally enables the receiver, if the port line is inactive. When the port pin is configured for output, a low signal will enable the RS-485 receiver input. A high signal will enable the RS-485 transmitter output.

Port line PD4 controls the RS-232 receiver disable/enable. A pull down resistor normally enables the receivers, if the port line is inactive.

Port line PD5 controls the RS-232 transmitter shutdown. A pull up resistor normally enable the transmitter, if the port line is inactive.

Port line PE2 controls the CAN transceiver mode, high-speed mode or silent mode. A pull down resistor normally selects high-speed mode, if the port line is inactive.

MEMORY MAP

Program Memory

Address (hex)	**Mode 0 (A)**
0000-0003	Boot Flash 1
0004-7FFF	Program Flash 1
8000-EFFF	Program Flash 2
F000-F7FF	Program Ram
F800-FFFF	Boot Flash 2

Address (hex)	**Mode 0 (B)**
0000-0003	Boot Flash 1
0004-6FFF	Program Flash
7000-77FF	Program RAM
7800-7FFF	Boot Flash 2
8000-FFFF	External Program Ram

Address (hex)	**Mode 3** (IsoMax is not supported)
0000-FFFF	External Program RAM

Data Memory

Address (hex)	**EX=0**
0000-0FFF	Internal Data Ram
1000-17FF	Peripherals
1800-1FFF	Reserved
2000-3FFF	Internal Data Flash
4000-FF7F	External Data Ram
FF80-FFFF	Core Registers

Address (hex)	**EX=1** (IsoMax is not supported)
0000-FF7F	External Data RAM
FF80-FFFF	Core Registers

DATA MEMORY PERIPHERAL REGISTER ADDRESS

Address Range (hex)	Base Address (hex)
1000-100F	SYS_BASE=1000
1010-10FF	Reserved
1100-111F	TmrA_BASE=1100
1120-113F	TmrB_BASE=1120
1140-115F	TmrC_BASE=1140
1160-117F	TmrD_BASE=1160
1180-11FF	CAN_BASE=1180
1200-121F	PWMA_BASE=1200
1220-123F	PWMB_BASE=1220
1240-124F	DEC0_BASE=1240
1250-125F	DEC1_BASE=1250
1260-127F	ITCN_BASE=1260
1280-12BF	ADCA_BASE=1280
12C0-12FF	ADCB_BASE=12C0
1300-130F	SCI0_BASE=1300
1310-131F	SCI1_BASE=1310
1320-132F	SPI_BASE=1320
1330-133F	COP_BASE=1330
1340-135F	PFIU_BASE=1340
1360-137F	DFIU_BASE=1360
1380-139F	BFIU_BASE=1380
13A0-13AF	CLKGEN_BASE=13A0
13B0-13BF	GPIOA_BASE=13B0
13C0-13CF	GPIOB_BASE=13C0
13D0-13DF	Reserved
13E0-13EF	GPIOD_BASE=13E0
13F0-13FF	GPIOE_BASE=13F0
1420-143F	PFIU2_BASE=1420

For more detail about each individual register address, please see the DSP56F80x User's Manual link below,
http://www.freescale.com/files/dsp/doc/user_guide/DSP56F801-7UM.pdf

Instructions for Wiring a Serial Cable on J1 Connector

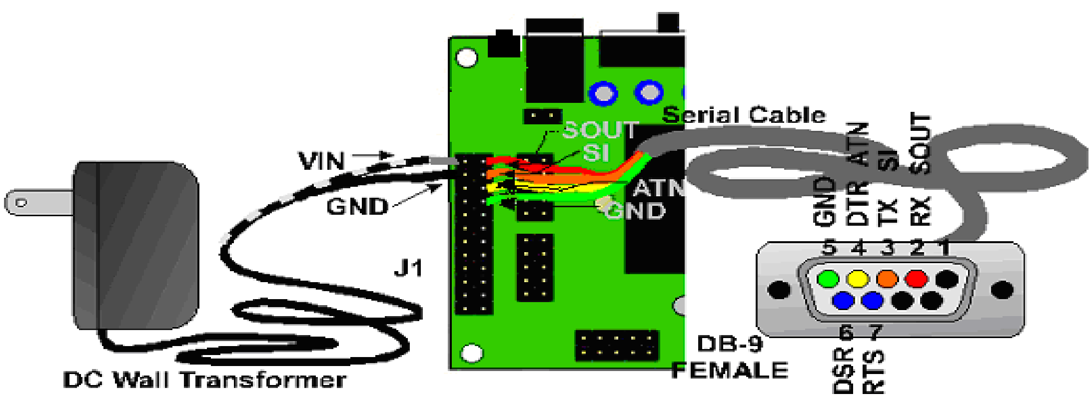
To use this option, RS-232 interface on SCI0. J15 must jumper on pin 1 & 2

Transformer hook up

Black w/Striped White +VIN	1	2	SOUT
Solid Black GND	3	4	SIN
RST'	5	6	ATN'
+5V	7	8	GND
PA0	9	10	PB0
PA1	11	12	PB1
PA2	13	14	PB2
PA3	15	16	PB3
PA4	17	18	PB4
PA5	19	20	PB5
PA6	21	22	PB6
PA7	23	24	PB7

Serial Cable hook up

+VIN	1	2	SOUT RED
GND	3	4	SIN ORANGE
RST'	5	6	ATN'YELLOW
+5V	7	8	GND GREEN
PA0	9	10	PB0
PA1	11	12	PB1
PA2	13	14	PB2
PA3	15	16	PB3
PA4	17	18	PB4
PA5	19	20	PB5
PA6	21	22	PB6
PA7	23	24	PB7



J1 Pin	Preferred Color	DB-9 Pin	DB-25 Pin
2 SOUT	RED	2 RX	3 TX
4 SIN	ORANGE	3 TX	2 RX
6 ATN	YELLOW	4 DTR	20 DTR
8 GND	GREEN	5 GND	7 GND
		6 DSR	6 DSR
		7 RTS	20 RTS

TROUBLE SHOOTING

There are no user serviceable parts on the ServoPod-USB™. If connections are made correctly, operation should follow, or there are serious problems on the board. As always, the first thing to check in case of trouble is checking power and ground are present. Measuring these with a voltmeter can save hours of head scratching from overlooking the obvious. After power and ground, signal connections should be checked next. If the serial cable comes loose, on either end, using your PC to debug your program just won't help. Also, if your terminal program has locked up, you can experience some very "quiet" results. Don't overlook these sources of frustrating delays when looking for a problem. They are easy to check, and will make a monkey of you more times than not, if you ignore them.

One of the great advantages of having an interactive language embedded in a processor, is if communications can be established, then program tools can be built to test operations. If the RS-232 channel is not in use in your application, or if it can be optionally assigned to debugging, talking to the board through the language will provide a wealth of debugging information.

The LED's can be wonderful windows to show operation. This takes some planning in design of the program. A clever user will make good use of these little light. Even if the RS-232 channel is in use in your application and not available for debugging, don't overlook the LED's as a way to follow program execution looking for problems.

The ServoPod-USB™ is designed so no soldering to the board should be required, and the practice of soldering to the board is not recommended. Instead, all signals are brought to connectors. That's one of the reasons it is called a "Pod", it can be plugged in and pulled out as a module.

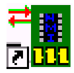
So, the best trouble shooting technique would be to unplug the ServoPod-USB™ and try to operate it separately with a known good serial cable on power supply.

If the original connections have been tested to assure no out-of-range voltages are present, a second ServoPod-USB™ can then be programmed and plugged into the circuit in question. But don't be too anxious to take this step. If the first ServoPod-USB™ should be burned out, you really want to be sure you know what caused it, before sacrificing another one in the same circuit.

Finally, for advanced users, the JTAG connection can give trace, single step and memory examination information with the use of special debugging hardware. This level of access is beyond the expected average user of the ServoPod-USB™ and will not be addressed in this manual.

NMITerm

Provided Windows terminal program from New Micros, Inc. Usually provided in a ZIP. Un ZIP in a subdirectory, such as C:\NMITerm. To start the program: click, or double click, the program icon.



NMITerm.LNK

NMITerm is a simple Windows-based communications package designed for program development on serial port based embedded controllers. It runs under Windows.

NMITerm provides:

1. Support for COM1 through COM16.
2. Baud rates from 110 through 256000.
3. Control over RTS and DTR lines.
4. Capture files, which record all terminal activity to disk.
5. Scroll-back buffer, editable and savable as a file.
6. On-line Programmer's Editor.
7. File downloader.
8. Programmable function keys.

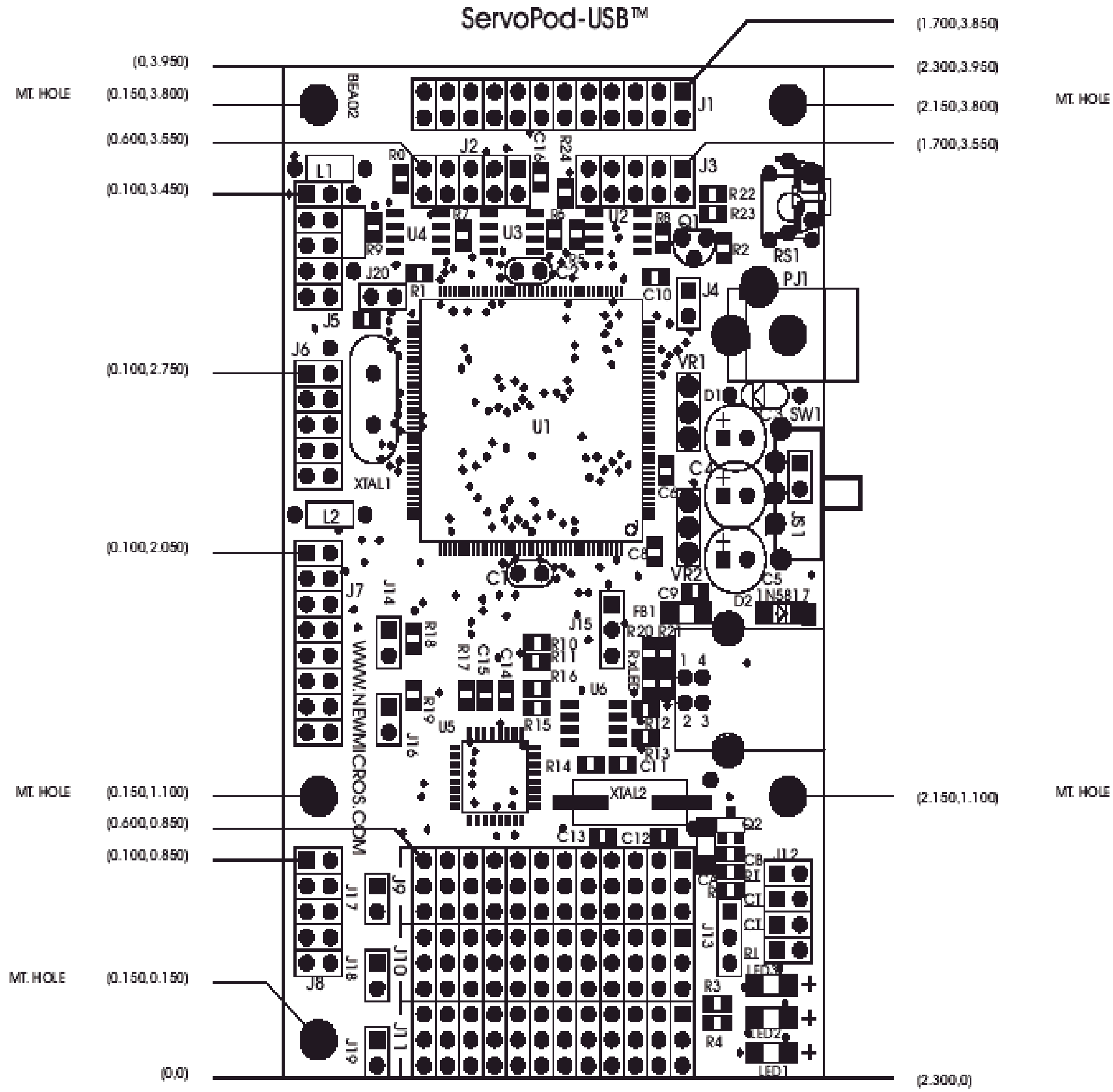
Quick start commands:

Baud: default 9600
DTR On/Off : ALT+T
Download: ALT+D

For further information use the Help screen.

This program can be downloaded from:
http://www.newmicros.com/download/software/NMI/NMITerm.zip

MECHANICAL



ServoPod-USB™
(1.700,3.850)
(0,3.950)
(2.300,3.950)
MT. HOLE
(0.150,3.800)
(2.150,3.800)
MT. HOLE
(0.600,3.550)
(1.700,3.550)
(0.100,3.450)
(0.100,2.750)
(0.100,2.050)
MT. HOLE
(0.150,1.100)
(2.150,1.100)
MT. HOLE
(0.600,0.850)
(0.100,0.850)
MT. HOLE
(0.150,0.150)
(0,0)
(2.300,0)
WWW.NEWMICROS.COM

ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Characteristic	Symbol	Min	Max	Unit
Supply voltage	V_{DD}	V_{SS} – 0.3	V_{SS} + 4.0	V
All other input voltages, excluding Analog inputs	V_{IN}	V_{SS} – 0.3	V_{SS} + 5.5V	V
Analog Inputs ANAx, V_{REF}	V_{IN}	V_{SS} – 0.3	V_{DDA} + 0.3V	V
Current drain per pin excluding V_{DD}, V_{SS}, PWM outputs, TCS, V_{PP}, V_{DDA}, V_{SSA}	I	—	10	mA
Current drain per pin for PWM outputs	I	—	20	mA
Junction temperature	T_J	—	150	°C
Storage temperature range	T_{STG}	-55	150	°C

Recommended Operating Conditions

Characteristic	Symbol	Min	Max	Unit
Supply voltage	V_{DD}	3.0	3.6	V
MPU operating temperature	T_A	-40	+85	°C

DC Electrical Characteristics

Operating Conditions: $V_{SS} = V_{SSA} = 0$ V, $V_{DD} = V_{DDA} = 3.0$–3.6 V, $T_A = –40°$ to $+85°C$, $C_L \leq 50$ pF, $f_{op} = 80$ MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Input high voltage	V_{IH}	2.0	—	5.5	V
Input low voltage	V_{IL}	-0.3	—	0.8	V
Input current low (pullups/pulldowns disabled)	I_{IL}	-1	—	1	μA
Input current high (pullups/pulldowns disabled)	I_{IH}	-1	—	1	μA
Typical pullup or pulldown resistance	R_{PU}, R_{PD}	—	30	—	KΩ
Input/output tri-state current	low I_{OZL}	-10	—	10	μA
Input/output tri-state current	low I_{OZH}	-10	—	10	μA
Output High Voltage (at IOH)	V_{OH}	V_{DD} – 0.7	—	—	V
Output Low Voltage (at IOL)	V_{OL}	—	—	0.4	V
Output High Current	I_{OH}	—	—	-4	mA
Output Low Current	I_{OL}	—	—	4	mA
Input capacitance	C_{IN}	—	8	—	pF
Output capacitance	C_{OUT}	—	12	—	pF
PWM pin output source current 1	I_{OHP}	—	—	-10	mA
PWM pin output sink current 2	I_{OLP}	—	—	16	mA
Total supply current	I_{DDT} 3				
Run 4		—	126	162	mA
Wait 5		—	72	98	mA
Stop		—	60	84	mA
Low Voltage Interrupt 6	V_{EI}	2.4	2.7	2.9	V
Power on Reset 7	V_{POR}	—	1.7	2.0	V

1. PWM pin output source current measured with 50% duty cycle.

2. PWM pin output sink current measured with 50% duty cycle.

3. $I_{DDT} = I_{DD} + I_{DDA}$ (Total supply current for $V_{DD} + V_{DDA}$)

4. Run (operating) I_{DD} measured using 8MHz clock source. All inputs 0.2V from rail; outputs unloaded. All ports configured as inputs; measured with all modules enabled.

5. Wait I_{DD} measured using external square wave clock source (f_{osc} = 8 MHz) into XTAL; all inputs 0.2V from rail;

no DC loads; less than 50 pF on all outputs. C_L = 20 pF on EXTAL; all ports configured as inputs; EXTAL capacitance linearly affects wait I_{DD}; measured with PLL enabled.

6. Low voltage interrupt monitors the V_{DDA} supply. When V_{DDA} drops below V_{EI} value, an interrupt is generated. For correct operation, set $V_{DDA}=V_{DD}$. Functionality of the device is guaranteed under transient conditions when $V_{DDA}>V_{EI}$.

7. Power-on reset occurs whenever the internally regulated 2.5V digital supply drops below V_{POR}. While power is ramping up, this signal remains active for as long as the internal 2.5V supply is below 1.5V no matter how long the ramp up rate is. The internally regulated voltage is typically 100 mV less than V_{DD} during ramp up until 2.5V is reached, at which time it self regulates.