USER MANUAL

Accessory 54E

UMAC USB Communications Accessory

3Ax-603467-xUxx

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DELTA TAU
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NEW IDEAS IN MOTION ...

Copyright Information

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INTRODUCTION

The UMAC Accessory 54E is a USB *(universal serial bus)* communications board designed exclusively for the UMAC-Turbo. Acc-54E provides a version 1.1 specification compliant USB connection between a personal computer and a UMAC. The actual communication with the UMAC is performed by the UMAC's DPRAM (dual ported random access memory) ASCII communications buffer.

All of the UMAC's automatic DPRAM reporting features can be used with this board including:

- DPR Control Panel
- Motor Data Reporting Buffer
- Background Reporting Buffer
- ASCII Command and Response Buffers
- Data Gathering Buffers
- Background Variable Copying Buffers
- The Binary Rotary Buffer Program Download Buffer.

HARDWARE SETUP

The Accessory 54E has 4 jumpers E1,E2,E3 and E4. These jumpers are factory preset to 2-3 and should only be set 1-2 if the Delta Tau Hub Circuit is present. Jumper E10 is reserved for future use and should not be modified from its factory default state.

E1-E4: Hub Enable Jumpers

Jumper	USB Hub Circuit not Present	USB Hub Circuit Present
E1	2-3*(default)*	1-2
E2	2-3*(default)*	1-2
E3	2-3*(default)*	1-2
E4	2-3*(default)*	1-2

E10: For future use

| Jumper	Function
E10	Not installed

SW1: DPRAM Address

Under no circumstances should the SW1 ever be changed from the default settings of all the switches ON unless more than one Acc-54E are being used with the same UMAC.

| SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PMAC DPR Address Range
ON	ON	ON	ON	ON	ON	$6C000-$6CFFF (default)
ON	OFF	ON	ON	ON	ON	$74000-$74FFF
ON	ON	OFF	ON	ON	ON	$6D000-$6DFFF
ON	OFF	OFF	ON	ON	ON	$75000-$75FFF
ON	ON	ON	OFF	ON	ON	$6E000-$6EFFF
ON	OFF	ON	OFF	ON	ON	$76000-$76FFF
ON	ON	OFF	OFF	ON	ON	$6F000-$6FFFF
ON	OFF	OFF	OFF	ON	ON	$77000-$77FFF

J1: USB Type B Receptacle

This connector is to be used in conjunction with USB A-B cable, which can be purchased from any local computer store. The A connector is connected to a PC or Hub device; the B plug plugs into the UMAC USB card. The figure below displays what the two ends on the cable should look like.
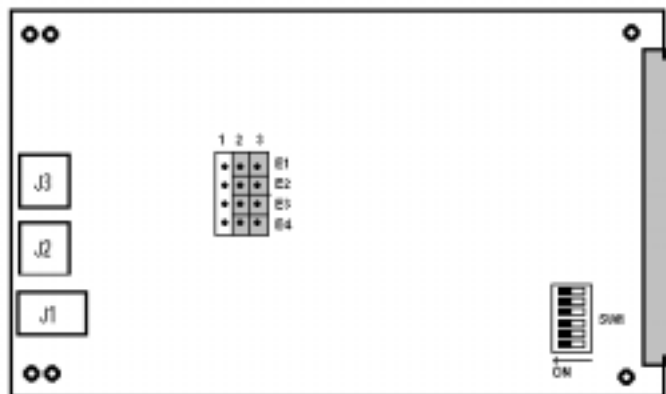
J2-J3: USB Type A Receptacle

This connector is to be used in conjunction with USB A-B cable which can be purchased from any local computer store. The A connector can be used to provide USB connectivity to any type of USB device, including a second or third UMAC.

♦ Series "A" plugs are always oriented **upstream** towards the PC or Hub
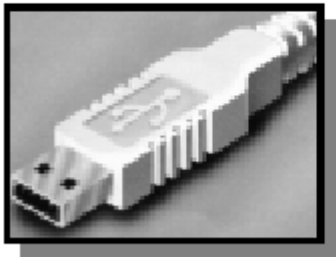
♦ Series "B" plugs are always oriented **downstream** towards the *USB Device* (the UMAC)
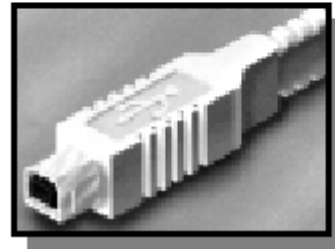
Maximum Cable

The maximum cable length according to the USB Specification 1.1 for a full speed cable is 5m (~15ft). According to the USB specification, you can connect up to five USB cables together using a hub to create a maximum length of 30m(~98ft). In addition, to extend the length of the USB connection there are USB active extension cables available. Although the USB active extension cables are prohibited by the USB specification, they are known to work in some applications. The photo below shows a USB active extension cable available from www.usbgear.com.

Use a USB cable of high quality. Using higher quality USB cables, some people have managed to operate up to 10m (30ft) cables without the use of an active extension cable or hub. However, violating the specification by running a cable more than 5m is not recommended.
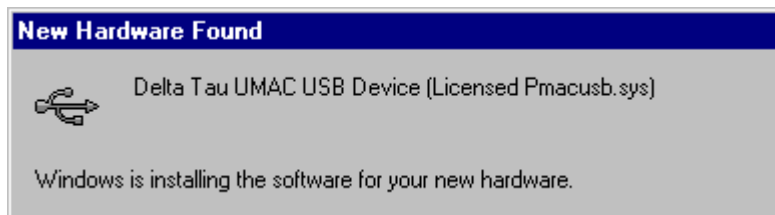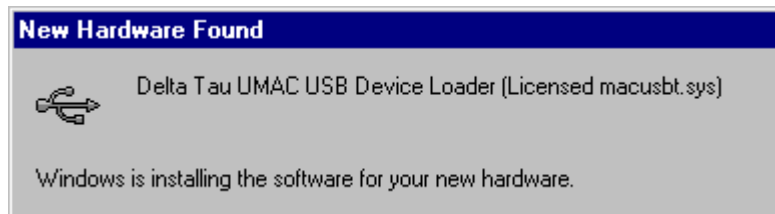
SOFTWARE SETUP

The UMAC-Turbo is configured automatically to communicate with the DPRAM of the ACC-54E, provided the UMAC-Turbo is not configured with option 2-B, the on board DPRAM. You should only order option 2-B when using a PC104 computer with UMAC-Turbo board.

Device Driver Installation

Starting with PEWIN version 2.36, the USB driver support is bundled with the PEWIN installation program. The UMAC USB card will work only with Windows 98, Windows ME and Windows 2000. It will not function with Windows NT 4.0; this version of Windows does not support plug and play, which is required by USB.

Three files are placed on your PC to achieve USB connectivity – device drivers PMACUSB.SYS and PMACUSBT.SYS into the WINDOWS\SYSTEM32\DRIVERS directory and the plug and play information file PMACUSB.INF in the WINDOWS\INF directory. When the UMAC is plugged into the PC, you will see a "New Hardware Found" Message. A series of dialog boxes will appear, indicating that windows is installing the device drivers for the system.

New Hardware Found

Delta Tau UMAC USB Device Loader (Licensed macusbt.sys)

Windows is installing the software for your new hardware.

New Hardware Found

Delta Tau UMAC USB Device (Licensed Pmacusb.sys)

Windows is installing the software for your new hardware.

Note:

Plug in the USB cable from the UMAC to the PC *after* you have installed the software PEWIN 2.38. If you plug in the USB cable before you have installed the software, you will have to restart Windows.

To verify that the software device drivers have been installed properly, you can right click on the My Computer icon on the desktop. Select Properties from the drop down menu that appears. The Windows tabbed dialog titled System Properties appears. Click the tab titled Device Manager. At this point a list of device categories appears. Click the + and you will see a list of

USB devices. Provided the device driver for Acc-54E has been installed properly, you will see a dialog box similar to the following:
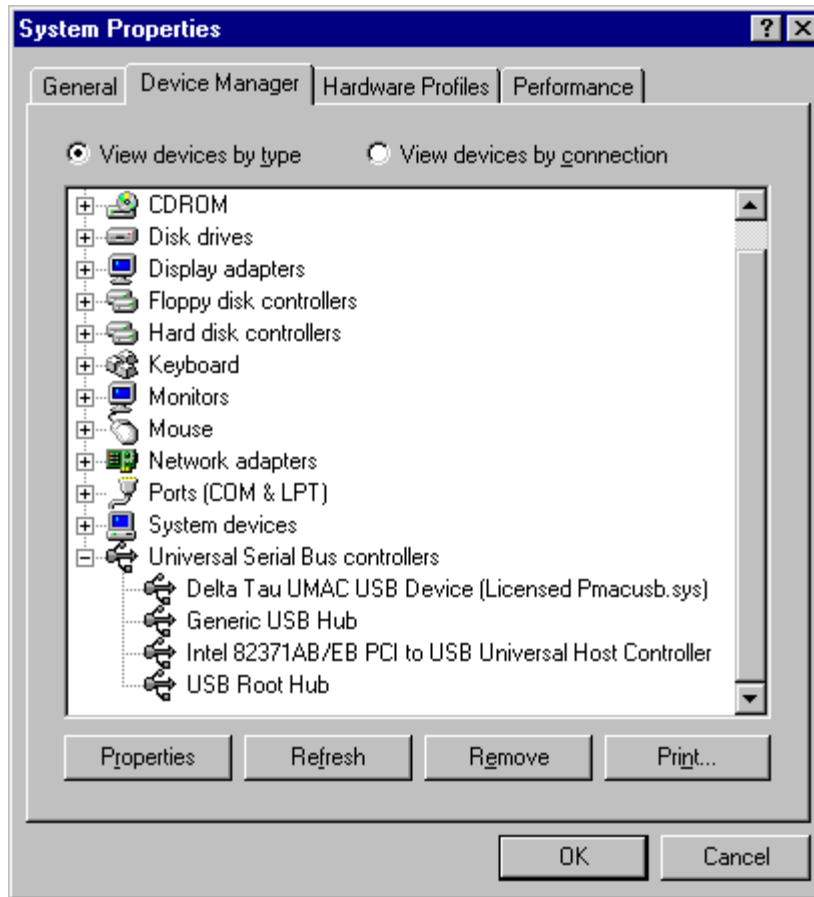
If you do not see Delta Tau UMAC USB Device (Licensed Pmacusb.sys) the device driver has not been installed; if you have a red x through that line or a yellow exclamation point through that line, then Windows had a problem installing the device. The appropiate trouble shooting steps are to first reboot you computer and examine this list again. If that doesn't work, ensure that pmacusb.sys and pmacusbt.sys are in the Windows\system32\Drivers directory. If both of these are true, check with the manufacturer of your computer and make sure that there is not an update to the BIOS to enable USB on your PC. Also if you do not see the Universal Serial Bus Controllers in your device manager dialog box, make sure that it is enabled in the BIOS of your computer.

UMAC-Turbo Memory Mapping for ACC-54E

The dip switch SW1 should always be configured with all of the switches set to the ON position. However, in the rare case that SW1 has been changed, the DPRAM address I24 must be changed. If you are using a UMAC-Turbo that has on-board DPRAM, I24 must be manually changed and saved through either the PC104 or RS232 serial port to a value that matches the address determined by the switch SW1. If you are using a UMAC Turbo that does not have on-board DPRAM, see *Initial UMAC-Turbo Card Configuration,* below.

Note

To determine whether or not the UMAC Turbo has DPRAM, check for the presence of U44 in the middle of the UMAC CPU board. If U45 is present, the UMAC Turbo has DPRAM. If not, it does not.

Initial UMAC-Turbo Card Configuration

To allow the UMAC to find the DPRAM on the Accessory 54E initially, install initialization jumper E3 on the UMAC CPU board. Once this is done you should be able to communicate with the UMAC through Accessory 54E's USB connection. Once you have established communications type, issue a SAVE command from the PEWIN terminal. Then, power off and remove the initialization jumper E3. You can then operate normally.

Note

This works only if the UMAC CPU does not have DPRAM on it. If it does have DPRAM, see *UMAC-Turbo Memory Mapping for ACC*-54E, above. Check for the presence of U45 in the middle of the UMAC CPU board. If U45 is not installed on the UMAC CPU board, the UMAC CPU does not have DPRAM.

Using USB with MOTIONEXE and PMAC.DLL

Official support for the USB card is not in PMAC.DLL; however the USB card uses the same technique for commmunicating with the PMAC as an ISA card. To establish communication with the card, go to the MotionExe program included with PEWIN32. Using the Add menu button for device zero, set up the card as if it has a Port Address of 0x210, an Interrupt Address of None and a DPRAM Adress of None. (*If you have PEWIN 2.38 you may click the USB Mode check box instead*). After doing this you will be able to use PEWIN 32 just as if the card was a PMAC on an ISA bus.
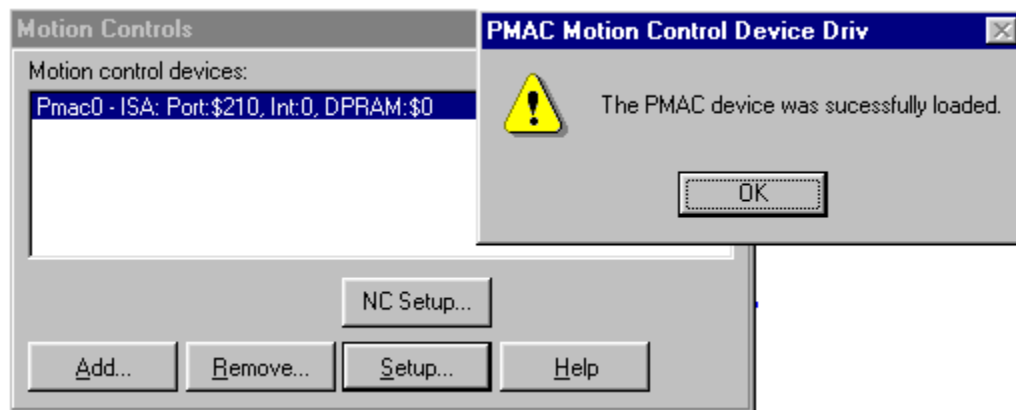
When using the UMAC USB card, all of the BUS communication functions are available. In addition there are a couple of DPRAM commands available. Using either PTALK DT or PCOMM 32 you can write a program to interface to the UMAC through the following functions:

```
PVOID CALLBACK PmacDPRGetMem(DWORD dwDevice,DWORD offset,
size_t count,PVOID val )
```

```
PVOID CALLBACK PmacDPRSetMem( DWORD dwDevice, DWORD offset,
size_t count, PVOID val )
```

Using PMAC with the USB DPRAM

The UMAC-Turbo can write to any DPRAM memory location on the Acc-54E. This can be done by using M-Variables that point to an area in the address range defined in the "SW1:DPRAM Address" table (p. 2) (usually $6C000 - $6CFFF). However, unpredictable results will occur if you write to the areas that are used for the DPRAM automatic reporting features (ie., the ASCII communications buffer ranging from $6C3A7-$6C410). The automatic reporting features memory area can be determined from the Turbo Software Reference Manual by examining the

address in the $60000-$60FFF; however, when using Acc-54E, this range is from $6C000-$6CFFF. Start your own variables at the $6CD60; this address is well outside the range of the automatic reporting features. Below is an example of pointing to a series of DPRAM locations on the USB card and the count:

```
M1000->DP:$6CD60        PmacDprGetMem(0,0x3580,4,&dwData)
M1001->Y:$6CD61         PmacDprGetMem(0,0x3584,2,&wData1)
M1002->X:$6CD61         PmacDprGetMem(0,0x3586,2,&wData2)
M1003->F:$6CD62         PmacDprGetMem(0,0x3586,4,&fData)
```

The parameters passed to the function PmacDPRGetMem are:

- The device number for the case of multiple devices
- The DPRAM offset
- The number of bytes to retrieve
- The location to place the retrieved bytes.

The DPRAM offset is the number of bytes from the base DPRAM location. To compute this value, take the UMAC-Turbo DPRAM address and multiply its offset by 4. The offset is always the last three digits of the DPRAM address. For example, for the address $6CD60 multiply $D60 by 4 to compute the offset; the offset for PMAC address $6CD60 is 0x3580. For X memory address, the same applies, except that 2 must be added to the offset calculation.

In practice it is not wise to call PmacDprGetMem for each item of data, due to the structure of USB. The reason is that each call can take 1 msec, but so would a single call getting all the data. More efficient coding would be as follows

```
typedef struct {
DWORD dwData;
WORD  wData1;
WORD  wData2;
float fData;
} Data;
PmacDprGetMem(0,0x3580,12,&Data);
```

Response to a request for 1KB of data with a PmacDprGetMem call would take ~1 msec; however, if you called PmacDprGetMem for each byte it would have taken ~1024msec.

Getting the Best Performance

To be assured of the best possible performance when using USB communications, use a USB Host controller that is made according to the Open Host Controller Interface (OHCI) standard. The USB Host controller built into Intel and VIA Chipsets is made according to the Universal Host Controller Interface (UHCI) standard. All other chipsets ie. (ALi, SiS etc.) use USB Host Controllers that conform to the OHCI standard.

Typically, the UHCI systems operate 25% slower in practice than their OHCI counterparts. The reasons for this are many and complex, but to summarize, UHCI systems have more of their functionality implemented in software while OHCI have more of their functionality implemented in hardware. In addition, a typical restriction of UHCI systems is that they only allow one USB request per millisecond, while OHCI systems allow multiple requests per millisecond. This restriction of UHCI systems leads to it being 25% slower than an OHCI system in practice.

To determine what type of Host Controller your computer has, right-click on the My Computer icon on the desktop; then select Properties from the drop down menu that appears. Click on the Device Manager Tab, and select the + on Universal Serial Bus Controllers. The phrase Universal

Host Controller or Open Host Controller will appear. If your computer has a Universal Host Controller you can purchase a USB PCI card which has an Open Host Controller from your local computer store.

Most USB PCI cards use the OHCI system; only if the chipset used on the USB PCI card is VIA is the card not an OHCI card. To be certain that the USB PCI card is an OHCI, get a card that is Macintosh compatible; this will assure you that the card is OHCI compatible.
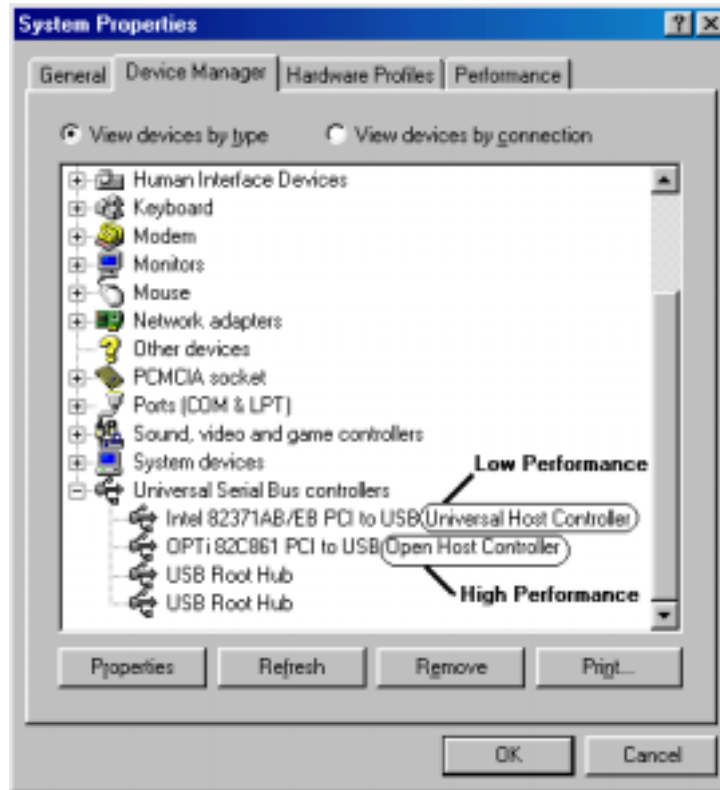
CURRENT UMAC USB CARD ISSUES

Firwmware Upgrades

Currently the UMAC USB card uses a DPRAM technique for communications. This prevents this card from performing firmware upgrades. Moreover, this card will not be recognized if the PMAC is in bootstrap mode. All firmware upgrades as a result must be done using RS232 serial communications. A future revision of the UMAC USB card will allow firmware upgrades.

UMAC's w/ On board DPRAM

Do not purchase the DPRAM option for the UMAC CPU. The UMAC looks for the first DPRAM it sees and sets it up as the default to use for communications, and the first one it sees is the one on the UMAC. This defeats autodetection of the USB DPRAM.

Using USB Simultaneously with ISA

At present, this can be done only when using Windows 98 or Windows ME. In addition, when using an ACC-54E simultaneously with an ISA card the USB devices must be allocated before the ISA cards. Simultaneous use of an ISA with the USB card is not supported in Windows 2000, but will be in a future release of PEWIN 32.

Windows 2000 Issues

Windows 2000 may crash if you try to use the USB card as a ISA card and the ISA driver PMAC.SYS is set up to load, because no PMAC ISA card is present. The work-around is to delete the PMAC.SYS driver so that Windows 2000 will not attempt to load it. If you are using PEWIN 2.38, deleting PMAC.SYS is not necessary.

Hot Pluggability

Because USB is a bus system, unplugging the USB cable to the UMAC while communicating with the card is prohibited. For example if you unplug while you are talking to PEWIN, Windows may crash. However, if PEWIN is closed, you can unplug safely.

Card Doesn't Work in some Slots

Communication data is incorrect or doesn't function when the USB is in the slot furthest from the UMAC CPU board. If the act of moving the USB board close to the UMAC CPU board fixes all the communication issues, then you have the UMAC CPU board of revision 603382-103 or later. You should have the UMAC CPU board backplane address decoding logic updated by the factory, because by moving the board you may have transferred the problem to another board.

Issuing a Save or Reset Command Causes a Crash

This a bug in PEWIN 2.36. Upgrade to PEWIN 2.38 to prevent this problem.

Slow File Downloads

PEWIN 2.38 incorporates a USB-specific download function that increases the download speed by a factor of ~10 from earlier PEWIN versions.

Slow Responses to SENDR Commands

PEWIN 2.38 is bundled with a new PMACUST.SYS that increases the speed of this function.

Windows Crashes when PMAC Cannot Be Located

PEWIN 2.38 is bundled with a new PMACUST.SYS that prevents this problem.