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DELTA TAU
Data Systems, Inc.

UMAC and 3U Stack

Universal Motion & Automation Controller



Products Selection Guide

June 01, 2001





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1.0 – Introduction to UMAC

– UMAC Description



**UMAC Turbo with PC/104
and the Turbo PMAC2 CPU**



**UMAC MACRO with PMAC2 Ultralite
and the MACRO interface card**

The UMAC (Universal Motion and Automation Controller) is a modular PMAC system built with a set of 3U-format Eurocards. The heart of the UMAC is the UBUS (Universal Bus) backplane. The UBUS is a backplane based on an expanded version of the well-known PMAC Expansion port through which many different accessories connect to PMAC.

The UMAC can be populated with either a 3U-format Turbo PMAC2 CPU board or a MACRO Interface/CPU board. If a MACRO Interface/CPU board is used then the UMAC MACRO system is completed with a remotely connected PMAC2 Ultralite board or another UMAC Turbo system with the ACC-5E through either a fiber optic or twisted pair cable. To create a complete UMAC system, boards with axis interface circuitry and/or I/O interface circuitry are added to the UBUS backplane.

UMAC provides a rugged, integrated package that puts the Turbo PMAC2 or MACRO electronics, built-in breakout connectors, and power supply in an enclosed 3U rack. Individual boards can slide in and out of the rack, communicating to the Turbo CPU or MACRO board over the common UBUS backplane, making configuration and troubleshooting a snap.

If the PC/104 interface is used with the 3U-format Turbo PMAC2 CPU board (not compatible with the MACRO Interface/CPU board), the PC/104 computer and its peripherals can fit inside the UMAC Turbo pack, yielding an incredibly powerful system inside a compact industrial package. The PC/104 interface provides the UMAC with a whole range of computation and connectivity capabilities. PC/104 computers are available all the way from very inexpensive 386-based models to cutting-edge designs rivaling your latest desktop models. Peripherals are available providing for almost every conceivable type of interface, including all of the major FieldBuses, Ethernet, disk drives, PCMCIA, etc.

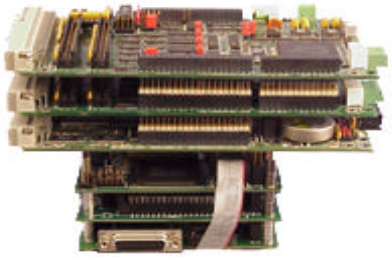
For easier identification, most accessories for the UMAC products carry the original name given for the traditional PMAC systems. For example, the well-known ACC-36P has become the ACC-36E and the ACC-28B for the traditional PMAC is now called ACC-28E for a UMAC system.



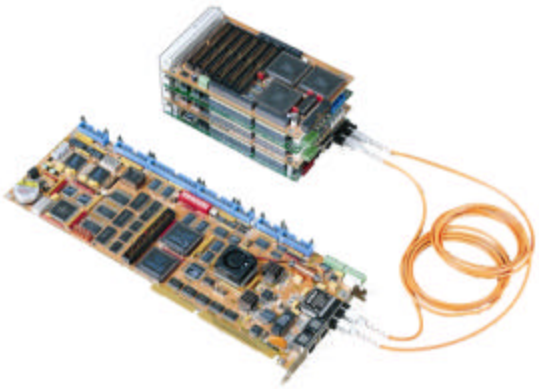


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– Stack Configuration



Stack of a 3U Turbo PMAC2 and PC\104



MACRO stack with the PMAC2 Ultralite

The stack configuration is how the 3U products series started. It is intended for compact, price-sensitive applications. It brings the power of the PMAC motion control to the embedded-systems world, either standalone or mounted on top of a PC/104 computer. This open frame card stacking method has become very popular in its own right as the "poor man's" package since it is quite inexpensive, practical and powerful motion control solution with a great degree of flexibility (you only stack cards that you need).

In most cases, the stack configuration is chosen over the UMAC configuration based on either space or cost constraints. For example, the stack configuration could be selected in order to fit the system in an already existing electrical cabinet.

In some other circumstances the stack boards are the only option for a particular system configuration. In this case the system could be composed of either stack boards or a combination of stack boards and UBUS boards. **This is referred as a hybrid stack\backplane configuration**.

The stack boards have these main limitations in comparison to the UBUS boards:

- Stack boards can only control 8 axes and less I/O points than an equivalent UMAC.
- Stack boards that are packaged in a UMAC rack system are more difficult to install as compared to backplane boards. The necessary cables and special backplane boards interconnecting the different boards to each other and to the machine makes the sliding of the individual component boards in and out of the UMAC system a more difficult process than when using only backplane boards.
- The stack axis boards require additional breakout boards for connections to motors and amplifiers. The UBUS backplane boards, on the other hand, have the dual function of being interface and breakout boards in one unit.

Note: It is for these reasons that although the stack configuration itself is quite usable, its use is not recommended inside an enclosed rack. If a packaged system is desired instead of an open low-cost stack configuration the UMAC system itself is highly recommended, as it will provide better service and greater flexibility.





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– Ordering UMAC Parts

Ordering parts for the UMAC is very simple. Given the characteristics of the application in question these items should be considered:

1. **CPU board:** order either a Turbo PMAC2-3U CPU board, which can operate stand-alone, or a combination of a MACRO Interface/CPU board with a PMAC2 Ultralite board. Commands for the MACRO Interface/CPU board could alternatively be given from a UMAC Turbo system with an ACC-5E instead of the PMAC2 Ultralite board. Different memory sizes, CPU speeds and other optional features are available for the 3U Turbo CPU or the PMAC2 Ultralite board.

2. **Number of axis boards:** either the MACRO Interface/CPU board or the Turbo PMAC2-3U CPU board requires axis boards to control the motors. A UMAC MACRO could control up to eight axes and a UMAC Turbo up to 32 axes. The number and type (digital, analog or stepper) of axis boards must be added accordingly, and it is limited either by the size of the UBUS backplane (4 to 18 slots) or the space provided by the UMAC rack.

3. **Number and type of the digital inputs and outputs required:** a great variety of I/O boards are available for potentially hundreds of I/O control lines. The selection could be made from TTL I/O, OPTO22 compatible boards, high or low power outputs, optically isolated boards, AC or DC I/O signals and so on.

4. **Kind of position feedback devices used:** The standard feedback type that the UMAC supports is one quadrature incremental encoder per motor. Other feedback devices are supported through the addition of optional accessory boards. The alternative options for feedback devices include dual-quadrature, sinusoidal encoders, parallel feedback interfaces and SSI encoder types.

5. **Type of communications desired:** when the Turbo PMAC2-3U CPU board is used, a variety of communication protocols and interfaces are available for high-speed communications. Options include USB/Ethernet, field bus adapters such as DeviceNet, Profibus or CanBus as well as the MACRO link between UMAC systems, I/O and digital or analog servo drives.

6. **PC/104 products:** a UMAC Turbo system can be equipped with a built-in PC/104 computer. The PC/104 computer plugs directly into the Turbo PMAC2-3U CPU board and has all the peripherals associated with any other IBM© compatible computer: Optional CD-ROM, Hard Drive, Keyboard, Monitor or LCD Display, Mouse, Floppy Drive and so on.

7. **UMAC 3U amplifiers:** 3U format linear or digital PWM amplifiers are provided for installation inside either a UMAC Turbo or a UMAC MACRO system. In addition, single or double axis MACRO compatible amplifiers are provided for a direct connection to a MACRO link.

8. **Power supplies, cables and racks dimensions:** Each board has its own power requirements and number of slots it occupies inside a UMAC system. After all the components have been selected, simply compute the total electrical current requirements and the number of slots necessary and then select the appropriate power supplies and rack dimensions accordingly. For convenience, a selection of fiber optics and PWM digital amplifier cables is also provided.





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– UMAC Products summary

UMAC configuration (backplane boards)

CPU Options:

- Turbo PMAC2-3U CPU: can control up to 32 axes and interface with a PC/104 computer, communication accessories (Ethernet, USB, fieldbus) and the MACRO interface with other UMAC MACRO systems.
- MACRO Interface/CPU board: can control up to 8 axes. It must receive servo commands from a remote motion controller: either a PMAC2 Ultralite board or a UMAC Turbo system with an ACC-5E. Cannot directly interface with PC/104 or communication adapters.

Axis boards:

- ACC-24E2: provides 2 or 4 digital PWM channels.
- ACC-24E2A: provides 2 or 4 analog ±10 Volts channels.
- ACC-24E2S: provides 2 or 4 pulse and direction (stepper) channels.

Digital I/O boards:

- ACC-9E: provides 48 sinking or sourcing digital inputs with a voltage range of 12 to 24 VDC.
- ACC-10E: provides 48 sinking or sourcing digital outputs of 12 to 24 VDC with 100 mA max per output.
- ACC-11E: provides 24 digital outputs (12-24 VDC, 100 mA/output max) and 24 digital inputs (12 to 24 VDC.)
- ACC-12E: provides 24 outputs (up to 60 VDC or 240 VAC, 1A/ output max) and 24 inputs (12 to 24 VDC.)
- ACC-14E: provides 48 TTL I/O points for direct connection to OPTO22 type boards.
- ACC-65E: provides isolated, self-protected sourcing 24 Inputs and 24 Outputs.
- ACC-66E: provides isolated, self-protected sourcing 48 Inputs.
- ACC-67E: provides isolated, self-protected sourcing 48 Outputs.
- ACC-68E: provides isolated, self-protected sinking 24 Inputs and 24 Outputs.

Position Feedback and analog inputs Interfaces:

- ACC-14E: provides 48 TTL I/O points typically used for the interface to parallel position feedback devices.
- ACC-28E: 2 or 4 Channels High Resolution 16-bit A/D Converter Board with ± 10V input range.
- ACC-36E: 16 Channels 12-Bit A/D Converter Board with ± 10V input range.
- ACC-51E: 2 or 4 Axes 4096x High Resolution Sinusoidal Analog Encoder Interpolator Board.
- ACC-53E: 4 or 8 Channel Synchronous Serial Encoder Interface (SSI) Board.
- ACC-57E: 2 or 4 Channel encoder inputs for either Yaskawa or Mitsubishi Absolute Encoders.
- ACC-58E: 2 or 4 Channel 16-bit resolver-to-digital converter Board.
- ACC-59E: 8 Channel 12-Bit A/D Converter Board plus 8 Channel 12-Bit DAC outputs.

Communication boards (UMAC Turbo only):

- ACC-5E: MACRO Interface to allow the Turbo PMAC2-3U CPU to communicate with MACRO systems.
- ACC-54E: USB/Ethernet (TCP/IP) Communications Board.
- ACC-55E: Universal Field Bus adapter Network (UNET) for Control Net, Device Net, Profibus, CAN Bus.





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Power supplies:

- ACC-E: AC-Input power supply, input of 85-240VAC, output of 8A at +5V, 1A each at +/-15V.
- ACC-E1: High-power AC-Input power supply, input of 85-240VAC, output of 14A at +5V, 1.5A each at +/-15V.
- ACC-E2: High-power AC-Input power supply, input of 85-240VAC, output of 20A at+ 5V, 1A each at +/-15V.
- ACC-F: DC-Input power supply, input of 24VDC, output of 10A at +5V, 1A at +15V, -0.25A at -15V.

PC/104 parts (UMAC Turbo only):

- ACC-PC: Built-in PC/104 embedded computer assembly (requires Turbo PMAC2-3U CPU Option 2). 233MHz, 686 CPU, Pentium, 32MB SDRAM, IDE Controller, 4GB hard disk, 1.44MB floppy drive, front-plate connections for SVGA video, keyboard, ECP/EPP parallel port, RS232/422/485 serial port and speaker.
- ACC-PC1: CD ROM drive 32X min. (externally mounted)
- ACC-PC2: USB interface internally mounted
- ACC-PC3: Keyboard (101 keys)
- ACC-PC4: Mouse, serial
- ACC-PC5: Monitor, 15" 1280x1024 resolution
- ACC-PC6: Monitor, 17" 1280x1024 resolution
- ACC-PC7: LCD Panel, 14" 1024x768 resolution (actual unit size: 15.35x14.76x7.87.)
- ACC-PC8: Ethernet utility module (NE2000 comp. Controller), internally mounted

3U-Amplifiers:

- AMP-1D: two axes digital PWM amplifier
- AMP-1DM: two axes digital PWM/MACRO amplifier (pending)
- AMP-2D: single axis digital PWM amplifier (pending)
- AMP-2DM: single axis digital PWM/MACRO amplifier (pending)
- AMP-1DPS: power supply for digital PWM amplifiers
- AMP-2DBP: backplane for digital PWM amplifier
- AMP-1: four axes analog linear amplifier 24 VDC, 0.5/1A
- AMP-2: four axes analog PWM amplifier, 48 VDC 3/5 A
- AMP-3: four axes analog PWM amplifier, 70 VDC 8/12 A
- AMP-4ABP: double analog amplifier backplane
- AMP-5ABP: single analog amplifier backplane
- AMP-6: two axes High Power amplifier
- AMP-7APS: power supply for analog PWM amplifiers (40 Volts)
- AMP-8APS: power supply for analog PWM amplifiers (65 Volts)
- AMP-9APS: power supply for analog PWM amplifiers (150 Volts)
- Other amplifiers: Delta Tau also produces high power amplifiers in non-3U format.

Backplanes:

- ACC-U4: 4-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U6: 6-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U8: 8-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U10: 10-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U12: 12-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U14: 14-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U16: 16-slot UBUS backplane board (+1 slot for power supply connection)
- ACC-U18: 18-slot UBUS backplane board (+1 slot for power supply connection)





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- ACC-56E: 3U size fused backplane extender board for test purposes
- ACC-J2: 2 Slot I/O, JEXP Backplane, (connects CPU to the I/O boards)
- ACC-J3: 3 Slot I/O, JEXP Backplane, (connects CPU to the I/O boards)
- ACC-J4: 4 Slot I/O, JEXP Backplane, (connects CPU to the I/O boards)
- ACC-J6: 6 Slot I/O, JEXP Backplane, (connects CPU to the I/O boards)
- ACC-J15: 15 Slot I/O, JEXP Backplane, (connects CPU to the I/O boards)

Racks:

- ACC-P1: 10-slot (42T) 3U Eurocard rack with connections for top, front, and bottom panel mounting.
- ACC-P2: 15-slot (63T) 3U Eurocard rack with connections for top, front, and bottom panel mounting
- ACC-P3: 21-slot (84T) 3U Eurocard rack with connections for top, front, and bottom panel mounting
- Custom: Pack frame per customer requirements; custom order for UMAC or amplifier racks.

Cables:

- ACC-7A: 1.5m (5ft) terminated glass optical fiber cable
- ACC-7B: 5m (15ft) terminated glass optical fiber cable
- ACC-7C: 8m (28ft) terminated glass optical fiber cable
- ACC-7D: Custom length terminated glass optical fiber cable
- Option-5A: Amplifier PWM Cable, 600 mm (24) inches long, mini-D, 36 conductor, 1/axis
- Option-5B: Amplifier PWM Cable, 900 mm (36 inches long), mini-D, 36 conductor, 1/axis
- Option-5C: Amplifier PWM Cable, 1.5 m (60 inches) long, mini-D, 36 conductor, 1/axis
- Option-5D: Amplifier PWM Cable, 1.8 m (72 inches) long, mini-D, 36 conductor, 1/axis
- Option-5E: Amplifier PWM Cable, 2.1 m (84 inches) long, mini-D, 36 conductor, 1/axis
- Option-5F: Amplifier PWM Cable, 3.6 m (144 inches) long, mini-D, 36 conductor, 1/axis

Stack configuration

CPU Options:

- Turbo PMAC2-3U CPU: In the stack configuration can control up to 8 axes. Can stack on top of a PC/104 computer but no high-speed communication accessories can be added to a stack configuration.
- MACRO Interface/CPU board: Can control up to 8 axes and must receive servo commands from a remote motion controller: a PMAC2 Ultralite board or a UMAC Turbo system with an ACC-5E.

Axis boards:

- ACC-1E: provides only 2 digital channels or 2 analog channels (option-A) to be used with the MACRO Interface/CPU board. **This accessory is not compatible with the Turbo PMAC2-3U CPU.**
- ACC-2E: provides 4 digital channels or 4 analog channels (option-A) to be used with either the MACRO Interface/CPU board or the Turbo PMAC2-3U CPU.

Breakout Boards:

- ACC-8E: 2-axis analog breakout board. Dual analog output per axis for velocity, torque, or sine-wave commands; encoder, hall, and optically isolated flag feedback; DIN-rail mountable





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- ACC-8F: 2-axis digital breakout board. Direct PWM output; serial digital current feedback; encoder, hall, and optically isolated flag feedback; DIN-rail mountable
- ACC-8S: 2-axis stepper breakout board. Pulse-and-direction output; encoder feedback by option only; optically isolated flag feedback; DIN-rail mountable
- ACC-8D, ACC-8P, ACC-8DP, ACC-8DCE: these DIN rail mountable accessories can be used when the ACC-1E or ACC-2E are ordered with the OPT-A, which is the PMAC(1) style interface.

Digital I/O boards:

- ACC-3E1: provides 48, 96, or 144 I/O lines for connection to OPTO-22 type boards, or latched parallel feedback.
- ACC-4E: provides 24 digital outputs (12-24 VDC, 100 mA/output max) and 24 digital inputs (12 to 24 VDC.)

Position Feedback and analog inputs Interfaces:

- ACC-6E: 8 or 16-Channel 12-Bit A/D Converter Board with ± 2.5V or 0-5V input range.
- Other non-stack accessory boards, usually in a rail-mount format, could be used connected to a stack configuration.

Hybrid configuration (for repeat applications only)

CPU Options:

- Turbo PMAC2-3U CPU: In the stack configuration can control up to 8-axis. Could stack to the optional PC/104 computer.
- MACRO Interface/CPU board: Can control up to 8-axis and must receive servo commands from a remote motion controller: a PMAC2 Ultralite board or a UMAC Turbo system.

Axis boards:

- ACC-1E: provides only 2 digital channels or 2 analog channels (option-A) to be used with the MACRO Interface/CPU board. **This accessory is not compatible with the Turbo PMAC2-3U CPU.**
- ACC-2E: provides 4 digital channels or 4 analog channels (option-A) to be used with either the MACRO Interface/CPU board or the Turbo PMAC2-3U CPU.

Breakout Boards:

- ACC-8DE: 3U format 2-axis analog breakout board. Optional 256 interpolator for analog sinusoidal encoders.
- ACC-8FE: 3U format 2-axis digital breakout board. Optional 256 interpolator for analog sinusoidal encoders.
- ACC-13: Encoder Breakout Board
- ACC-13A: Flag Breakout Board
- ACC-13B: Amplifier Connector Breakout

Digital I/O boards:

- ACC-3E1: provides 48, 96, or 144 I/O lines for connection to OPTO-22 type boards, or latched parallel feedback.
- ACC-4E: provides 24 digital outputs (12-24 VDC, 100 mA/output max) and 24 digital inputs (12 to 24 VDC.)





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Backplanes:

- ACC-8FE-Option-2A: 1 Slot Backplane (for one ACC-8FE or 8DE). A 100-pin interface cable is supplied
- ACC-8FE-Option-2B: 2 Slot Backplane (for two ACC-8FE/8DE). Two 100-pin cables are supplied
- ACC-8FE-Option-2C: 4 Slot Backplane (for four ACC-8FE/8DE). Four 100-pin interface cables are supplied.

– Designing your own custom UMAC boards

Delta Tau provides a rich selection of accessories for axes boards, digital I/O boards, analog inputs boards, communication interfaces, feedback interfaces and many others. However, if a particular feature for the UMAC system is desired but not yet supported, Delta Tau provides all the necessary information for its development. This includes the UBUS electrical characteristics, the UMAC mechanical dimensions and other important features like the description of the "self-identification" chip (which allows the UMAC system to recognize any board installed in the UBUS backplane) and the overall interface of the new accessory board with the Turbo PMAC2-3U CPU board or the MACRO Interface/CPU board. Some examples of custom designed UMAC boards include:

1) Vision inputs cards.
2) Temperature control cards.
3) High power (115V / 10A) I/O cards.
4) Etc.





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2.0 – CPU selection

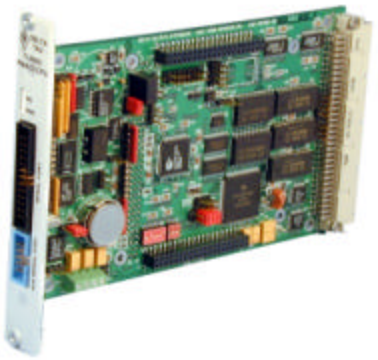
A UMAC system can be populated with either a 3U-format Turbo PMAC2 CPU board or a MACRO (Motion And Control Ring Optical) Interface CPU board.

If a MACRO Interface/CPU board is used then the UMAC MACRO system is completed with a remotely connected PMAC2 Ultralite board through either a fiber optic or twisted pair cable. This clever distribution of components brings many benefits: drastic reduction of wiring complexity, elimination of interference by electromagnetic noise and long distance connections (3000 m, ~2 miles with glass fiber). In addition, if the MACRO Interface/CPU board is used, it can be controlled from another UMAC Turbo system populated with a 3U-format Turbo PMAC2 CPU board and an ACC-5E. A UMAC MACRO can control up to 8 axes. However, four UMAC MACRO systems controlled by a single Turbo PMAC2 motion controller can be tied together in a MACRO ring for up to 32 axes of distributed motion control.

If a 3U-format Turbo PMAC2 CPU board is selected then the UMAC Turbo system could be installed in the machine as a stand-alone unit controlling up to 32 axes. As an option, a PC/104 computer could be added inside the UMAC Turbo or the UMAC Turbo could be connected to a main host computer by different means of fast communication interfaces: serial, Ethernet or USB.

– Turbo PMAC2-3U

A UMAC system with Turbo PMAC2-3U CPU board is called UMAC Turbo system. The Turbo PMAC2-3U CPU board allows controlling up to 32 axes either through digital, analog or stepper amplifiers/drivers. In compare with other PMAC types the Turbo PMAC has a better velocity and acceleration control algorithms (lookahead), an overall improved firmware and optionally provides the fastest CPU speeds and larger memory sizes. A PC/104 computer could be plugged to the Turbo PMAC2-3U CPU board for a complete IBM-compatible computer interface inside the UMAC Turbo system. In addition, communication interfaces for Ethernet/USB, fieldbus or MACRO are available to allow the UMAC Turbo system interface with any other external component.



Part Number: 3x0-603382-10x
Number of slots: 1
Resources: only 1 CPU board allowed per each UMAC Turbo system
Power Requirements: 1 A @ 5V

Number of channels: The Turbo PMAC2-3U CPU board does not have any on-board channels for controlling amplifiers and motors. Accessory boards, either in a stack or UBUS backplane configuration, provide the necessary channel circuitry. In a stack configuration a maximum of 8 channels can be connected to the Turbo PMAC2-3U CPU board for a maximum of 8 axes of motion control. In an UBUS backplane configuration a maximum of 32 channels can be connected to the Turbo PMAC2-3U CPU board for a maximum of 32 axes of motion control.

CPU and Memory: The Turbo PMAC is provided with an 80 MHz DSP56303 CPU (120 MHz PMAC equivalent) and flash memory. Any variable change in a flash type memory needs to be manually saved in Turbo PMAC for it to be retained on a power-up\reset cycle. Therefore, if machine parameters like parts counters or state variables are required, the Option-16A or Option-16B battery-backed parameter RAM is suggested.





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- Option-4C: this option provides an enhanced CPU microprocessor, an 80 MHz DSP56309 CPU with an expanded internal CPU memory instead of the standard 80 MHz DSP56303 CPU. This option is recommended for controlling more than 16 axes, especially for a large number of commutated axes.
- Option-5C0: this is the standard CPU and memory configuration. It is provided automatically if no Option 5xx is specified. It provides an 80 MHz CPU (120 MHz PMAC equivalent), 128k x24 of compiled/assembled program memory, 128k x 24 of user data memory and a 1M x 8 flash memory.
- Option-5C1: This option provides an 80 MHz CPU with an expanded 512k x 24 of user data memory and a 2M x 8 flash memory. It provides a larger memory for user motion programs, uncompiled PLC programs, and user tables and buffers.
- Option-5C2: This option provides an 80 MHz CPU with an expanded 512k x 24 of compiled/assembled program memory and a 2M x 8 flash memory. It provides a larger memory for compiled PLCs, and user-written phase/servo algorithms.
- Option-5C3: This option provides an 80 MHz CPU with an expanded 512k x 24 of compiled/assembled program memory, an expanded 512k x 24 of user data memory, and a 4M x 8 flash memory. This is the maximum memory expansion option for user motion programs, uncompiled PLC programs user tables and buffers, compiled PLCs, and user-written phase/servo algorithms.
- Option-5D0: This option provides a 100 MHz CPU with 128k x24 of compiled/assembled program memory, 128k x 24 of user data memory and a 1M x 8 flash memory.
- Option-5D1: This option provides a 100 MHz CPU with an expanded 512k x 24 of user data memory and a 2M x 8 flash memory. It provides a larger memory for user motion programs, uncompiled PLC programs, and user tables and buffers.
- Option-5D2: This option provides a 100 MHz CPU with an expanded 512k x 24 of compiled/assembled program memory and a 2M x 8 flash memory. It provides a larger memory for compiled PLCs, and user-written phase/servo algorithms.
- Option-5D3: This option provides a 100 MHz CPU with an expanded 512k x 24 of compiled/assembled program memory, an expanded 512k x 24 of user data memory, and a 4M x 8 flash memory. This is the maximum memory expansion option for user motion programs, uncompiled PLC programs user tables and buffers, compiled PLCs, and user-written phase/servo algorithms.
- Option-16A: 32Kx24 SRAM battery-backed parameter memory (not compatible w/ 16B)
- Option-16B: 128Kx24 SRAM battery-backed parameter memory (not compatible w/ 16A)

Communications: The Turbo PMAC2-3U CPU can either communicate through the RS-422/RS-232 serial interface using the optional ACC-3D flat cable or through the optional PC/104 bus interface. All communication ports in a Turbo PMAC are independent of each other allowing multiple devices communicating with it at any given time.

- Option-2: It provides the Turbo PMAC2-3U CPU with the PC/104 interface for the connection of the optional PC/104 assembly. This option does not provide the PC/104 assembly accessory itself.
- Option-2B: This option provides a 32Kx16 Dual Ported RAM circuitry on board of the Turbo PMAC2-3U CPU. It provides a method of sharing memory between Turbo PMAC and the host computer for very fast interchange of data.
- Option-9T: Auxiliary RS-232 serial port. With this option a second serial port circuitry with a 10-pin connector is installed in the Turbo PMAC2-3U CPU. The optional ACC-3L is recommended for this serial port connection.

Firmware version: Turbo PMAC is provided with the latest firmware revision with both the regular and the extended servo algorithms. Parameters in the Turbo PMAC allow the selection per motor of either the regular or extended servo algorithms.

- Option-10: Through this option an older than the latest firmware released version could be ordered on-board. This is important in cases where the new Turbo PMAC is a replacement in an already existing machine or a new





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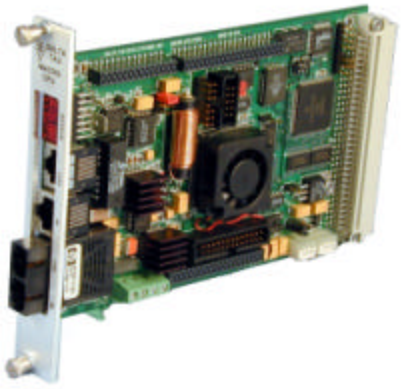
machine using same existing programs is developed. When possible use the same firmware revision for similar machines.

Miscellaneous: most options to the Turbo PMAC board are only possible to install in factory whereas most accessories for Turbo PMAC can be ordered and installed at a later stage. Therefore, it is important to order all the necessary options at the time when PMAC is ordered.

- If ordered with the 3A0 part number prefix, this board comes with a front panel attached to the board and no top or bottom panels. This configuration is appropriate for mounting in a 3U rack.
- If ordered with the 300 part number prefix, this board comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- Option-3: Front panel with connector labeling. This option is not necessary for stack configurations.
- Option-3A: Top and bottom panels with connector labeling. This option is not necessary for stack configurations.
- Option-8A: The standard clock crystal in Turbo PMAC has +/-100 ppm accuracy. Through this option a high-accuracy clock crystal (+/-15ppm) is installed instead. This option is only required for an accurate synchronization and velocity accuracy for long-term applications. Generally, this will only be noticeable if a continuous move sequence lasts more than 10 minutes.
- Option-18A: Electronic board identification number module (not compatible w/ 18B). This option could be used to let a host computer program identify the Turbo PMAC board connected to the machine.
- Option-18B: Electronic board identification number & real-time clock/calendar module (not compatible w/ 18A). This option could be used to let a host computer program identify the Turbo PMAC board connected to the machine or to let Turbo PMAC use the real-time clock/calendar information.

– MACRO Interface/CPU board

MACRO is an acronym for "Motion and Control Ring Optical". This is a non-proprietary digital interface developed by Delta Tau Data Systems for connection of multi-axis motion controllers, amplifiers, and I/O on a fiber optic or twisted pair copper (RJ45 connector) ring. Since the fiber optic cable transmits light and not electricity, it is immune to electromagnetic noise, capacitive coupling, ground loops, and other wiring problems. With the MACRO Interface/CPU board, the PMAC2 Ultralite or a UMAC Turbo System can control servo axis and I/O even if they are a great distance away. With the fiber optic MACRO interface, the UMAC MACRO can be up to 3 kilometers (2 miles) away from the PMAC2 controller or any other MACRO system on the ring. With the RJ-45 electrical interface, it can be up to 30 meters (100 feet) away. A Turbo PMAC2 Ultralite board or a UMAC Turbo system can control up 32 axes. A single UMAC MACRO can connect up to 8 axes. Therefore, up to four UMAC MACRO systems can be tied together in a single ring for a convenient motion control distribution.



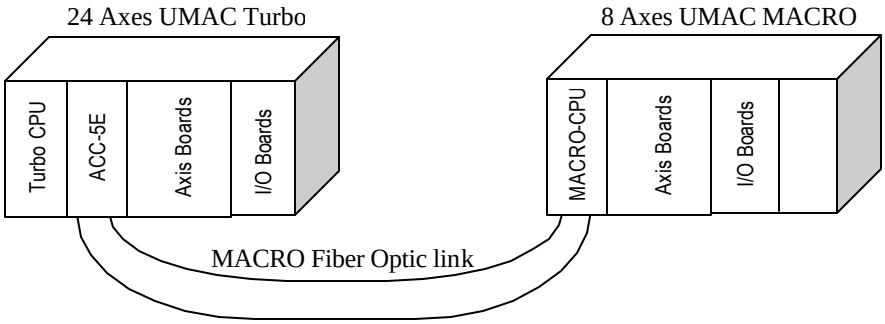
Part Number: 3x0-602804-10x
Number of slots: 1
Resources: only 1 CPU board allowed per each UMAC MACRO system
Power Requirements: 1.5 A @ 5V





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Example: In order to control a total of 32 axes and several I/O points, a UMAC Turbo system and a UMAC MACRO system are tied together in a fiber optics MACRO link:



Number of channels: The MACRO Interface/CPU board does not have any on-board channels for controlling amplifiers and motors. Accessory boards, either in a stack or UBUS backplane configuration, provide the necessary channel circuitry. In both cases, either in a stack or UBUS backplane configuration, a maximum of 8 channels can be connected to the MACRO Interface/CPU board for a maximum of 8 axes of motion control.

CPU and Memory: The MACRO board is provided with an 80 MHz DSP56303 CPU with 512 x 8 flash memory. There is not CPU speed or memory space options for the MACRO Interface/CPU board. These characteristics are selected on the PMAC2 Ultralite or Turbo PMAC2-3U CPU that is communicating with it.

Communications: The only possible communication with the MACRO Interface/CPU board is through the MACRO link. The on-board RS-232 serial interface is for diagnostics and firmware downloading only. The MACRO Interface/CPU board has also a 26-pin JTHW port for the optional connections of selected PMAC accessories.

Firmware version: The MACRO Interface/CPU board is provided with the latest firmware revision. Notice that the MACRO Interface/CPU firmware code is completely different than any other PMAC firmware code.

- Option-10: Through this option an older than the latest firmware released version could be ordered on-board. This is important in cases where the MACRO Interface/CPU board is a replacement in an already existing machine or a new machine using same existing programs is developed. When possible use the same firmware revision for similar machines.

Miscellaneous: Typically, a PMAC2 "Ultralite" board, one without any of its own servo interface circuitry, is used with the UMAC MACRO to provide 8 axes control as the most cost-effective solution. The PMAC2 Ultralite Option A or C selected must match the MACRO Option A or C selection. In addition, a combination of fiber optics and twisted pair (RJ45) link options could be ordered. For example, the PMAC2 can connect the first and last UMAC MACRO with a long fiber optic link and use shorter distance twisted pair cables linking the different UMAC MACRO systems together.

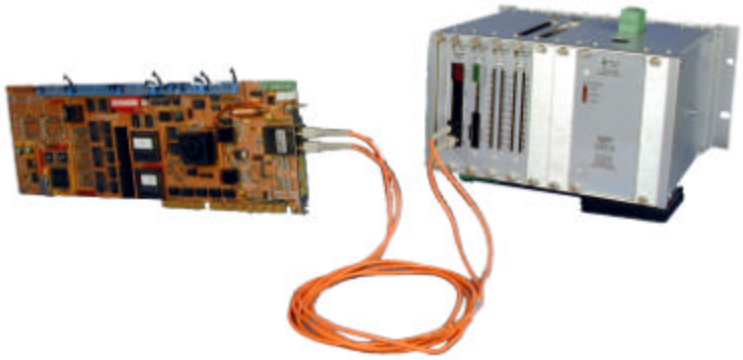
- If ordered with the 3A0 part number prefix, this board comes with a front panel attached to the board and no top or bottom panels. This configuration is appropriate for mounting in a 3U rack.
- If ordered with the 300 part number prefix, this board comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- Option-A: the MACRO interface is provided with the fiber optic connectors. This option has to match the connectors present on the ACC-5E or the PMAC2 Ultralite board communicating with the MACRO Interface.





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- Option-C: the MACRO interface is provided with the RJ-45 electrical MACRO connectors. This option has to match the connectors present on the ACC-5E or the PMAC2 Ultralite board communicating with the MACRO Interface.



UMAC MACRO with the PMAC2 Ultralite

ACC-7x: Optical Fiber cable for MACRO Interfaces

The glass optical fiber cable could be purchased selecting any of the following accessories according to the desired length:

- ACC-7A: 1.5m (5ft) terminated glass optical fiber cable
- ACC-7B: 5m (15ft) terminated glass optical fiber cable
- ACC-7C: 8m (28ft) terminated glass optical fiber cable
- ACC-7D: Custom length terminated glass optical fiber cable

Selecting the MACRO components: the MACRO ring description

A basic understanding of how the information is transferred around the MACRO ring is important for selecting the MACRO components. A MACRO ring is composed of devices, either “Masters” or “Slaves”, interconnected through a fiber optics link, an RJ-45 twisted pair connection or a combination of both. Information is transferred around the ring by a set of registers referred as “Nodes”. All these terms will be explained on the following sections.

MACRO Masters

A MACRO “Master” is a device connected on the MACRO link that can send commands to and read information from a MACRO “Slave”. A MACRO “Master” have on-board logic to generate servo commands and/or I/O signals to be sent to the appropriate MACRO “Slave”. The most commonly used MACRO “Master” is the PMAC2 Ultralite motion controller. These are the available MACRO “Masters” part of the PMAC family of motion controllers:





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Most commonly used Master devices	Servo Nodes	I/O Nodes	Auxiliary Nodes	Notes
PMAC2 PC Ultralite	8	6	2	ISA format limited to 8 servo nodes
PMAC2 VME Ultralite	8	6	2	VME format limited to 8 servo nodes
Turbo PMAC2 PC Ultralite	8/16/24/32	6/12/18/24	2/4/6/8	ISA format, requires optional MACRO chips for more than 8 servo nodes
Turbo PMAC2 3U (PC/104) with ACC-5E	8/16	6/12	2/4	UBUS format, requires optional MACRO chips for more than 8 (16) servo nodes
QMAC (Turbo PMAC2 Pack)	8/16	6/12	2/4	Packaged System
Less commonly used Master devices	**Servo Nodes**	**I/O Nodes**	**Auxiliary Nodes**	**Notes**
Turbo PMAC2 PC (ISA) with ACC-42P2	8	6	2	ISA format limited to 8 servo nodes
Turbo PMAC2 PC (PCI) with ACC-42P2	8	6	2	PCI format limited to 8 servo nodes
PMAC2 PC (ISA) with ACC-42P2	8	6	2	ISA format limited to 8 servo nodes
PMAC2 PC (PCI) with ACC-42P2	8	6	2	PCI format limited to 8 servo nodes
PMAC2 Lite with ACC-42P2	8	6	2	ISA format limited to 8 servo nodes
Mini PMAC2 with ACC-42P2	8	6	2	ISA format limited to 8 servo nodes

The ACC-24P2 is used to combine “local” servo drives with MACRO servo drives allowing, for example, a motor to be connected close to PMAC and another motor to be remotely connected at a long distance from PMAC.

MACRO Slaves

A MACRO “Slave” is a device connected on the MACRO link that can receive commands from and send information to a MACRO “Master”. A MACRO “Slave” does not have an on-board logic to generate servo commands and/or I/O signals. The most commonly used MACRO “Slave” is the MACRO Interface/CPU board, which is part of the UMAC MACRO system. Other MACRO slave types include MACRO type amplifiers and third party MACRO I/O modules.

MACRO Node

A MACRO node is a set of registers dedicated for a particular type of information to be transferred between a MACRO “Master” and a MACRO “Slave”. There are two types of nodes: servo nodes and I/O nodes.

24-bits	
16-bits	not used
16-bits	not used
16-bits	not used

Node structure using four consecutive memory registers

Servo Nodes: In MACRO type1 protocol nodes 0,1,4,5,8,9,12 and 13 are reserved to transfer servo information between the MACRO “Master” and the MACRO “Slave”. The MACRO “Slave” will read the information sent by the “Master” and then write the appropriate information to be sent back from the “Slave” to the “Master”. This is how typically a servo node looks like before and after the MACRO “Slave” process it:





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Command Output A	
Command Output B	not used
Command Output C	not used
Amplifier Enable	not used

Node from Master to Slave

Encoder Feedback	
First Current Feedback	not used
Second Current Feedback	not used
Flags Status, Amplifier Fault	not used

Node from Slave to Master

I/O Nodes: In MACRO type1 protocol nodes 2,3,6,7,10 and 11 are reserved to transfer I/O information between the MACRO "Master" and the MACRO "Slave". Typically these nodes are used to transfer information related to general-purpose digital I/O boards but could also be used for any other purpose. If, for example, an extra encoder is needed for a particular motor with dual feedback, an I/O node could be used to send the information between the MACRO "Slave" to the MACRO "Master". A total of 72 bits per node is available for transferring information between the MACRO "Slave" and the MACRO "Master". Knowing the maximum number of bits available for MACRO I/O transfers is important when populating a UMAC MACRO system with a large number of I/O boards. This is how typically a servo node looks like before and after the MACRO "Slave" process it:

24-bits digital outputs write	
16-bits digital outputs write	not used
16-bits digital outputs write	not used
16-bits digital outputs write	not used

Node from Master to Slave

24-bits digital inputs read	
16-bits digital inputs read	not used
16-bits digital inputs read	not used
16-bits digital inputs read	not used

Node from Slave to Master

The number of nodes and methods of data transfer used for each UMAC MACRO accessory is described in the appropriate accessory manual for each product. This is important to determine the maximum number of accessories that can be used on a given UMAC MACRO system.





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3.0 – UMAC axis interface and breakout boards

– Introduction

The PMAC2 SERVO IC circuitry

The main component in a UMAC System is its CPU. The CPU of a UMAC Turbo System is the Turbo PMAC2-3U CPU whereas the CPU for a UMAC MACRO system is the MACRO Interface/CPU board. The CPU circuitry communicates with the amplifier and motor signals through specially designed custom gate array ICs, referred to as "SERVO ICs". The PMAC2 style SERVO ICs has four motor channels and each motor channel in it has the following features that allow virtually controlling any kind of motor or amplifier:

- 3 top-and-bottom PWM output signal pairs (when the digital side is used by the ACC-24E2, ACC-1E or ACC2E)
- 2 18-bit serial DAC output lines with clock and strobe (when the analog side is used by the ACC-24E2A)
- 1 pulse-and-direction output signal pair (when the stepper side is used by the ACC-24E2S)
- 1 3-channel (A, B and C) quadrature differential encoder input with hardware capture and compare
- 4 capture-capable input flags (HOME, +LIMIT, -LIMIT and USER)
- 5 supplemental input flags, for hall commutation, sub-count data or error code

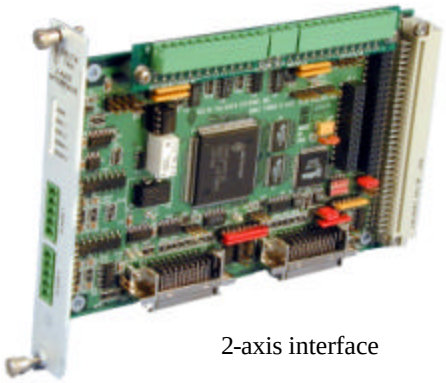
The backplane axis accessory boards

The axis boards provide the SERVO IC circuitry that is essential for the interfacing of motor and amplifier signals. In an UMAC system, the Turbo PMAC2-3U CPU board or the MACRO Interface/CPU board connects to the axis accessory boards through the UBUS backplane. The backplane axis accessory boards have the necessary SERVO IC circuitry and connectors that interface with the amplifier, encoder and flag signals. Therefore, the backplane axis accessory boards have the dual function of being axis interface and breakout boards. The Turbo PMAC2-3U CPU board can interface to eight backplane SERVO ICs for a total of 32 axes of motion control (as long as the backplane dimensions allows it). The MACRO Interface/CPU board can interface to only two backplane SERVO ICs providing up to eight axes of motion control.

– ACC-24E2: Digital Axis Interface/Breakout Board

Part Number: 3x0-603397-10x
Number of slots: 1 slot per two axes, 2 slots per four axes
Resources: 1 Servo IC for either 2 or 4 axes
Power Requirements: 470 mA @ 5V (690 mA with Option-1D)

The ACC-24E2 axis interface and breakout board provides the interface circuitry and breakout connectors for either 2 or 4 channels of digital servo interface. This accessory is used to control digital amplifiers with direct PWM digital signals. Alternatively, any individual channel of this accessory could be setup to provide a pulse and direction signal (PFM) in case both a digital PWM and a stepper motor are controlled with it. A Mini-D 36-pin amplifier connector is provided for each axis. There is removable encoder terminal block and a



2-axis interface



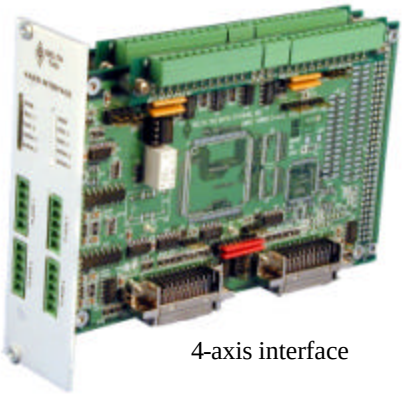


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removable flag terminal block for each axis. The ACC-24E2 can have either Option 1A for 2 additional analog servo interface channels or Option 1D for 2 additional digital servo interface channels. This means that this accessory could be populated with a half digital interface and a half analog interface. This accessory connects to the CPU board through the backplane expansion port. It is intended for UMAC usage only; refer to the ACC-2E for "stack" interface boards.

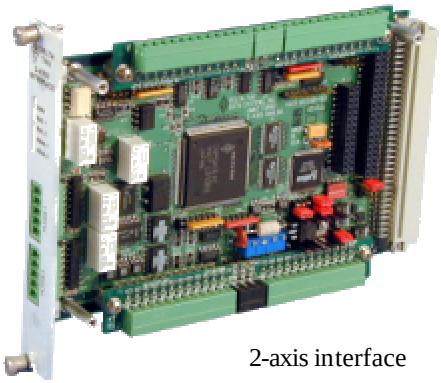
Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.
- Option-1D: This option provides two extra digital channels for a total of 4 digital PWM channels on-board. Any of the extra two channels could also be set as pulse and direction (PFM) signals and are provided with a removable Mini-D 36-pin amplifier connector, a removable encoder terminal block and a removable flag terminal block for each axis. This option combines with ACC-24E2 board to comprise two-slot module.
- Option-1A: This option provides two extra **analog** channels with two ±10 Volts DAC outputs per channel for velocity, torque or sinusoidal commutation amplifiers. If a single DAC amplifier is used, the second DAC of the channel could be used for any other general purpose. Any of the extra two channels could also be set as pulse and direction (PFM) signals and are provided with a removable amplifier signals terminal block, a removable encoder terminal block and a removable flag terminal block for each axis. This option combines with ACC-24E2 board to comprise two-slot mo dule.


4-axis interface

– ACC-24E2A: Analog Axis Interface/Breakout Board

Part Number: 3x0-603398-10x
Number of slots: 1 slot per two axes, 2 slots per four axes
Resources: 1 Servo IC for either 2 or 4 axes
Power Requirements: 500 mA @ 5V (830 mA with Option-1A)


2-axis interface

The ACC-24E2A axis interface and breakout board provides the interface circuitry and breakout connectors for either 2 or 4 channels of analog servo interface. The two analog channels provided have two ±10 Volts DACs per channel and are suitable for controlling velocity, torque or sinusoidal commutation amplifiers. If a single DAC amplifier is used, the second DAC of the channel could be used for any other general purpose. Alternatively, any individual channel of this accessory could be setup to provide a pulse and direction signal (PFM) in case both an analog and a stepper motor are controlled with it. A removable amplifier signals terminal block is provided for each axis. There is removable encoder terminal block and a removable flag terminal block for each axis. The ACC-24E2A can have either Option 1A for 2 additional analog servo interface channels or Option 1D for 2 additional digital servo interface channels. This means that this accessory could be populated with a half digital interface and a half analog interface. This accessory connects to the CPU board through the backplane expansion port. It is intended for UMAC usage only; refer to the ACC-2E for "stack" interface boards.

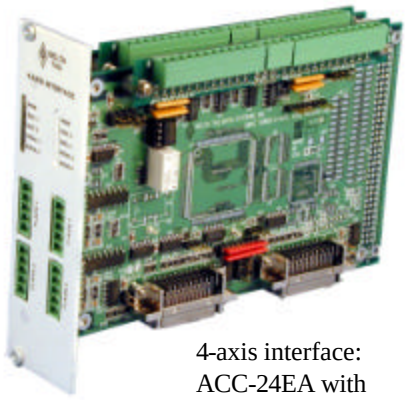




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Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.
- Option-1D: This option provides two extra **digital** channels for controlling digital amplifiers with direct PWM signals. Any of the extra two channels could also be set as pulse and direction (PFM) signals and are provided with a removable Mini-D 36-pin amplifier connector, a removable encoder terminal block and a removable flag terminal block for each axis. This option combines with ACC-24E2A board to comprise two-slot module.

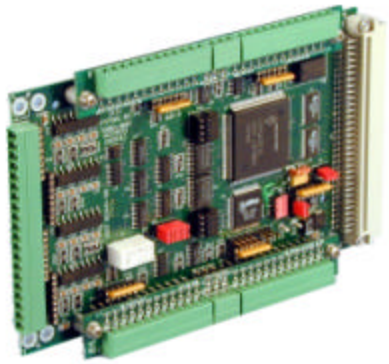


4-axis interface: ACC-24EA with Option-1D

- Option-1A: This option provides two extra analog channels for a total of 4 on-board analog channels. Each extra channel has two ±10 Volts DAC outputs per channel for velocity, torque or sinusoidal commutation amplifiers. If a single DAC amplifier is used, the second DAC of the channel could be used for any other general purpose. Any of the extra two channels could also be set as pulse and direction (PFM) signals and are provided with a removable amplifier signals terminal block, a removable encoder terminal block and a removable flag terminal block for each axis. This option combines with ACC-24E2A board to comprise two-slot module.

– ACC-24E2S: Stepper/Encoder Interface/Breakout Board

Part Number: 3x0-603441-10x
Number of slots: 1 slot per four axes
Resources: 1 Servo IC per 4 axes
Power Requirements: 650 mA @ 5V



The ACC-24E2S axis interface and breakout board provides the interface circuitry and breakout connectors for 4 channels of pulse and direction, stepper, signals. There is a removable stepper terminal block, a removable encoder terminal block and a removable flag terminal block for each axis. This accessory connects to the CPU board through the backplane expansion port. It is intended for UMAC usage only; refer to the ACC-2E for "stack" interface boards.

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.





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– UMAC-Option-5x: Mini-D 36-pin PWM cable for digital amplifiers

The cable connecting a digital PWM amplifier and the ACC-24E2 or Option-D of either ACC-24E2 or ACC-24E2A can be purchased through the following UMAC options:

- Option-5A: Amplifier PWM Cable, 600 mm (24) inches long, mini-D, 36 conductor, 1/axis
- Option-5B: Amplifier PWM Cable, 900 mm (36 inches long), mini-D, 36 conductor, 1/axis
- Option-5C: Amplifier PWM Cable, 1.5 m (60 inches) long, mini-D, 36 conductor, 1/axis
- Option-5D: Amplifier PWM Cable, 1.8 m (72 inches) long, mini-D, 36 conductor, 1/axis
- Option-5E: Amplifier PWM Cable, 2.1 m (84 inches) long, mini-D, 36 conductor, 1/axis
- Option-5F: Amplifier PWM Cable, 3.6 m (144 inches) long, mini-D, 36 conductor, 1/axis

– Built-in MLDT interface in the PMAC2 style channels

Any channel of an accessory ACC-24E2, the ACC-24E2A or the ACC-24E2S **that is not being used for digital PWM or stepper PFM signals** could be setup to interface an MLDT position feedback device. MLDT position feedback devices are in most cases used with analog ±10 Volts amplifiers. If a digital amplifier or a stepper drive is used with an MLDT device then two channels for that particular axis must be used: one for the PWM or PFM output signals and one for the MLDT feedback device interface.





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4.0 – UMAC I/O Boards

– Introduction

The IOGATE circuitry

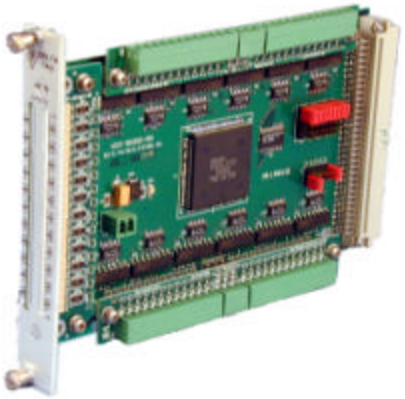
The main component in a UMAC System is its CPU. The CPU of a UMAC Turbo System is the Turbo PMAC2-3U CPU whereas the CPU for a UMAC MACRO system is the MACRO Interface/CPU board. The CPU circuitry communicates with the digital I/O lines through specially designed custom gate array ICs, referred to as "IOGATES". Each IOGATE provides 48 I/O lines configurable in a number of groups of either inputs or outputs.

The backplane digital inputs and outputs accessory boards

The I/O boards provide the IOGATE chips circuitry that is needed for the interfacing to external digital I/O lines. In an UMAC system, the Turbo PMAC2-3U CPU board or the MACRO Interface/CPU board connects to the digital I/O boards through the UBUS backplane. The backplane digital I/O boards have the necessary IOGATE circuitry, isolation circuitry and terminals for general-purpose I/O connections. In addition, certain backplane I/O boards types are dedicated for parallel feedback signal connections. The Turbo PMAC2-3U CPU board can interface to 16 backplane IOGATE chips. The MACRO Interface/CPU board can interface to 4 backplane IOGATE chips. A great variety of I/O boards are available for potentially hundreds of I/O control lines. The selection could be made from TTL I/O, OPTO22 compatible boards, high or low power outputs, optically isolated boards, AC or DC I/O signals and so on.

– ACC-9E: Isolated 48-Input Backplane Board

Part Number: 3x0-603283-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements: 40 mA @ 5V



The ACC-9E is a 3U-size rack-mounted board with 48 isolated digital inputs at 12V to 24V levels. The inputs are sinking or sourcing by user configuration. Removable terminal blocks are provided for the connection to I/O points. This accessory board connects to the CPU board through the backplane expansion port. It is intended for UMAC use only; refer to ACC-3E1 and 4E for "stack" I/O boards.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603283-10x), the ACC-9E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603283-10x), the ACC-9E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the accessories P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

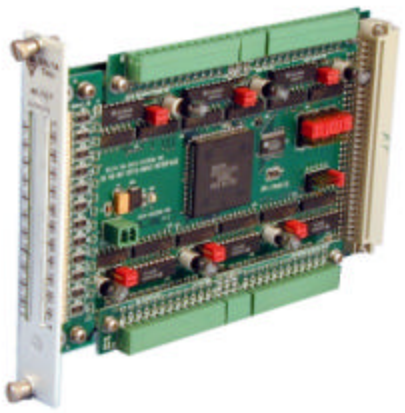




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– ACC-10E: Isolated 48-Output Backplane Board

Part Number: 3x0-603299-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements: 30 mA



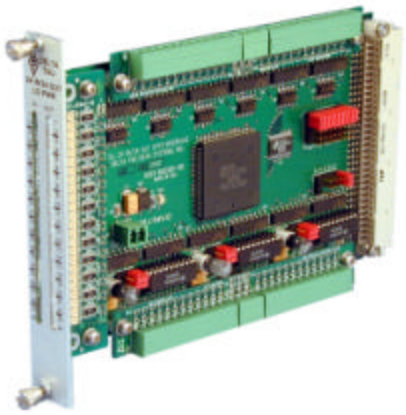
The ACC-10E is a 3U-size rack-mounted board that provides 48 discrete, optically isolated digital outputs at 12V to 24V levels, with 100 mA drive capability per output point. The user must select between sourcing or sinking output drivers by selecting the appropriate option A or B. Removable terminal blocks are provided for the connection to I/O points. This accessory board connects to the CPU board through the backplane expansion port. It is intended for UMAC use only; refer to ACC-3E1 and 4E for "stack" I/O boards.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603299-10x), the ACC-10E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603299-10x), the ACC-10E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U frame supplied by Delta Tau.
- Option-A: Sourcing output drivers: 6 UDN2981A or equivalent octal driver ICs for 48 sourcing outputs.
- Option-B: Sinking output drivers: 6 ULN2803A or equivalent octal driver ICs for 48 sourcing inputs.

– ACC-11E: Isolated 24-Input/24-Output Backplane Board

Part Number: 3x0-603307-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements: 30 mA



The ACC-11E is a 3U-size rack-mounted board with 24 isolated digital inputs at 12V to 24V levels and 24 isolated digital outputs at 12V to 24V levels, 100 mA per output point. The user must select between sourcing or sinking output drivers by selecting the appropriate option A or B. Removable terminal blocks are provided for the connection to I/O points. This accessory board connects to the CPU board through the backplane expansion port. It is intended for UMAC use only; refer to ACC-3E1 and 4E for "stack" I/O boards.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603307-10x), the ACC-11E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.



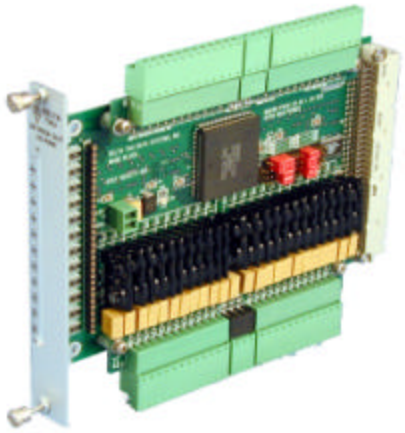


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- If ordered with the 3R0 part number prefix (part # 3R0-603307-10x), the ACC-11E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-A: Sourcing output drivers: 3 UDN2981A or equivalent octal driver ICs for 24 sourcing outputs.
- Option-B: Sinking output drivers: 3 ULN2803A or equivalent octal driver ICs for 24 sourcing inputs.

– ACC-12E: Isolated 24-Input/24-High-Power-Output Board

Part Number: 3x0-603277-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements:



The ACC-12E is a 3U-size rack-mounted board with 24 isolated digital inputs and 24 isolated digital outputs. The Inputs are at 12V to 24V levels, sinking or sourcing by user configuration. The Outputs can be DC sinking or sourcing, 1A each at up to 60VDC. Alternatively, the Outputs can be AC, 1A each at up to 240VAC. The Output modules are individually selectable by order configuration. The user must individually select up to 24 output module options from Option-1, Option-2A or Option-2B. Removable terminal blocks are provided for the connection to I/O points. This board connects to the CPU board through the backplane expansion port. It is intended for UMAC use only – refer to ACC-3E1 and 4E for "stack" I/O boards.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603277-10x), the ACC-12E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603277-10x), the ACC-12E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-1: Single AC output module, 1A @ 240VAC
- Option-2A: Single DC sourcing output module, 1A @ 60VDC
- Option-2B: Single DC sinking output module, 1A @ 60VDC

– ACC-14E: 48-TTL-I/O Backplane Board

Part Number: 3x0-603474-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements: 130 mA

The ACC-14E 48-Input/Output Board provides 48 discrete digital I/O points at 5V levels. It connects to the Interface/CPU board through the backplane expansion port. The typical use of the ACC-14E is for parallel position feedback devices like absolute encoder and laser interferometers. Each ACC-14E board has 48 bits of input, so it may be connected to two parallel





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feedback devices of up to 24 bits each, or one of over 24 bits. A secondary use of this accessory is for connections of regular digital I/O points provided by an Opto-22™ or compatible I/O module boards. Two 50-pin IDC headers, top edge and bottom edge, are provided for connection to I/O points. This accessory is intended for UMAC use only; refer to ACC-3E1 and 4E for "stack" I/O boards.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603472-10x), the ACC-14E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603472-10x), the ACC-14E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– ACC-65E: Isolated, self-protected sourcing 24-In/24-Out Board

Part Number: 3x0-603575-10x
Number of slots:
Resources:
Power Requirements:

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– ACC-66E: Isolated, self-protected sourcing 48-Input Board

Part Number: 3x0-603576-10x
Number of slots:
Resources:
Power Requirements:

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.





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– ACC-67E: Isolated, self-protected sourcing 48-Outputs Board

Part Number: 3x0-603577-10x
Number of slots:
Resources:
Power Requirements:

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– ACC-68E: Isolated, self-protected sinking 24-In/24-Out Board

Part Number:
Number of slots:
Resources:
Power Requirements:

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.





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5.0 – UMAC PC/104 and communication Boards

– Introduction

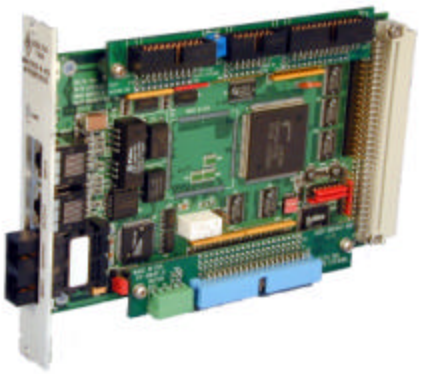
A rich selection of communication accessory boards is provided only for the UMAC Turbo system but none for the UMAC MACRO system. These communication accessory boards allow a UMAC Turbo system to communicate with other external devices or a main host computer by means of different protocols. The available high-speed communication protocols and interfaces include Ethernet, USB, field bus adapters as well as the MACRO link between UMAC systems or other PMAC2 Ultralite.

The Dual ported RAM circuitry

Most communication accessories for the UMAC Turbo system use a circuitry very similar to the on-board Dual Ported RAM of the Turbo PMAC2-3U CPU, which is ordered through its Option-2B. The Turbo PMAC2-3U CPU can address eight backplane Dual Ported RAM type circuits for a total of eight backplane communication boards. The MACRO CPU Interface cannot address any Dual Ported RAM circuits and therefore there are no communication accessories for the UMAC MACRO System.

– ACC-5E: General-Purpose I/O and MACRO Backplane Board

Part Number: 3x0-603437-10x
Number of slots: 1 slot
Resources: 1 MACRO chip per 16 MACRO nodes
Power Requirements:



The ACC-5E board provides a UMAC Turbo system with the same ports that are present along the top of a PC-bus PMAC2, or out the front of a VME-bus PMAC2: the JDISP display port, the JTHW multiplexer port, the JIO general-purpose I/O port, and the JHW handwheel port. The JHW handwheel port includes two complete quadrature encoder inputs. Optionally, this accessory can also provide a 16-node or 32-node MACRO-ring interface. This allows a UMAC Turbo to communicate to other UMAC MACRO even at great distances away from it. ACC-5E connects to the CPU board through the UBUS backplane expansion port. **This accessory is intended for UMAC Turbo use only.**

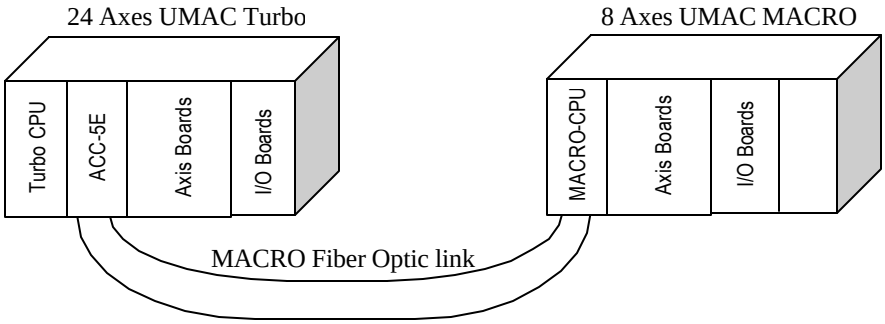
One of the uses of this accessory is to link a UMAC Turbo system and a UMAC MACRO system to control a large number of motors.





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Example: In order to control a total of 32 axes and several I/O points, a UMAC Turbo system and a UMAC MACRO system are tied together in a fiber optics MACRO link:



Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.
- Option-A: A 16-node MACRO Interface is provided with only fiber optics connectors.
- Option-B: A 16-node MACRO Interface is provided with both fiber optics and RJ-45 connectors.
- Option-C: A 16-node MACRO Interface is provided with only RJ-45 connectors.
- Option-2: An additional 16-node MACRO Interface is provided for a total of 32 MACRO nodes.

– ACC-54E: USB and Ethernet TCP/IP communication adapter

Part Number: 3x0-603467-10x
Number of slots: 1 Slot
Resources: 1 DPRAM IC
Power Requirements: 1 A @ 5V



This accessory allows the UMAC Turbo system to communicate with other external devices using either the USB or Ethernet high-speed communication protocols. The method of communication is very similar to the DPRAM ASCII communication protocol. This accessory does not allow the UMAC Turbo system to interface with a Novell or Microsoft network. Select the appropriate network interface for the PC/104 accessory instead. **This accessory is intended for UMAC Turbo use only.**

Options:

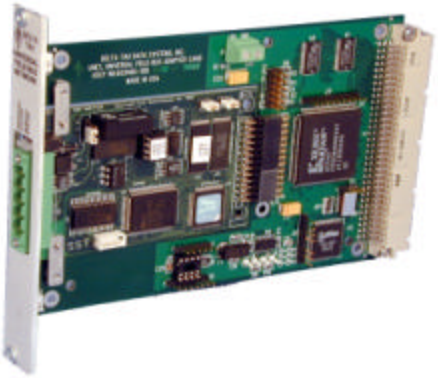
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.



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- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.
- Option-1: 12 mbps USB Interface
- Option-2: 10-Base-T Ethernet coaxial link

– ACC-55E: UNET, Universal Field bus adapter network card



Part Number: 3x0-603485-10x
Number of slots: 1 Slot
Resources: 1 DPRAM IC
Power Requirements:

This accessory allows the UMAC Turbo system to communicate with other external devices using a field bus communication protocol like Device Net, Profibus, and Can Bus as required. The UNET board can act as a master or a slave in the field bus connections. The UNET board uses the SST company UCS interface board for adaptation to various field buses and, therefore, other field buses could be used as well. **This accessory is intended for UMAC Turbo use only.**

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.

– PC/104 products

ACC-PC: PC/104 computer assembly



Part Number: 3R0-0PC104-10X
Number of slots: 5 Rack (no UBUS) positions
Resources: None
Power Requirements: 3A @ 5V

When the Turbo PMAC2-3U CPU Option-2 is ordered, the PC/104 interface is installed on it allowing mounting an entire PC-compatible computer inside the UMAC Turbo system. Delta Tau can provide this computer, complete with hard disk, floppy disk, and the interfaces to mouse, keyboard, and monitor mounted on a front panel. PC-compatible embedded PC/104 computers may also be purchased from third parties, but care must be taken to make sure that all components are PC/104



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"form-factor compliant" (most are not). The PC/104 assembly occupies 5 rack positions. Since this assembly does not plug into the UBUS backplane, the 5 positions will be taken into account for the pack frame selection (ACC-Px) but not for the UBUS selection (ACC-Ux). The PC/104 assembly provided by Delta Tau includes:



- 233MHz 686 Pentium CPU
- 32MB SDRAM
- IDE Controller, 4GB hard disk
- 1.44MB floppy drive
- Front-plate connections for SVGA video, keyboard
- ECP/EPP parallel port
- RS232/422/485 serial port
- Speaker.

ACC-PC1: CD-ROM DRIVE

This accessory provides an external mount CD-ROM reader.

ACC-PC2: USB interface

This accessory provides an internally mounted USB interface.

ACC-PC3: Keyboard

This accessory provides a 101-key keyboard.

ACC-PC4: Mouse

This accessory provides a serial mouse.

ACC-PC5: 15" CRT Monitor

This accessory provides a 15" CRT monitor with 1280x1024 resolution.

ACC-PC6: 17" CRT Monitor

This accessory provides a 17" CRT monitor with 1280x1024 resolution.

ACC-PC7: 14" LCD Panel

This accessory provides a 14" LCD panel with 1024 x768 resolution. The actual unit size is 15.35x14.76x7.87.

ACC-PC8: USB interface

This accessory provides an internally mounted Ethernet module.





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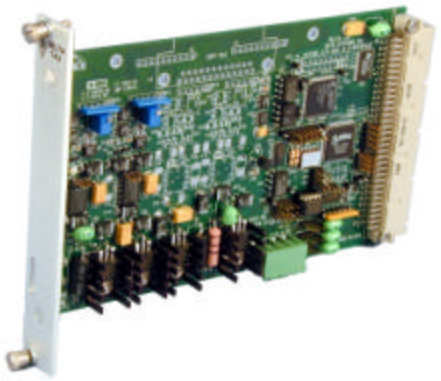
6.0 – UMAC miscellaneous Boards

– Introduction

A rich selection of accessory boards is provided to expand the features of the UMAC system. The standard feedback device that the UMAC reads without the addition of any extra accessories is one incremental quadrature encoder per axis. Optional accessory boards allow using other position feedback devices like dual quadrature, analog feedback devices, sinusoidal interpolators and SSI interfaces. Also, 3U format motor amplifiers are available among many other optional boards.

– ACC-28E: High-Resolution Analog-to-Digital Converter Board

Part Number: 3x0-603404-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements: 120 mA @ 5V



The ACC-28E is a 3U-size rack-mounted board that provides 2 or 4 channels of 16-bit A/D converters for analog inputs with ±10 Volts input range. These inputs can be used for servo feedback, or for general-purpose analog input functions. It connects to the CPU board through the backplane expansion port.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603404-10x), the ACC-28E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603404-10x), the ACC-28E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-1: 2 additional on-board 16-bit A/D converters.

– ACC-36E: Analog-to-Digital Converter Board

Part Number: 3x0-603483-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements: 140 ma @ 5V

The ACC-36E is a 3U-size rack-mounted board that provides 16 channels of 12-bit A/D converters for analog inputs with ±10 Volts input range. These inputs can be used for servo feedback, or for general-purpose analog input functions. It connects to the CPU board through the backplane expansion port.





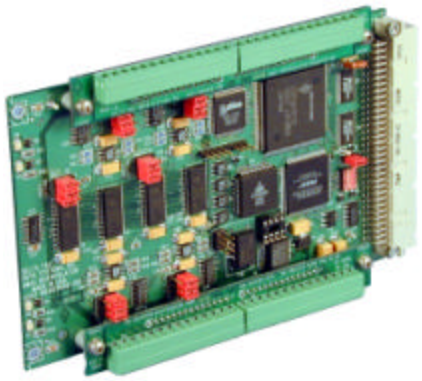
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Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.

– ACC-51E: High-Resolution Analog Encoder Interpolator Board

Part Number: 3x0-603438-10x
Number of slots: 1 slot
Resources: 1 Servo IC
Power Requirements: 420 mA @ 5V



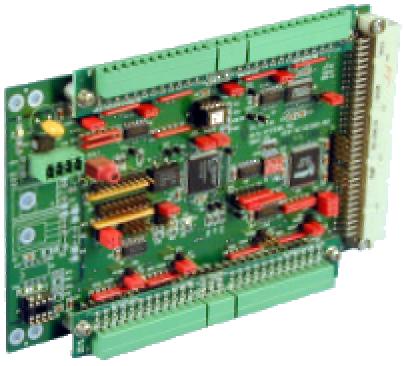
The ACC-51E is a 3U-size rack-mounted board with interpolation circuitry for 2 analog "sine-wave" (1Vpp nominal) encoders to produce 4096 states per encoder line. It connects to the CPU board through the backplane expansion port.

Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.
- Option-1: two additional sinusoidal interpolator inputs for a total of four on-board sinusoidal interpolator inputs.
- Option-2: option for Stegman Hiperface absolute encoders.

– ACC-53E: SSI Encoder Interface Board

Part Number: 3x0-603360-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements:



The ACC-53E provides 4 or 8 channels of Synchronous Serial Interface (SSI) for absolute encoders and compatible devices. It connects to the CPU board through the backplane expansion port. The data format supports 24 bits of position data plus 1 error bit.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603360-10x), the ACC-53E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.





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- If ordered with the 3R0 part number prefix (part # 3R0-603360-10x), the ACC-53E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-1: Additional 4 Channel On-Board SSI Encoder Interface
- Option 2: Kawasaki Serial Encoder Interface

– ACC-57E: Yaskawa or Mitsubishi encoder interface

Part Number: 3x0-603484-10x
Number of slots: 1 per two channels, 2 per 4 channels
Resources: 1 Thumbwheel address (Middle Thumbwheel row)
Power Requirements:

The ACC-57E is a 3U-size rack-mounted board that provides 2 or 4 channels of either Yaskawa or Mitsubishi absolute encoder interface (not both). The user must order either Option-Y for the Yaskawa interface or Option-M for the Mitsubishi interface. Two extra axis interface of the same type could be added for a total of 4 absolute encoder interface inputs. It is not possible, however, to order half ACC-57E with the Yaskawa interface and half ACC-57E with the Mitsubishi interface. This accessory connects to the CPU board through the backplane expansion port.

Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603484-10x), the ACC-57E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603484-10x), the ACC-57E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-Y: 2 axes Yaskawa absolute encoder inputs.
- Option-1Y: 2 additional axes Yaskawa absolute encoder inputs. Requires Option-Y.
- Option-B2: 3V Battery (Default is 3.6 Volts). This option is for existing customers only.
- Option-M: 2 axes Mitsubishi absolute encoder inputs.
- Option-1M: 2 additional axes Mitsubishi absolute encoder inputs. Requires Option-M.

– ACC-58E: Resolver to Digital converter board

Part Number: 3x0-603482-10x
Number of slots: 1 slot
Resources: 1 IOGATE IC
Power Requirements:

The ACC-58E is a 3U-size rack-mounted board that provides 2 or 4 channels 16-bit interface for resolver position feedback devices. Ordering Option-1 a total of four resolver inputs are provided through this accessory board. This accessory connects to the CPU board through the backplane expansion port.





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Options:

- If ordered with the 3A0 part number prefix (part # 3A0-603482-10x), the ACC-58E comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix (part # 3R0-603482-10x), the ACC-58E comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-1: two additional 16-bit resolver to digital converters for a total of four on-board resolver to digital converters.

– ACC-59E: 12-bits DAC/ADC converter

Part Number: 3x0-603494-10x
Number of slots: -
Resources: -
Power Requirements: -

The ACC-59E is a 3U-size rack-mounted board that provides low-cost 12-bits DAC outputs and 12-bits analog inputs. This accessory connects to the CPU board through the backplane expansion port.

Options:

- If ordered with the 3A0 part number prefix this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– ACC-61E: 4 Axes Analog UMAC Demo Unit

Part Number: 3x0-603445-10x
Number of slots: -
Resources: -
Power Requirements: -

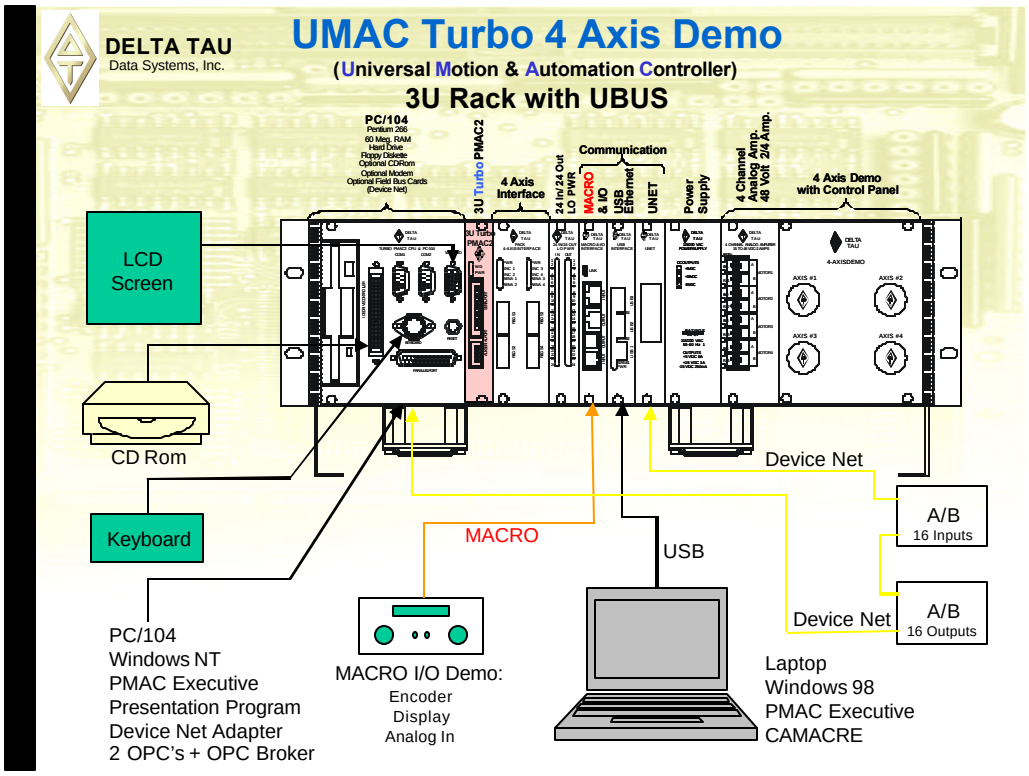
The ACC-61E is a 21-slot rack With 4 motors and I/O switch panel mounted internally (5 slots) for 4 axis of analog control. Must order controller and options separately from the price list: UMAC MACRO or UMAC TURBO.

Available options include: PC104, MACRO interface & I/O, USB, Unet, and 24 in/24 out I/O

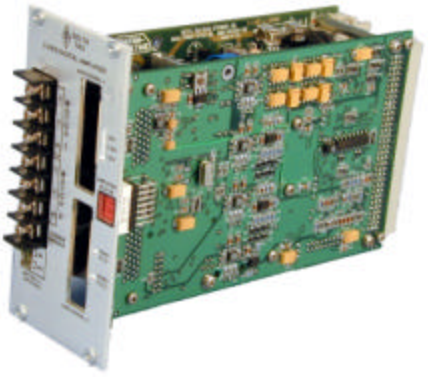




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– AMP-1D, two axes digital PWM amplifier



Part Number: 400-603391-10x
Number of slots: 3
Resources: 2 digital channels
Power Requirements:

This accessory is a 3U-format amplifier for brushless motor applications. It could be installed a UMAC system using its own optional backplane assembly. It provides two axes of amplifier circuits with these characteristics: 50 to 180VDC Bus, 3 Phase, 3A rms continuous, 8A peak each axis. **The actual amplifier performance is based on temperature, duty cycle, bus voltage and other parameters. Please consult the appropriate amplifier manual for further details.**

Options:

- If ordered with the 400 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.





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- If ordered with the 4A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 4R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-1DM, two axes digital PWM/MACRO amplifier *(pending)*

Part Number: 4x0-603492-10x
Number of slots: 3
Resources:
Power Requirements:

This accessory is a 3U-format amplifier for brushless motor applications. It could be installed a UMAC system using its own optional backplane assembly. In addition, this amplifier could be controlled by a MACRO link. It provides two axes of amplifier circuits with these characteristics: 50 to 180VDC Bus, 3 Phase, 3A rms continuous, 8A peak each axis. **The actual amplifier performance is based on temperature, duty cycle, bus voltage and other parameters. Please consult the appropriate amplifier manual for further details.**

Options:

- If ordered with the 400 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 4A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 4R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-2D, single axis digital PWM amplifier *(pending)*

Part Number: 4x1-603391-10x
Number of slots: 3
Resources:
Power Requirements:

This accessory is a 3U-format amplifier for brushless motor applications. It could be installed a UMAC system using its own optional backplane assembly. It provides a single axis amplifier circuit with these characteristics: 50 to 360VDC Bus, 3 Phase, 8A rms continuous, 16A rms peak **The actual amplifier performance is based on temperature, duty cycle, bus voltage and other parameters. Please consult the appropriate amplifier manual for further details.**

Options:

- If ordered with the 401 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.





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- If ordered with the 4A1 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 4R1 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-2DM, single axis digital PWM/MACRO amplifier *(pending)*

Part Number: 4x1-603492-10x
Number of slots: 3
Resources:
Power Requirements:

This accessory is a 3U-format amplifier for brushless mo tor applications. It could be installed a UMAC system using its own optional backplane assembly. In addition, this amplifier could be controlled by a MACRO link. It provides single axis of amplifier circuits with these characteristics: 50 to 360VDC Bus, 3 Phase, 8A rms continuous, 16A rms peak **The actual amplifier performance is based on temperature, duty cycle, bus voltage and other parameters. Please consult the appropriate amplifier manual for further details.**

Options:

- If ordered with the 401 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 4A1 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 4R1 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-1DPS, power supply for digital PWM amplifiers

Part Number: 3x0-603428-10x
Number of slots: 2

This accessory is a 3U-format power supply for the digital PWM amplifiers. It could be installed a UMAC system using its own optional backplane assembly. It has these characteristics: 35 to 230Vrms AC input, 50 to 360VDC bus output @ 10A and 12VDC output at 250 mA (used to power the amplifier fans).

Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.





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- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-2DBP, backplane for digital PWM amplifier

Part Number: 3x0-603435-10x
Number of slots: 9

This accessory is backplane assembly for two digital PWM amplifier assemblies and one power supply or three digital PWM amplifier assemblies with an external supply.

– AMP-1, four axes analog linear amplifier 24 VDC, 0.5/1A

Part Number: 3x0-603489-10x
Number of slots: 2
Resources: 4 analog channels
Power Requirements:

This accessory is a 3U-format amplifier for hydraulic values and small motors applications. It could be installed a UMAC system using its own optional backplane assembly. It provides four axes of amplifier circuits each with these characteristics: ±10V Linear output, 12 to 24VDC bus, 0.5A continuous 1A peak, linear modulation

Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-2, four axes analog PWM amplifier, 48 VDC 3/5 A

Part Number: 3x0-603443-10x
Number of slots: 2
Resources: 4 analog channels
Power Requirements:

This accessory is a 3U-format amplifier for brushed motors applications. It could be installed a UMAC system using its own optional backplane assembly. It provides four axes of amplifier circuits, each with these characteristics:





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- Analog ±10V torque (current) input command
- H-bridge single-phase output with current feedback
- 15 to 40VDC bus
- 3A each axis continuous, 5A peak, 30 kHz PWM

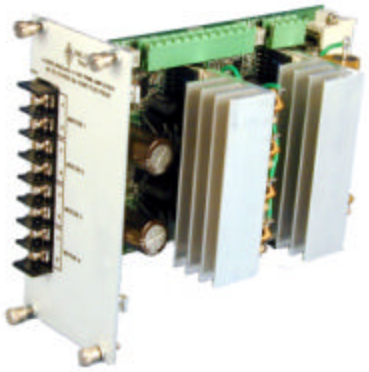


Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.

– AMP-3, four axes analog PWM amplifier, 70 VDC 8/12 A

Part Number: 3x0-603486-10x
Number of slots: 3
Resources: 4 analog channels
Power Requirements:



This accessory is a 3U-format amplifier for brushed motors or direct micro-stepping applications. It could be installed a UMAC system using its own optional backplane assembly. It provides four axes of amplifier circuits, each with these characteristics:

- Analog ±10V torque (current) input command
- H-bridge single-phase output with current feedback
- 15 to 65VDC bus
- 8A each axis continuous, 12A peak, 30 kHz PWM

Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.





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– AMP-4ABP, double analog amplifier backplane

Part Number: 3x0-603470-10x
Number of slots: 4

This accessory is backplane assembly for up to two 4-axis analog amplifiers. Can be used for 2/48V or one 48V and one 70V analog amplifier board. Connector for external DC-bus supply, external shunt

– AMP-5ABP, single analog amplifier backplane

Part Number: 3x0-603490-10x
Number of slots: 2

This accessory is backplane assembly for one 4-axis analog amplifier assemblies. Can be used on all analog amplifier boards. Connector for external DC-bus supply, external shunt

– AMP-6, two axes High Power amplifier

Part Number: 3x0-603538-10x
Number of slots: 3
Resources: 2 channels
Power Requirements:

- 180 VDC bus
- 12A each axis continuous, 24A peak

– AMP-7APS, power supply for analog PWM amplifiers (40 Volts)

Part Number: 3x0-603530-10x
Number of slots:

This accessory is a 3U-format power supply for the analog PWM amplifiers. It could be installed a UMAC system using its own optional backplane assembly. It has these characteristics: 40 VDC bus output @ 15 A with 10% TAP and ±15VDC outputs at 1.5 A each.

– AMP-8APS, power supply for analog PWM amplifiers (65 Volts)

Part Number: 3x0-603529-10x
Number of slots:





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This accessory is a 3U-format power supply for the analog PWM amplifiers. It could be installed a UMAC system using its own optional backplane assembly. It has these characteristics: 65 VDC bus output @ 20 A with 10% TAP and ±15VDC outputs at 1.5 A each.

– AMP-9APS, power supply for analog PWM amplifiers (150 Volts)

Part Number: 3x0-603537-10x
Number of slots:

This accessory is a 3U-format power supply for the analog PWM amplifiers. It could be installed a UMAC system using its own optional backplane assembly. It has these characteristics: 150 VDC bus output @ 20 A with 10% TAP and ±15VDC outputs at 1.5 A each.





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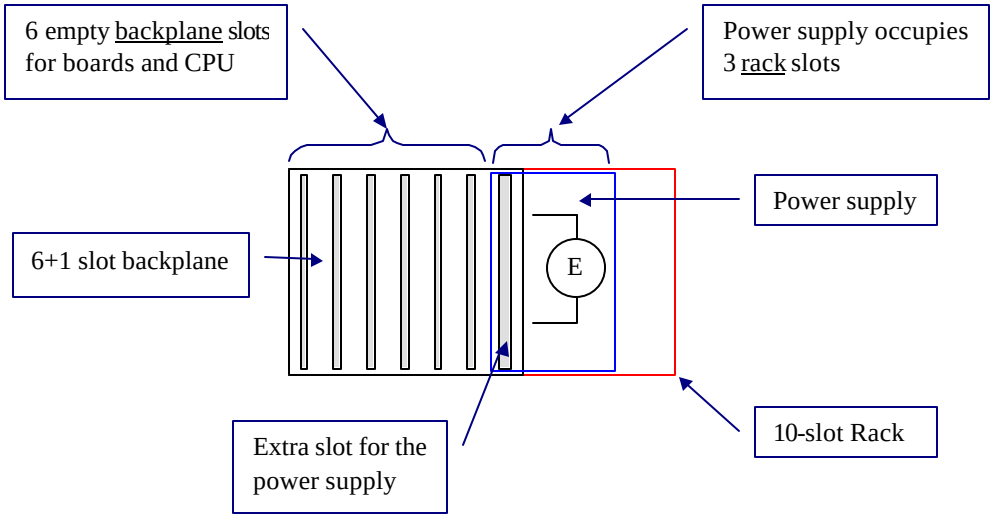
7.0 – Power Supplies and backplane options

– Introduction

When the UMAC is purchased, options for the enclosure, the UBUS backplane boards, and the power supplies must be ordered to create a complete integrated package. Each board has its own power requirements and number of slots that occupies in a UMAC system. After all the components have been selected simply compute the total electrical current requirements and the number of slots necessary and then select the power supplies and rack dimensions accordingly.

– Selecting the backplane and rack

The backplane must be selected according to the number of slots necessary based on the number of accessory boards part of the UMAC system. Each board is described in this products guide including the number of rack slots that it occupies. For example, the Turbo PMAC2-3U CPU board occupies one slot whereas the ACC-24E2 with the Option-1A occupies 2 slots. The power supply, on the other hand, occupies rack slots but only one backplane slot which is taken into account in each ACC-Ux backplane accessory. ACC-U6, for example, has 6 slots for accessory boards plus one extra slot for the power supply connection:



In the above example a 6-slots backplane, ACC-U6, has been selected to fit the Turbo PMAC2-3U CPU board and the other accessory boards. The power supply, ACC-E1, occupies three rack slots for a total of 9 slots. Therefore, the rack selected is ACC-P1, a 10-slot rack. Notice that the ACC-F power supply occupies only 2 slots and not three as in this example.





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– ACC-Ex: AC Input Power Supplies

For those users desiring to connect the UMAC directly to the AC line, Delta Tau provides the Option E power supplies. With these power supplies, the +/-15V supplies are not isolated from the +5V supply; they share a common reference. While the ACC-Ux backplane boards and the backplane accessory boards maintain separate references for these supplies to provide isolation, use of the Option E power supplies will automatically tie the references together and defeat isolation. External isolated supplies must be used to maintain isolation between analog and digital circuits in UMAC systems.

ACC-E: 8A at +5V, and 1A each at +/-15V

(Part # 30E-603269-OPT) provides a power supply that can accept an AC input from 85VAC to 240VAC, and output DC voltages with up to 8A at +5V, and 1A each at +/-15V. This power supply occupies 3 slots.

ACC-E1: 14A at +5V, and 1.5A each at +/-15V

(Part # 31E-603269-OPT) provides a power supply that can accept an AC input from 85VAC to 240VAC, and output DC voltages with up to 14A at +5V, and 1.5A each at +/-15V. This power supply occupies 3 slots.

ACC-E2: 20A at +5V, and 1A each at +/-15V

(Part # 32E-603468-OPT) provides a power supply that can accept an AC input from 85VAC to 240VAC, and output DC voltages with up to 20A at +5V, and 1A each at +/-15V. This power supply occupies 3 slots.





– ACC-F: DC-Input Supply, 10A +5V, 1A +15V, and 0.25A -15V

For those users who already have a 24-volt DC supply in their machine with enough current capacity to power the UMAC, Delta Tau provides the Option F DC-input power supply (DC/DC converter). With this power supply, the +/-15V supplies are not isolated from the +5V supply; they share a common reference. While the ACC-Ux backplane boards and the backplane accessory boards maintain separate references for these supplies to provide isolation, use of the Option F power supply will automatically tie the references together and defeat isolation. External isolated supplies must be used to maintain isolation between analog and digital circuits in UMAC systems.



- ACC-F (Part # 30F-603216-OPT) provides a power supply that can accept a DC input from an unregulated 24VDC supply, and output DC voltages with up to 10A at +5V, 1A at +15V, and 0.25A at -15V. This power supply occupies 2 slots.







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– ACC-Px: Pack Frames

Delta Tau can provide special Eurocard pack frames in the 3U format to mount *and enclose* the 3U boards and modules. Third-party open racks may also be purchased for mounting the boards, but they do not provide an easy way of enclosing the boards. Full enclosure is important for electromagnetic-interference concerns, especially for systems that must obtain the European CE mark. Complete UMAC systems are provided with front and side plates covering any empty rack slots.

ACC-P1: 10 Slot

(Part # 542-602932-10x) provides a 10-slot ("42T") pack frame with provisions for mounting top, front, and back panels for all boards and modules. It is 218.5 mm (8.60") wide by 222.2 mm (8.75") deep by 132 mm (5.2") high.

ACC-P2: 15 Slot

(Part # 563-602932-10x) provides a 15-slot ("63T") pack frame with provisions for mounting top, front, and back panels for all boards and modules. It is 325.1 mm (12.80") wide by 222.2 mm (8.75") deep by 132 mm (5.2") high.



ACC-P3: 21 Slot

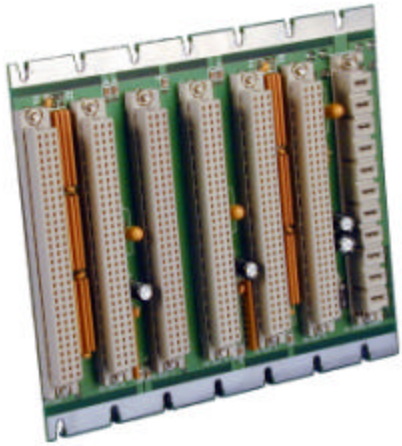
(Part # 584-602932-10x) provides a 21-slot ("84T") pack frame with provisions for mounting top, front, and back panels for all boards and modules. It is 431.8 mm (17.00") wide by 222.2 mm (8.75") deep by 132 mm (5.2") high.

Custom

(Part # 500-602932-10x) Pack frame per customer requirements; custom order for UMAC or amplifier racks.

– ACC-Ux: UBUS Backplane Boards

Delta Tau provides a set of backplane boards to connect the UMAC CPU board to its servo and I/O interface boards via the 96-pin DIN connectors on each board across a shared bus called the UBUS. Standard Eurocard backplane boards from third parties can also be used, but Delta Tau's backplane boards have several potentially important features. First, they have a special connector for the Option E and F power supplies, meaning that no special wiring of power sources is required. Second, each supply voltage (+5V, GND, +15V, -15V, and AGND) has a wide plane connection across the backplane board, not just a narrow trace. Third, all three rows are bussed between connectors, not just the outer two rows. Finally, the signal traces are terminated in a manner optimized for use in the UMAC.



ACC-U4: 4-slots UBUS backplane (300-603462-10x)

Provides a backplane board for connecting 4 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 5 slots. Select ACC-J4 for a version that does not have an extra slot width for the power-supply connection.





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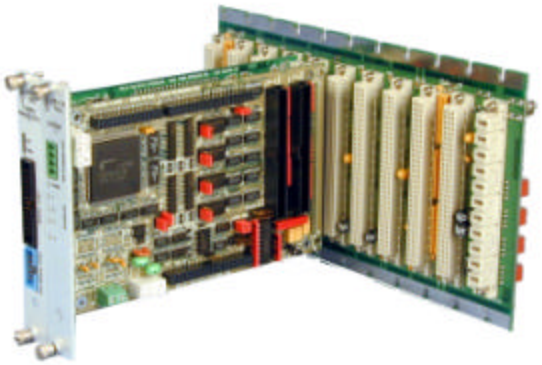
ACC-U6: 6-slots UBUS backplane (300-603403-10x)
Provides a backplane board for connecting 6 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 7 slots. Select ACC-J6 for a version that does not have an extra slot width for the power-supply connection.

ACC-U8: 8-slots UBUS backplane (300-603463-10x)
Provides a backplane board for connecting 8 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 9 slots.

ACC-U10: 10-slots UBUS backplane (300-603464-10x)
Provides a backplane board for connecting 10 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 11 slots.

ACC-U12: 12-slots UBUS backplane (300-603465-10x)
Provides a backplane board for connecting 12 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 13 slots.

ACC-U14: 14-slots UBUS backplane (300-603466-10x)
Provides a backplane board for connecting 14 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 15 slots.



ACC-U16: 16-slots UBUS backplane (300-603471-10x)
Provides a backplane board for connecting 16 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 17 slots.

ACC-U18: 18-slots UBUS backplane (300-603491-10x)
Provides a backplane board for connecting 18 3U-format circuit boards plus an ACC-E or F power supply, with a total width of 19 slots.

– ACC-Jx: UBUS Backplane Boards without power supply slot

In comp are with backplanes provided by ACC-Ux the backplanes provided by ACC-Jx do not have an extra slot for the power supply connection. Terminals on the back of the backplane are provided for the wiring of the power supply lines. These backplanes are mostly used on UMAC MACRO systems where two different MACRO CPUs with different set of nodes are desired inside the same rack.

ACC-J2: 2 Slots JEXP BACKPLANE

Part Number: 3x0-603303-10X
Number of slots: 2 slots

ACC-J3: 3 Slots I/O, JEXP BACKPLANE

Part Number: 3x0-603304-10X
Number of slots: 3 slots





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ACC-J4: 4 Slots I/O, JEXP BACKPLANE

Part Number: 3x0-603305-10X
Number of slots: 4 slots

ACC-J6: 6 Slots I/O, JEXP BACKPLANE

Part Number: 3x0-603306-10X
Number of slots: 6 slots

ACC-J15: 15 Slots I/O, JEXP BACKPLANE

Part Number: 3x0-603396-10X
Number of slots: 15 slots

POWER SUPPLY BACKPLANE

Part Number: 3x0-603281-10X
Number of slots: 3 slots

For 3U type DC power supplies

POWER SUPPLY BACKPLANE

Part Number: 3x0-603282-10X
Number of slots: 4 slots

For 3U type AC power supplies

– ACC-56E: Backplane extender board

Part Number: 3x0-603401-10x
Number of slots: 1
Resources: none
Power Requirements: -

This accessory is a 3U size fused backplane extender for test purposes.





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8.0 – Stack configuration

– Introduction

The stack configuration is intended for compact, price-sensitive applications. It brings the power of the PMAC motion control to the embedded-systems world, either standalone or mounted on top of a PC/104 computer. This open frame card stacking method has become very popular in its own right as the "poor man's" package since it is quite inexpensive, practical and powerful motion control solution with a great degree of flexibility (you only stack cards that you need). In most cases, the stack configuration is chosen over the UMAC configuration based on either space or cost constraints. For example, the stack configuration could be selected in order to fit the system in an already existing electrical cabinet.

Stack boards are plugged directly into either a Turbo PMAC2-3U CPU board or a MACRO Interface/CPU board. The stack axis boards provide the necessary SERVO IC circuitry that interface with the amplifier, encoder and flag signals. However, in a stack configuration, additional breakout boards are required for the signal connections. The stack digital I/O boards provide the necessary IOGATE circuitry for digital inputs and outputs control. Both the Turbo PMAC2-3U CPU and the MACRO Interface/CPU board can connect to only two stack SERVO ICs and up to 4 stack IOGATE ICs.

Note: While the stack boards can be mounted inside a UMAC system, the 96-pin DIN connector at the back of each board is not compatible with the UBUS backplane board and cannot be plugged into a backplane bus board. Plugging a stack board in a UBUS backplane will damage the on-board circuitry of the stack accessory and of the components inside the UMAC system.

– ACC-1E: Two Axes Interface Stack Board

Part Number: 3x0-602810-10x
Resources: 1 stack Servo IC
Power Requirements:



The ACC-1E is a 2-axis interface piggyback board that provides the interface circuitry for 1 or 2 axes of motion control. The channels provided by this accessory could be PMAC2 style through a single 100-pin high-density JMACH connector. This configuration is suitable to control either digital amplifiers with direct PWM signals, or stepper drives with pulse and direction signals. Alternatively, this accessory could be ordered with PMAC(1) style channels through a single 96-pin DIN connector. This configuration is suitable for analog amplifiers that require either one or two ±10 Volts DAC analog control signals. In both cases, either when ordered with PMAC(1) style or PMAC2 style connectors, an ACC-8 family board or equivalent is necessary to make the connection to the amplifier, encoder, and flags for the axes. In addition, the ACC-1E can also provide 8 or 16 channels of 12-bit A/D conversion. This board connects to the MACRO Interface/CPU board through inter-board "stack" connectors.

Note: The ACC-1E two-axis stack board is not compatible with the Turbo PMAC2 CPU board. It can only be used with the MACRO Interface/CPU board.





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Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-A: This option provides on-board 4 channels of analog output, 2 sets of flag isolation, and PMAC(1)-style interface through 96-pin DIN connector with the pinout like PMAC(1)-VME board. Therefore, the PMAC(1)-style ACC-8D or ACC-8P breakout board with Option V cable could be used for the connection of amplifier, encoder, and flags signals.
- Option-B: On-board 8-channel, 12-bit analog-to-digital converters with single-ended 0 to 5V, or +/-2.5V inputs (not compatible with ACC-6E ADC piggyback board)
- Option-B1: On-board additional 8-channel for a total of 16, 12-bit analog-to-digital converters with single-ended 0 to 5V, or +/-2.5V inputs (not compatible with ACC-6E ADC piggyback board)

– ACC-2E: Four Axes Interface Stack Board

Part Number: 3x0-602805-10x
Resources: 1 stack Servo IC
Power Requirements:



The ACC-2E is a 4-axis interface piggyback board that provides the interface circuitry for up to 4 axes of motion control. The channels provided by this accessory could be PMAC2 style through a single 100-pin high-density JMACH connector. This configuration is suitable to control either digital amplifiers with direct PWM signals, or stepper drives with pulse and direction signals. Alternatively, this accessory could be ordered with PMAC(1) style channels through a single 96-pin DIN connector. This configuration is suitable for analog amplifiers that require either one or two ±10 Volts DAC analog control signals. In both cases, either when ordered with PMAC(1) style or PMAC2 style connectors, an ACC-8 family board or equivalent is necessary to make the connection to the amplifier, encoder, and flags for the axes.

Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-A: This option provides on-board 8 channels of analog output, 4 sets of flag isolation, and PMAC(1)-style interface through 96-pin DIN connector with the pinout like PMAC(1)-VME board. Therefore, the PMAC(1)-style





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ACC-8D or ACC-8P breakout board with Option V cable could be used for the connection of amplifier, encoder, and flags signals.

– Breakout boards associated with the ACC-1E or ACC-2E

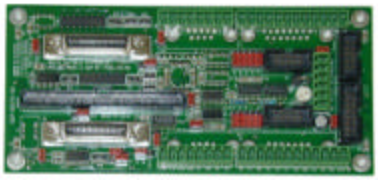
The PMAC2 style machine interface ports provided by the ACC-1E or the ACC-2E are not designed for the direct connection to drives, encoders, flags, etc. Almost always an interface board is required. Delta Tau provides a family of 2-axis interface boards (the ACC-8 family) that cover most common interfaces.

ACC-8E: two-axis PMAC2 analog breakout board



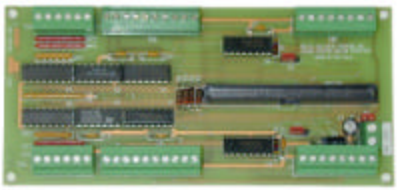
The Accessory 8E for the PMAC2 family of controllers provides the pinouts for 2 axes with analog-input amplifiers. The amplifiers can be velocity-mode, torque-mode, or sinusoidal input mode (2 analog commands); or any mix of the above. The ACC-8E board has a single flat-cable connection to the PMAC2. All of the main signals to and from the machine can be wired through modular removable terminal blocks. Alternatively, many signals can be connected to the machine through flat cables via on-board IDC headers.

ACC-8F: two-axis PMAC2 digital breakout board



The Accessory 8F digital interface board (ACC-8F) for the PMAC2 family of controllers provides pinouts for 2 channels with digital-input amplifiers. The amplifier inputs are direct PWM commands. The ACC-8F board has one flat-cable connection to the PMAC2. The connection to each digital amplifier is through a separate Mini-D connector. Encoder inputs can be brought in either through DB15 connectors, IDC Headers, or removable modular terminal blocks. Main flag inputs are brought in through DB9 connectors or removable modular terminal blocks. Supplementary flag inputs can be interfaced via the DB15 connectors, removable modular terminal blocks, or an IDC header.

ACC-8S: two-axis PMAC2 stepper breakout board



PMAC2's Accessory 8S (ACC-8S) is a 2 axes output board designed for easy connection to Stepper drivers. The step and direction outputs are RS422 compatible and are capable of being connected in either differential mode or single ended configurations for 5 volt input drivers. Flag input terminals are provided to allow connection of 12V-24V sensors or limit switches. The PMAC2 can use a folded back signal from the ACC-8S to simulate the closure of a motor's position loop. Jumpers are provided to allow the use of an external encoder for true closed-loop control. Being a two-axis accessory, velocity loop encoder input may be used if only 1 drive output is used. ACC-8S is one of a series of I/O accessories for PMAC2. The interface to the PMAC2 is made using the JMACH connector cable. This cable is supplied with the board and is 24 inches long. When used with the ACC-8S, the PMAC2 outputs a pulse train of variable frequency and constant pulse width. This scheme is known as Pulse Frequency Modulation (PFM).

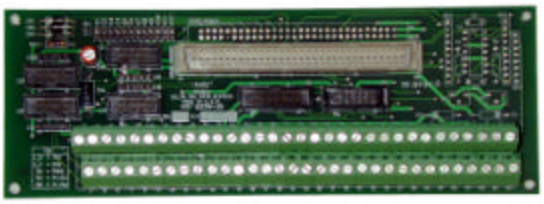




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ACC-8D, ACC-8P, ACC-8DP, ACC-8DCE: PMAC(1) style breakout boards

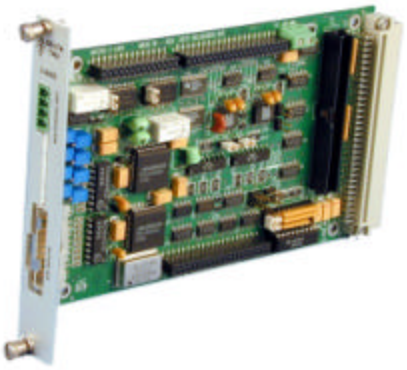
The PMAC(1) series of accessories 8 (ACC-8D, ACC-8D, ACC-8P, ACC-8DP, ACC-8DCE) provide a convenient means for routing the PMAC(1) style connectors present on either the ACC-1E or ACC-2E ordered with Option-A. The appropriate ACC-8 selected must be ordered with Option-V that provides a 96-pin socket and 64-line flat cable to the ACC-1E or ACC-2E.



ACC-8D with the Option-V connector

– ACC-6E: A/D-Converter Stack Board

Part Number: 3x0-602810-10x
Resources: only 1 ACC-6E per CPU board
Power Requirements:



The ACC-6E is a 3U-size piggyback board with 8 or 16 12-bit analog-to-digital converters. The analog inputs that come in through a 20-pin IDC header on the front edge can have a 0 to 5V range, or a +/-2.5V range, individually software selectable. The ACC-6E connects to the Interface/CPU board through inter-board "stack" connectors. **This accessory is not compatible with Option-B or Option-B1 of the ACC-1E 2-axis board.**

Options:

- If ordered with the 306 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A6 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R6 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-A: provides 8 additional 12-bit analog-to-digital converters for a total of 16 on board.

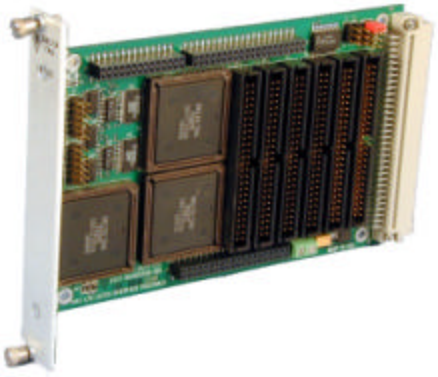




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– ACC-3E1: 144-I/O Stack Board

Part Number: 3x0-603359-10x
Resources: 1 stack IOGATE IC per 48 I/O
Power Requirements:



The ACC-3E1 is 3U-size board supporting the interface circuitry and connectors for 48, 96, or 144 digital I/O at TTL levels. This accessory is designed for easy interface to Opto-22© and compatible I/O boards, or to parallel position feedback devices. This accessory board connects to the CPU board through the backplane expansion port but could also be used in a stack configuration.

Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-A: provides 48 additional digital I/O for a total of 96 I/O points at TTL levels with 2 50-pin IDC headers meant for interface to Opto-22 and compatible I/O boards.
- Option-B: provides 48 additional digital I/O for a total of 144 I/O points at TTL levels with 2 50-pin IDC headers meant for interface to Opto-22 and compatible I/O boards.

– ACC-4E: 48-Isolated-I/O Stack Board

Part Number: 3x0-602872-10x
Resources: 1 stack IOGATE IC
Power Requirements:



The ACC-4E is a 3U-size rack-mounted board with 24 isolated digital inputs at 12V to 24V levels and 24 isolated digital outputs at 12V to 24V levels, 100 mA per output point. The user must select between sourcing and sinking output drivers by selecting the appropriate option A or B. This accessory is intended for "Stack" use only – refer to ACC-11E for UMAC use.

Options:

- If ordered with the 300 part number prefix, this accessory comes with no front, top, or bottom panels. This configuration is appropriate for a pure stack configuration, not mounted in any 3U rack.
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.



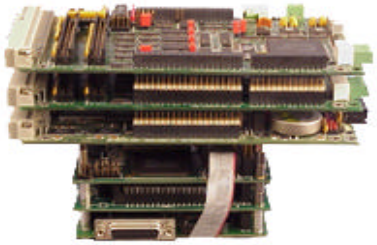


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- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-pack frames. This configuration is appropriate for mounting in the enclosed 3U pack frame supplied by Delta Tau.
- Option-A: Sourcing output drivers: 3 UDN2981A or equivalent octal driver ICs for 24 sourcing outputs.
- Option-B: Sinking output drivers: 3 ULN2803A or equivalent octal driver ICs for 24 sourcing inputs.

– Stack PC/104 products

When the Turbo PMAC2-3U CPU Option-2 is ordered, the PC/104 interface is installed on it allowing a PC/104 computer to be stack to the Turbo PMAC2-3U CPU board. PC-compatible PC/104 computers may be purchased from third parties. **Delta Tau does not provide the PC/104 assembly for a stack configuration. The PC/104 assembly cannot be connected to a MACRO CPU/Interface board.**



Third party PC/104 computer stack to a Turbo PMAC2-3U CPU and shown with two accessories ACC-2E.





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9.0 – Hybrid Stack/UMAC configuration

– Introduction

When stack boards are used inside a UMAC system the system is then referred to as "**Hybrid System configuration**". This is the case for legacy systems and already existing applications. The stack boards have these main limitations in comparison to the UBUS boards:

- Stack boards can only control 8 axes and less I/O points than an equivalent UMAC.
- Stack boards that are packaged in a UMAC rack system are more difficult to install as compared to backplane boards. The necessary cables and special backplane boards interconnecting the different boards to each other and to the machine makes the sliding of the individual component boards in and out of the UMAC system a more difficult process than when using only backplane boards.
- The stack axis boards require additional breakout boards for connections to motors and amplifiers. The UBUS backplane boards, on the other hand, have the dual function of being interface\breakout boards in one unit.

Note: It is for these reasons that although the stack configuration itself is quite usable, its use is not recommended in a UMAC system. If a packaged system is desired instead of an open low-cost stack configuration the UMAC system itself is highly recommended, as it will provide better service and greater flexibility.

Note: While the stack boards can be mounted inside a UMAC system, the 96-pin DIN connector at the back of each board is not compatible with the UBUS backplane board and cannot be plugged into a backplane bus board. Plugging a stack board in a UBUS backplane will damage the on-board circuitry of the stack accessory and of the components inside the UMAC system.

– ACC-8DE/ACC-8FE: Breakout Boards for ACC-1E or ACC-2E



The UMAC supports two breakout boards for the servo interface circuitry on either the ACC-2E or ACC-1E stack boards. The ACC-24E2, ACC-24E2A and ACC-24E2S backplane axis interface boards have their own breakout connectors and so do not need separate breakout boards.

The ACC-8DE, (part # 3A0-603215-10x) is a 3U-sized board that provides the breakout for 2 axes with single analog outputs. It connects to a PMAC2-style 100-pin connector on an ACC-1E or ACC-2E axis interface board through a provided 100-pin flat cable. It is meant for a hybrid "stack/UMAC" configuration.

The ACC-8FE, (part # 3A0-603176-10x) is a 3U-sized board that provides the breakout for 2 axes with PWM digital outputs. It connects to a PMAC2-style 100-pin connector on an ACC-1E or ACC-2E axis interface board through a provided 100-pin flat cable. It is meant for a hybrid "stack/UMAC" configuration.





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Options:

- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to the board, and top and bottom panels attached (or that can be attached) to one of the Option P 3U-rack frames. This configuration is appropriate for mounting in the enclosed 3U rack frame supplied by Delta Tau.
- Option-1: This option provides an on-board 2 Axes Analog Encoder Interpolation Circuitry that performs interpolation on analog "sine-cosine" incremental encoders resulting in 128 or 256 states per line of the encoder.
- Option-2A: Part Number: 603177. This option provides a one-slot backplane for one ACC-8DE/ACC-8FE board. A 100-pin flat cable is provided.
- Option-2B: Part Number: 603285. This option provides a two-slot backplane for two ACC-8DE/ACC-8FE boards. Two 100-pin flat cables are provided.
- Option-2C: Part Number: 603286. This option provides a four-slot backplane for four ACC-8DE/ACC-8FE boards. Four 100-pin flat cables are provided.
- Option-3A: Part Number: 200-603270-036x. Flag Cable, 900 mm (36 inches) long, mini-D, 20 conductor, 1/2 per axis
- Option-3B: Part Number: 200-603270-072x. Flag Cable, 1.8 m (72 inches) long, mini-D, 20 conductor, 1/2 per axis
- Option-3C: Part Number: 200-603270-144x. Flag Cable, 3.6 m (144 inches) long, mini D, 20 conductor, 1/2 per axis
- Option-4A: Part Number: 200-603271-036x. Encoder Cable, 900 mm (36 inches) long, mini-D, 14 conductor, 1/axis
- Option-4B: Part Number: 200-603271-072x. Encoder Cable, 1.8 m (72 inches) long, mini-D, 14 conductor, 1/axis
- Option-4C: Part Number: 200-603271-144x. Encoder Cable, 3.6 m (144 inches) long, mini-D, 14 conductor, 1/axis
- Option-5A: (200-602739-024x) Amplifier PWM Cable, 600 mm (24) inches long, mini-D, 36 conductor, 1/axis
- Option-5B: (200-602739-036x) Amplifier PWM Cable, 900 mm (36 inches long), mini-D, 36 conductor, 1/axis
- Option-5C: (200-602739-060x) Amplifier PWM Cable, 1.5 m (60 inches) long, mini-D, 36 conductor, 1/axis
- Option-5D: (200-602739-072x) Amplifier PWM Cable, 1.8 m (72 inches) long, mini-D, 36 conductor, 1/axis
- Option-5E: (200-602739-084x) Amplifier PWM Cable, 2.1 m (84 inches) long, mini-D, 36 conductor, 1/axis
- Option-5F: (200-602739-144x) Amplifier PWM Cable, 3.6 m (144 inches) long, mini-D, 36 conductor, 1/axis

– ACC-13x: Breakout Boards adapters

The ACC-13 series provides a convenient method to convert the connectors present on the ACC-8DE/ACC-8FE boards into terminal breakout boards.

ACC-13: Encoder Breakout Board

14 pin mini-D to screw in terminal blocks (one per axis). Connects to ACC-8DE/8FE with Option 4x cables. Part Number: 300-603365-100

- Option-1: Rail mount

ACC-13A: Flag Breakout Board

20 pin mini-D to screw in terminal blocks (one per 2 axes). Connects to ACC-8DE/8FE with Option 3x cables. Part Number: 300-603366-100

- Option-1: Rail mount





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ACC-13B: Amplifier Connector Breakout

36 pin mini-D to screw in terminal blocks (one per axis). Connects to ACC-8DE/8FE with Option 5x cables. Part Number: 300-603376-100

- Option-1: Rail mount





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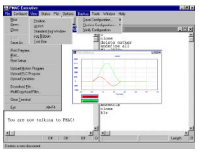
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10.0 – Host Computer Software

– PMAC Executive Program

The PMAC Executive Program for the IBM PC and compatibles is a host program environment for the PMAC controller, intended as a development tool in creating PMAC applications. It provides a terminal emulator, a text editor for writing and editing PMAC motion and PLC programs, a screen to jog motors, extensive tuning utilities, plotting capabilities, and various special screens for viewing various PMAC variables and status registers. The program consists of pull-down menus with simple but descriptive menu choices for performing different functions. ACC-9 is a once-per-customer purchase. OEMs wishing to re-sell the program to their customers must purchase one copy for each customer. Such OEMs should contact the factory for volume purchase agreements.

The PMAC Executive programs has the following main tools and features:



- A terminal window. This is the main channel of communication between the user and PMAC.
- Watch window for real-time system information and debugging.
- Position window for displaying the position, velocity and following error of all motors on the system.
- Several ways to tune PMAC systems. Interface for data gathering and plotting.

ACC-9WN: Windows 32-bits Executive Program

This program is the latest developed in the PMAC Executive program series and it is commonly known as "PEWIN-32". It only runs under the following 32-bits Windows© operating systems: Windows 95, Windows 98 or Windows NT. This program is the only option for Turbo PMAC based applications. **This program does not run under 16-bits Windows 3.x..**

- ACC-9WN: IBM-PC PMAC Executive Software for Windows 95/NT (32-bit) for startup, diagnostics, & programming (PEWIN32); executable code, site license.

  Option-1: 32-bit Windows Executive upgrade, site license
  Option-2: 32-bit Windows Executive unlimited resale license

– PMAC Communication Libraries

Delta Tau created a series of software communication libraries for the easy developing of a host computer interface for a PMAC application. Some of these libraries are strongly suggested when the PMAC Dual-Ported RAM feature is used or for the software development under the Windows NT© operating system.

ACC-9PL: PMAC drivers for National Instruments Labview

This set of libraries provides a communication interface for PMAC under the National Instruments Labview© environment and it is commonly known as "PMACPanel". PMACPanel is an easily extensible set of more than 400 Virtual Instruments





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with over 40 tutorials and examples that allow you to interact with PMAC from any LabVIEW application. Requires LabVIEW version 5.0 and above.

- ACC-9PL: IBM-PC PMAC LabView Interface Library (PMACPanel) linkable code for DOS & Windows 95/NT site license.

  Option-1: Inclusion of PCOMM32 library
  Option-2A: PMACPanel upgrade, site license
  Option-2B: PMACPanel & PCOMM32 upgrade, site license

ACC-9PN: 32-bits PCOMM communication libraries

This set of communication libraries, commonly known as "PCOMM-32", is used for the development of host computer programs running under 32-bits Windows© operating systems: Windows 95, Windows 98 or Windows NT. This program is the only option for Turbo PMAC based applications and is the latest developed communication libraries set in which all other 32-bits software accessories are based **This set of communication libraries is not suitable for 16-bits Windows 3.x.**. The Delta Tau PComm32 Communication Driver is a set of more than 200 functions written as a development tool for the creation of PMAC 32-bit applications on Windows 95 or Windows NT. Nearly all methods of communication to PMAC are included. PComm32 may be used by the PMAC1 as well as the PMAC2 and Mini-PMAC. The routines were designed with robustness, speed and portability in mind. PComm32 has been tailored to be compatible with Borland and Microsoft development products using C, C++, Visual Basic or Delphi. The library is structured such that an application using the library created for the Windows 95 will also be able to run under Windows NT as long as the application itself uses no operating system specific functions.

- ACC-9PN: IBM-PC PMAC Communications Library (PCOMM32) for C/C++ linkable code for **32-bits** Windows 95/NT, site license.

  Option-1: PCOMM32 upgrade, site license

ACC-9PT: 32-bits PTalk communication libraries

This set of communication libraries, commonly known as "PTalk", is used for the development of host computer programs running under 32-bits Windows© operating systems: Windows 95, Windows 98 or Windows NT. PTalk is a custom control (OCX) communication library designed to provide 32-bit software development with Visual Basic, Visual C++ or Delphi communicating with PMAC. This accessory is selected instead of the equivalent ACC-9PN when simplicity is desirable in the implementation of an application under "visual" programming environments.

- ACC-9PT: IBM-PC PMAC Visual Programming Library (Ptalk OCX) linkable code for Windows 95/NT, site license.

  Option-1: Inclusion of PCOMM32
  Option-2A: Ptalk OCX library upgrade, site license
  Option-2B: Ptalk OCX & PCOMM32 upgrade, site license





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– PMAC Setup utility programs

Delta Tau created a series of setup programs for the selection of PMAC motor parameters. These programs provide a step-by-step method for selecting the values and configuring the PMAC setup I-variables. In addition, tuning and trouble-shooting screens are provided for a complete set of PMAC configuration tools.

- TurboSETUP: dedicated for any Turbo PMAC boards. This program is particularly important for the setup of MACRO components. **This program is only available upon request or accessible on the Delta Tau Internet/FTP site.**





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11.0 – Configuration Examples

– Eight Axes UMAC Turbo system

A UMAC Turbo system has been selected to control 8 axes of motion: 6 axes are controlled through direct PWM digital amplifiers and two axes are controlled through analog ±10 Volts amplifiers. No PC/104 computer is necessary since the Turbo PMAC2-3U CPU will be used stand-alone and programmed serially with a host computer. 48 digital inputs and 48 sinking digital outputs are required. 24 of the digital outputs are high power with 1 Amp per output drive whereas the remaining 24 outputs are up to 100 mA current drive. A complete enclosed system is desired and therefore panels covering all sides of the accessory boards are required. These are the parts ordered for this system:

Quantity	Description	Part Number	Slots	Resources
1	TURBO PMAC2 CPU (3U Size) with Option-5C0	3A0-603382-10x	1	none
1	Option-3: Front panel with connector labeling	303-0PMAC2-OPT	-	none
1	Option-3A: Top and bottom panels with connector labeling	3A3-0PMAC2-OPT	-	none
1	ACC-24E2: 2-Axis Digital PWM Servo Interface/Breakout Board	3R0- 603397-10x	1	1 SERVO IC
1	ACC-24E2-Option 1D - Additional 2 axes digital PWM servo interface/breakout (Piggy-back assembly)	301-603397-10x	1	none
1	ACC-24E2: 2-Axis Digital PWM Servo Interface/Breakout Board	3R0- 603397-10x	1	1 SERVO IC
1	ACC-24E2- Option 1A - Additional 2 axes analog servo interface/breakout (Piggy-back assembly)	301-603398-10x	1	none
1	ACC-11E: Isolated 24-Input/ 24-Output Board 24 Optically isolated inputs at 12 - 24VDC levels 24 Optically isolated outputs at up to 24VDC and 100mA	3R0-603307-10x	1	1 IOGATE
1	ACC-11E -Option B - 24 Sinking Output Drivers	302-603307-OPT	0	none
1	ACC-12E: Isolated 24-Input/ 24-High-Power-Output 24 Optically isolated inputs at 12 - 24VDC levels Individual output modules must be selected (option 1 or 2)	3R0-603277-10x	1	1 IOGATE
24	ACC-12E-Option 2: DC output modules Up to 60VDC/1A each	302-603277-OPT	0	none
24	ACC-12E-Option 2-Option B: Sinking DC output modules Up to 60VDC/1A each	30B-603277-OPT	0	none
1	ACC-P2: 15-slot (63T) 3U Eurocard rack with connections for top, front, and bottom panel mounting. 12.80" Wide X 8.75" Deep X 5.20" High	563-602932-10x	-	none
1	ACC-U8: 8-slot UBUS backplane board (+1 slot for power supply connection)	300-603463-10x	-	none
1	ACC-E: AC-Input power supply, input of 85-240VAC, output of 8A at +5V, 1A each at +/-15V, 3 slots, back-plane connection	30E-603269-OPT	-	none

- The total number of slots required by the accessory boards is 7 and therefore an 8-slot, ACC-U8, has been selected. This backplane will have a total of 9 slots.





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- The SERVO IC resources required are 2. The UMAC Turbo can address 8 backplane SERVO ICs and therefore there is no limitation for the axis accessory boards selected. Also the number of IOGATEs used is 2. The UMAC Turbo system can address 16 backplane IOGATEs, which means that this UMAC Turbo system can still have 14 more IOGATE circuits if necessary.
- Since a 9 slots backplane is used and the power supply selected takes 3 extra slots, the enclosure used is a 15-slot rack provided by the ACC-P2. All the accessory boards have been ordered with the "3R0" part number, resulting in a completely closed UMAC system.
- Recommended optional accessories: PMAC ACC-3D Serial Cable, UMAC Option-5xPWM amplifier cables, PMAC ACC-9WN Executive Software

– Eight Axes UMAC MACRO system

A UMAC MACRO system has been selected to control 8 axes of motion: 4 axes are controlled through direct PWM digital amplifiers and four axes are controlled through stepper motor drivers. An already present PMAC2 Ultralite board will control this UMAC MACRO system by a fiber optic link. 48 digital inputs and 48 sinking digital outputs are required. All outputs require a maximum of 100 mA current drive. A complete enclosed system is desired and therefore panels covering all sides of the accessory boards are required. These are the parts ordered for this system:

Quantity	Description	Part Number	Slots	Resources
1	MACRO Interface CPU	3A0-602804-10x	1	none
1	Option-A: Fiber-optic MACRO connectors	30A-CPUMAC-OPT	0	none
1	ACC-24E2: 2-Axis Digital PWM Servo Interface/Breakout Board	3R0- 603397-10x	1	1 SERVO IC
1	ACC-24E2-Option 1D - Additional 2 axes digital PWM servo interface/breakout (Piggy-back assembly)	301-603397-10x	1	none
1	ACC-24E2S: 4-Channel Encoder-Input/Stepper-Output Interface/Breakout Board	3R0-603441-10x	1	1 SERVO IC
2	ACC-11E: Isolated 24-Input/ 24-Output Board 24 Optically isolated inputs at 12 - 24VDC levels 24 Optically isolated outputs at up to 24VDC and 100mA	3R0-603307-10x	2	2 IOGATEs
2	ACC-11E -Option B - 24 Sinking Output Drivers	302-603307-OPT	0	none
1	ACC-P1: 10 1/2-slot (42T) 3U Eurocard rack with connections for top, front, and bottom panel mounting 8.60" Wide X 8.75" Deep X 5.20" High	542-602932-10x	-	none
1	ACC-U8: 6-slot UBUS backplane board (+1 slot for power supply connection)	300-603403-10x	-	none
1	ACC-E: AC-Input power supply, input of 85-240VAC, output of 8A at +5V, 1A each at +/-15V, 3 slots, back-plane connection	30E-603269-OPT	-	none

- The total number of slots required by the accessory boards is 6 and therefore a 6-slot, ACC-U6, has been selected.
- The SERVO IC resources required are 2. The UMAC MACRO can address 2 backplane SERVO ICs and therefore no extra SERVO IC circuits could be added on this system. The number of IOGATEs used is 2. The UMAC MACRO system can address 4 backplane IOGATEs, which means that this UMAC MACRO system can still have 2 more IOGATE circuits if necessary.





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- The enclosure used is a 10-slot rack provided by the ACC-U8. All the accessory boards have been ordered with the "3R0" part number, resulting in a completely closed UMAC system.
- Recommended optional accessories: ACC-7x MACRO Cables, UMAC Option-5x PWM amplifier cables, ACC-9WN PMAC Executive Software

– Four Axes Turbo Stack system

A Turbo Stack system has been selected to control 4 axes of motion through analog ±10 Volts amplifiers. No PC/104 computer is necessary since the Turbo PMAC2-3U CPU will be used stand-alone and programmed serially with a host computer. 12 digital inputs and 12 sinking digital outputs are required. All outputs require a maximum of 100 mA current drive. In addition, 8 analog inputs are necessary for the reading of two analog joysticks. These are the parts ordered for this system:

Quantity	Description	Part Number	Resources
1	TURBO PMAC2 CPU (3U Size) with Option-5C0	300-603382-10x	none
1	ACC-2E; 4-axis Interface Board. Digital, PWM servo interface	300-602805-10x	1 SERVO IC
1	ACC-2E: Option A - On-Board 4-Channel of +/- 10V Analog Outputs	30A-602805-OPT	none
1	ACC-4E: 48 Opto I/O, Optically Isolated 24-Input/24-Output Board 24 Isolated digital inputs, sinking or sourcing, 12V-24V 24 Isolated digital outputs at up to 24V and 100 mA	300-602872-10x	1 IOGATE
1	ACC-4E-Option A1: 24 Sinking Output Drivers	3A1-602872-OPT	none
1	ACC-6E: 8-Channel 12-Bit A/D Converter	306-602810-10x	1 ACC-6E
1	ACC-8P: PMAC(1) 4-channel breakout board	3A0-FLKM60-000	none
1	ACC-8P-Option V: 40 cm (16") cable with 96-pin DIN connector	30V-0ACC8D-OPT	none

- The SERVO IC resource required is 1. The TURBO PMAC2 CPU can address 2 stack SERVO ICs and therefore there is no limitation for the axis accessory boards selected. Also the number of IOGATEs used is 1. The TURBO PMAC2 CPU can address four stack IOGATEs, which means that this stack system can still have 3 more IOGATE circuits if necessary. This configuration uses one ACC-6E and cannot use a second ACC-6E. However, the ACC-6E-Option-A could be ordered for 8 extra analog converters on board of the ACC-6E for a total of 16 analog inputs.
- The accessory boards have been ordered with the "300" part number and therefore no panels around these boards will be included. This configuration is suitable for most stack configurations.
- The connections to the amplifiers, flags and encoders will be performed through the ACC-8P breakout board.
- Recommended optional accessories: PMAC ACC-3D Serial Cable, ACC-9WN PMAC Executive Software





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– Four Axes MACRO Stack system

A MACRO Stack system has been selected to control 4 axes of motion through stepper drives. An already present PMAC2 Ultralite board will control this UMAC MACRO system by a fiber optic link. 48 digital inputs and outputs to drive OPTO-22 style modules are required. These are the parts ordered for this system:

Quantity	Description	Part Number	Resources
1	MACRO Interface CPU	300-602804-10x	1
1	Option-A: Fiber-optic MACRO connectors	30A-CPUMAC-OPT	0
1	ACC-2E; 4-axis Interface Board Digital, PWM servo interface	300-602805-10x	1 SERVO IC
1	ACC-3E1: 48/96/144-I/O Board Digital I/O for OPTO-22 style boards	300-603359-10x	1 IOGATE
2	ACC-8S: PMAC2 2-axis stepper-motor breakout board	3A0-602644-100	none

- The SERVO IC resource required is 1. The MACRO Interface/CPU board can address 2 stack SERVO ICs and therefore there is no limitation for the axis accessory boards selected. Also the number of IOGATEs used is 1. The MACRO Interface/CPU board can address four stack IOGATEs, which means that this stack system can still have 3 more IOGATE circuits if necessary. This configuration uses one ACC-6E and cannot use a second ACC-6E. However, the ACC-6E-Option-A could be ordered for 8 extra analog converters on board of the ACC-6E for a total of 16 analog inputs.
- The accessory boards have been ordered with the “300” part number and therefore no panels around these boards will be included. This configuration is suitable for most stack configurations.
- The connections to the stepper drives, flags and encoders will be performed through the ACC-8S stepper interface and breakout board.
- Recommended optional accessories: ACC-7x MACRO Cables, ACC-9WN PMAC Executive Software





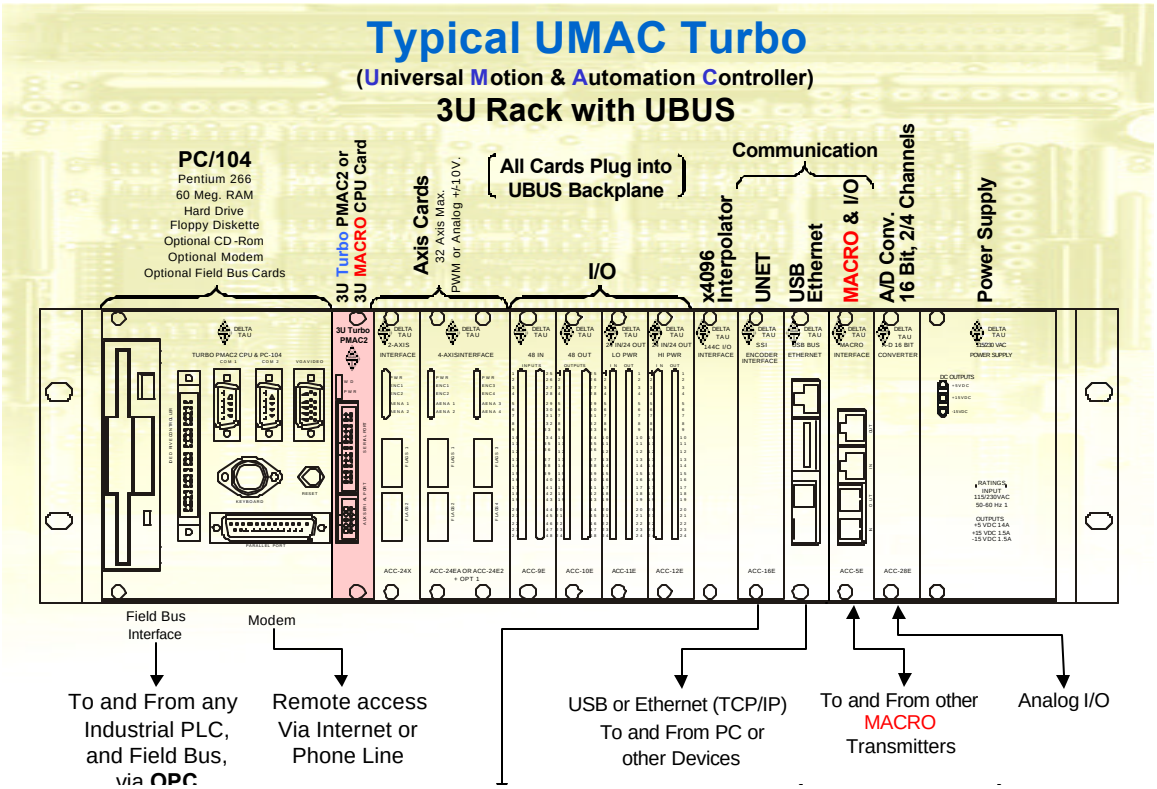
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3U PRODUCTS

Typical UMAC Turbo

(Universal Motion & Automation Controller)

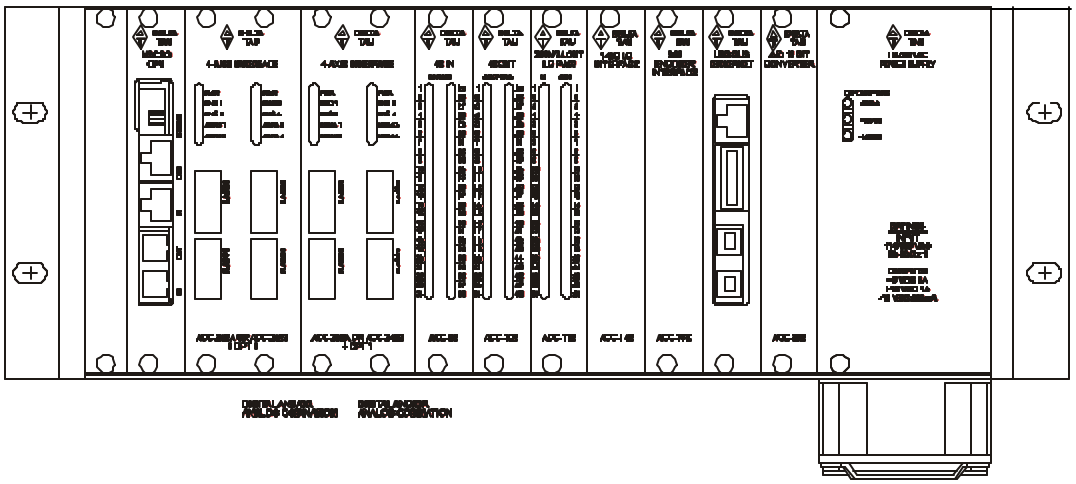
3U Rack with UBUS

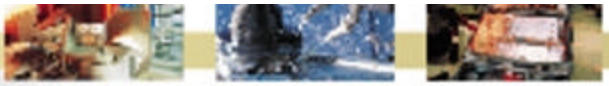


Typical UMAC MACRO

MACRO

Typical 8 Axis Configuration with I/O



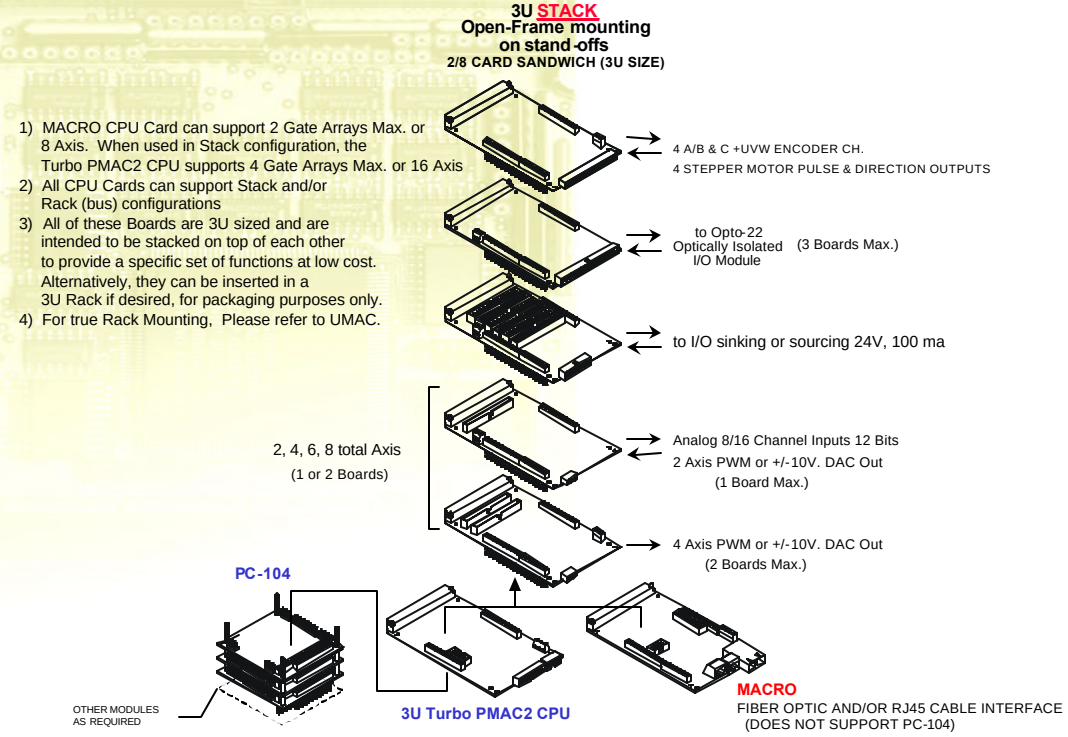


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3U Turbo PMAC2 & MACRO "Stack"



The 3U Stack provides low cost, open frame packaging for a variety of motion applications.

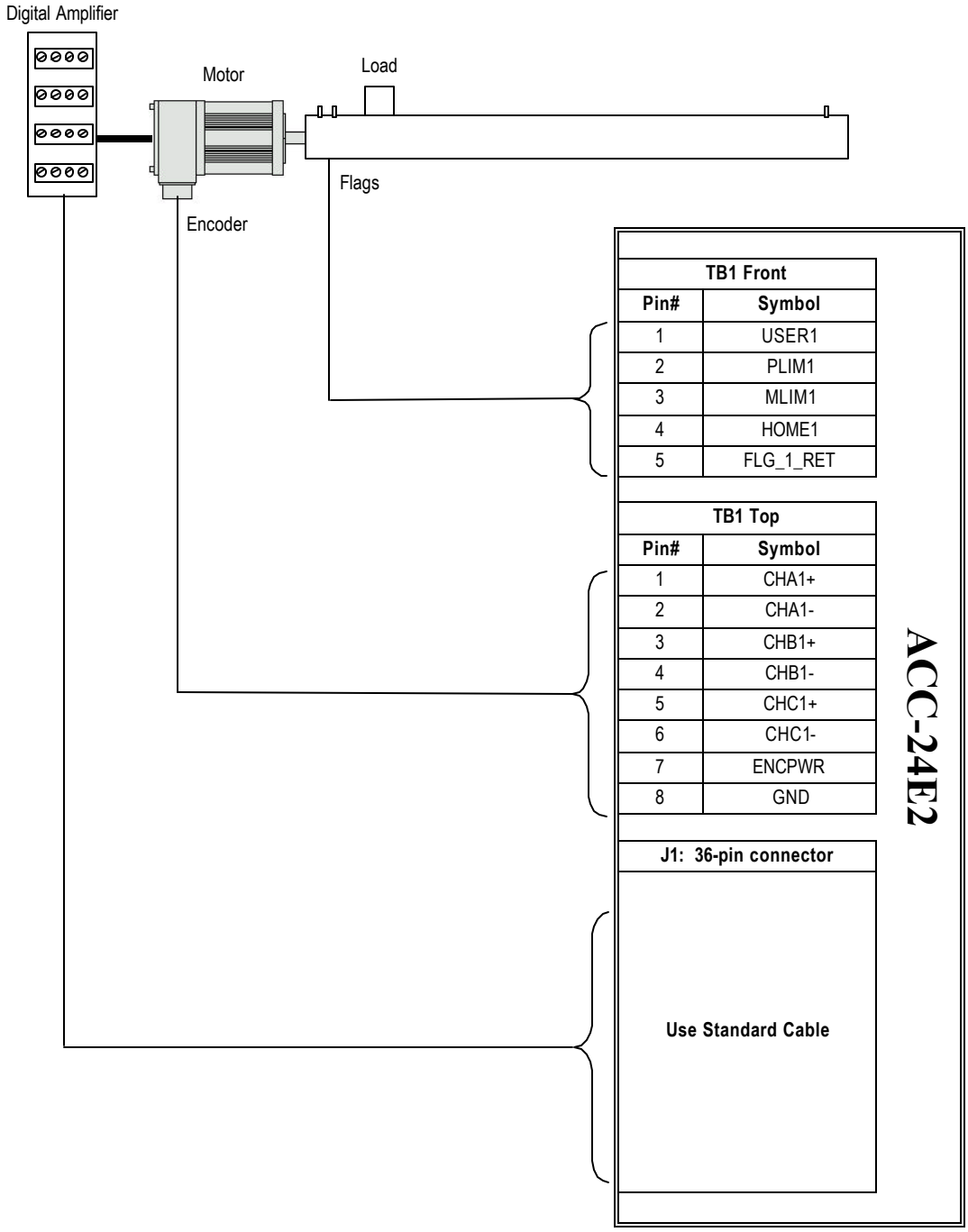




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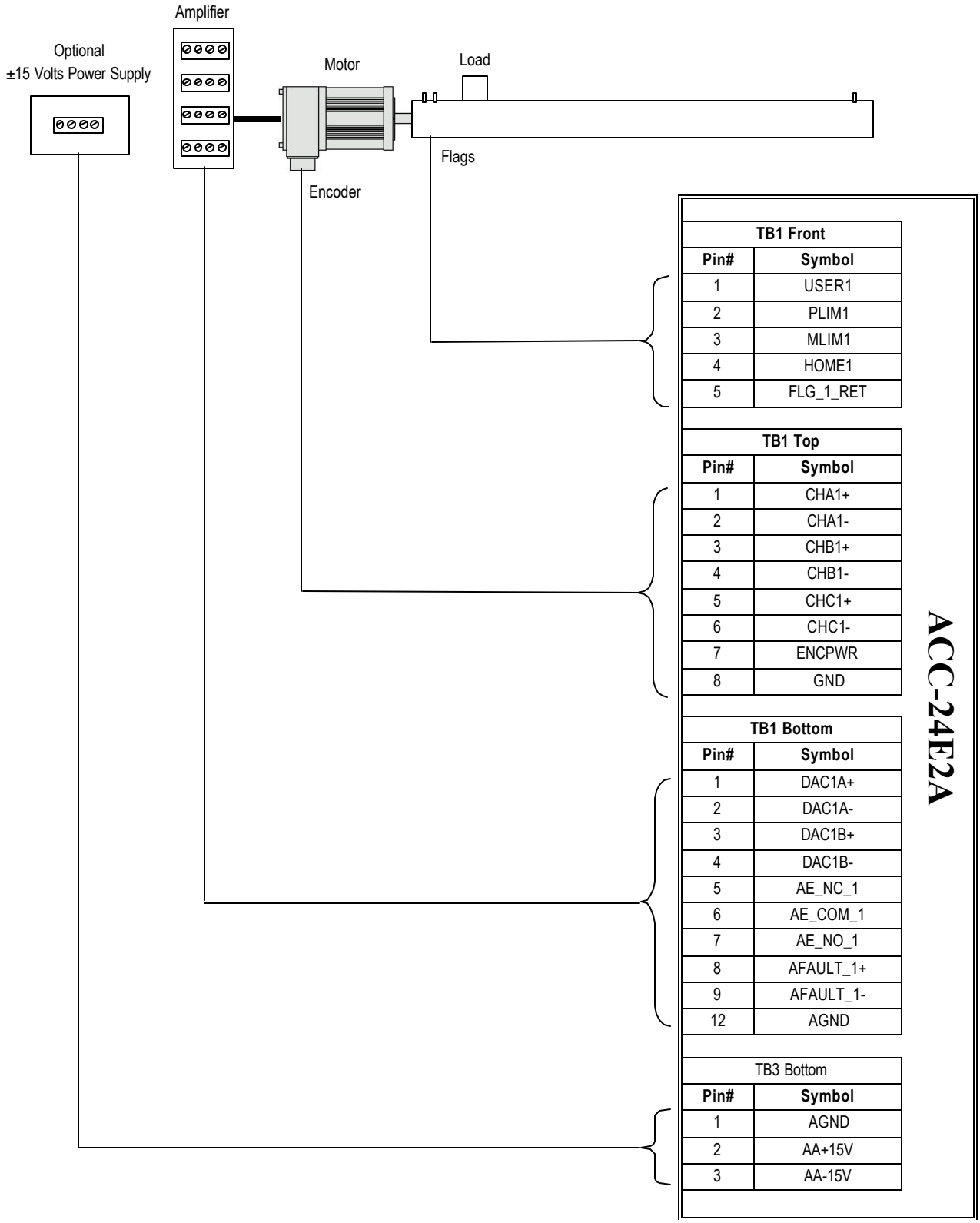
12.0 – Connection diagrams Examples

– Connections example: Digital amplifier with incremental encoder



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– Connections example: Analog amplifier with incremental encoder



TB1 Front	
Pin#	**Symbol**
1	USER1
2	PLIM1
3	MLIM1
4	HOME1
5	FLG_1_RET

TB1 Top	
Pin#	**Symbol**
1	CHA1+
2	CHA1-
3	CHB1+
4	CHB1-
5	CHC1+
6	CHC1-
7	ENCPWR
8	GND

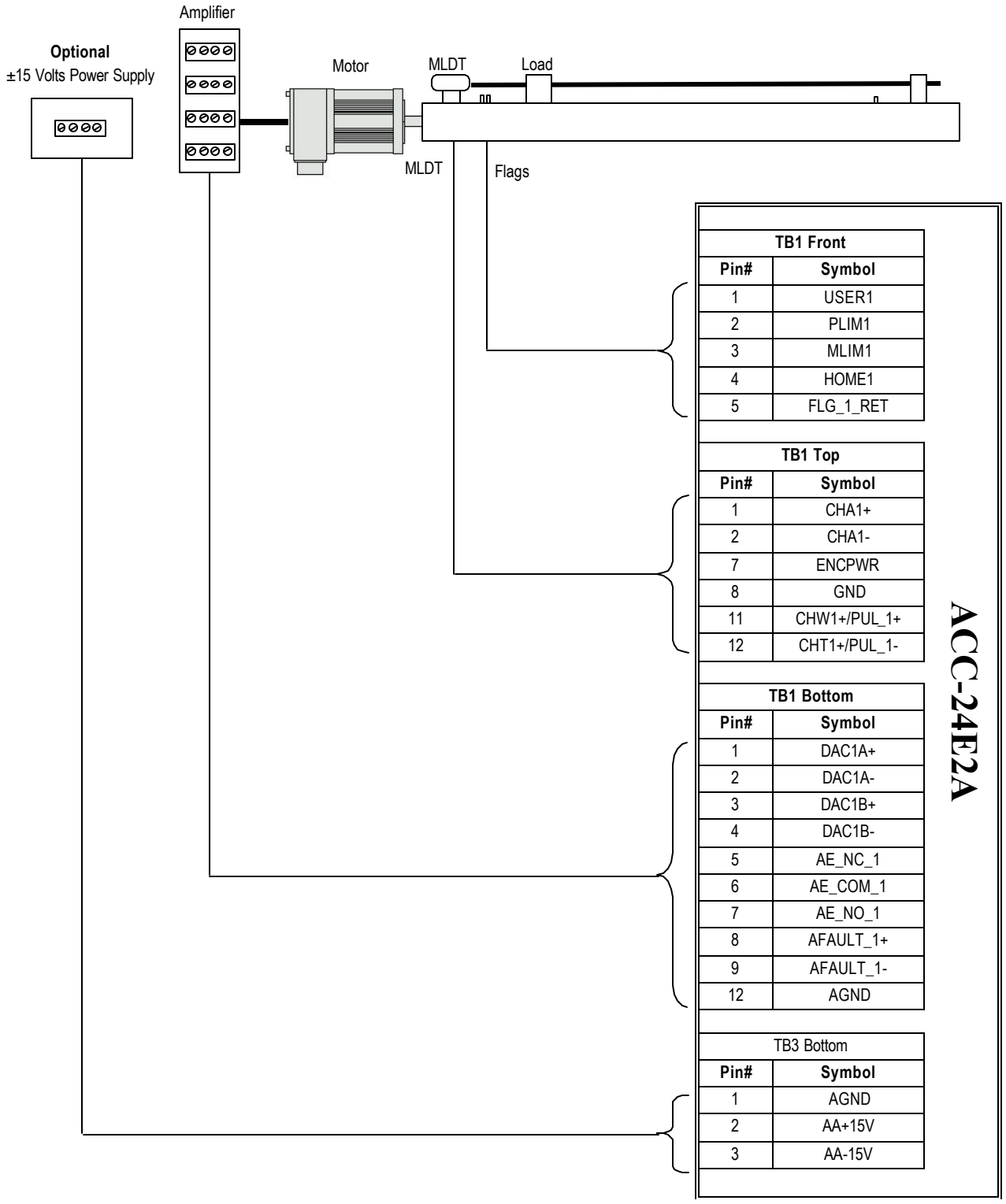
TB1 Bottom	
Pin#	**Symbol**
1	DAC1A+
2	DAC1A-
3	DAC1B+
4	DAC1B-
5	AE_NC_1
6	AE_COM_1
7	AE_NO_1
8	AFAULT_1+
9	AFAULT_1-
12	AGND

TB3 Bottom	
Pin#	**Symbol**
1	AGND
2	AA+15V
3	AA-15V

Note: most UMAC systems are ordered with an internal ±15 Volts power supply. The optional external power supply shown in this diagram provides greater electrical noise immunity separating the analog and digital circuits ground reference. In most cases the analog amplifier provides this power supply. Jumpers E85, E87 and E88 must be set accordingly.

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– Connections example: Analog amplifier with MLDT feedback



TB1 Front	
Pin#	**Symbol**
1	USER1
2	PLIM1
3	MLIM1
4	HOME1
5	FLG_1_RET

TB1 Top	
Pin#	**Symbol**
1	CHA1+
2	CHA1-
7	ENCPWR
8	GND
11	CHW1+/PUL_1+
12	CHT1+/PUL_1-

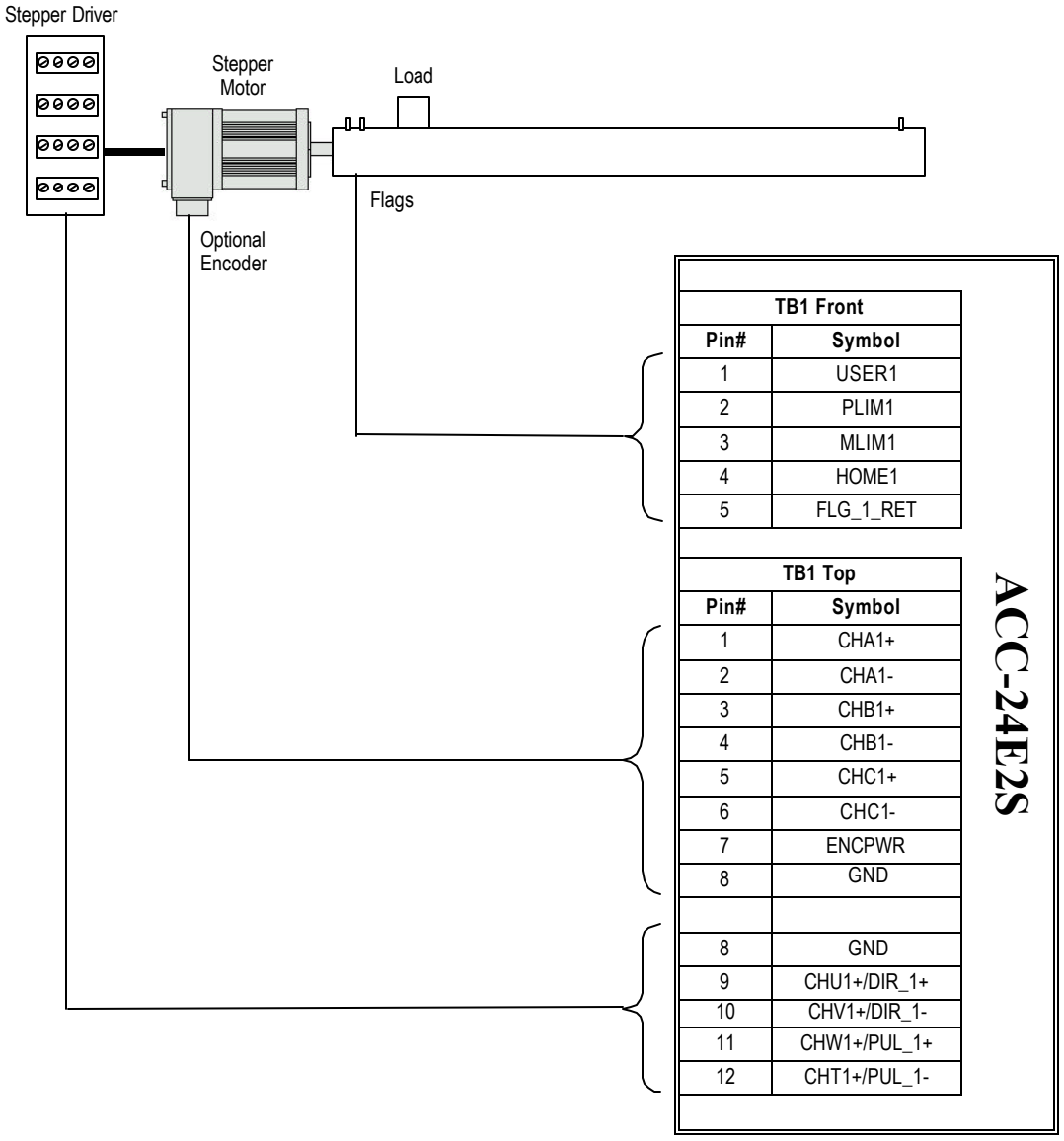
TB1 Bottom	
Pin#	**Symbol**
1	DAC1A+
2	DAC1A-
3	DAC1B+
4	DAC1B-
5	AE_NC_1
6	AE_COM_1
7	AE_NO_1
8	AFAULT_1+
9	AFAULT_1-
12	AGND

TB3 Bottom	
Pin#	**Symbol**
1	AGND
2	AA+15V
3	AA-15V

Note: most UMAC systems are ordered with an internal ±15 Volts power supply. The optional external power supply shown in this diagram provides greater electrical noise immunity separating the analog and digital circuits ground reference. In most cases the analog amplifier provides this power supply. Jumpers E85, E87 and E88 must be set accordingly.

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– Connections example: Stepper driver with incremental encoder



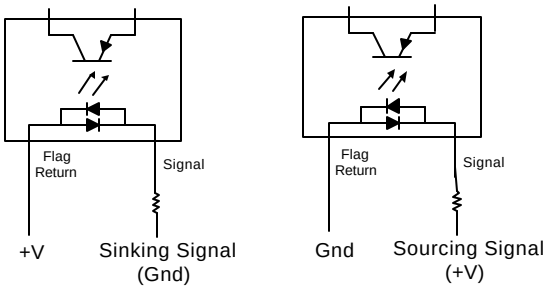
TB1 Front	
Pin#	**Symbol**
1	USER1
2	PLIM1
3	MLIM1
4	HOME1
5	FLG_1_RET

TB1 Top	
Pin#	**Symbol**
1	CHA1+
2	CHA1-
3	CHB1+
4	CHB1-
5	CHC1+
6	CHC1-
7	ENCPWR
8	GND
8	GND
9	CHU1+/DIR_1+
10	CHV1+/DIR_1-
11	CHW1+/PUL_1+
12	CHT1+/PUL_1-

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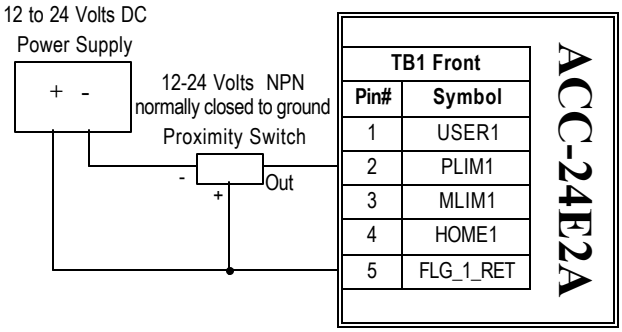
– Connections example: ACC-24E2A axis flag signals

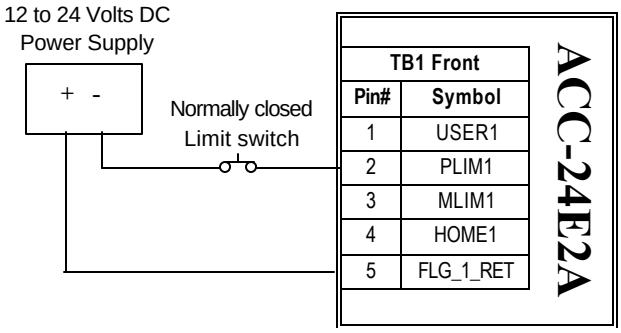
The axes accessory boards have a bipolar opto-isolating circuitry (chip PS-2705-4NEC) for the flag connections:



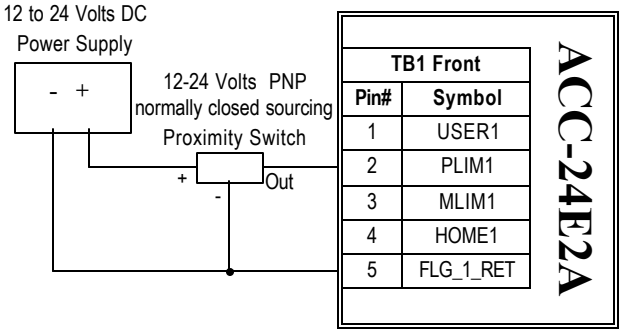
Examples: These examples show the connection of the most common types of end-of-travel sensors. The optional power supply shown could be taken from the ACC-24E2A TB3-Bottom connector.

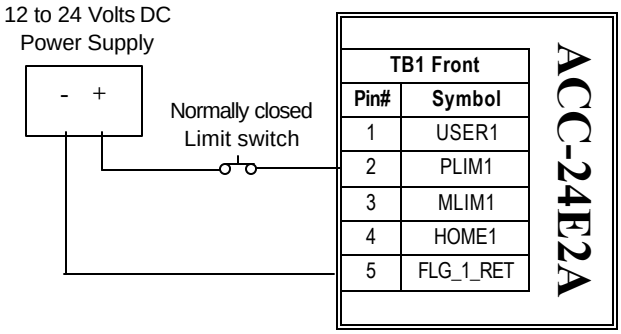
Sinking sensors





Sourcing sensors

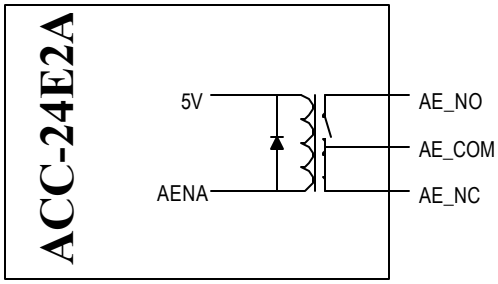




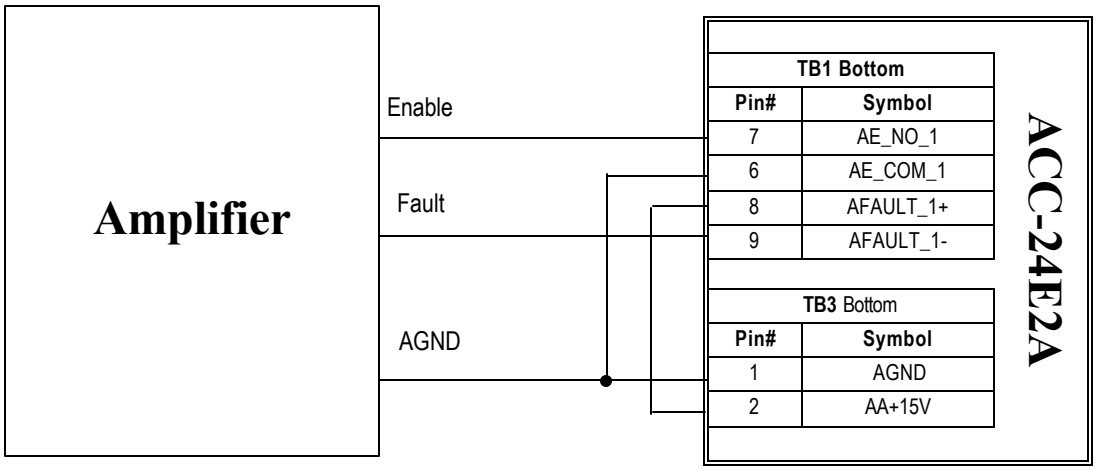
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– Connections example: ACC-24E2A amplifier fault\enable signals

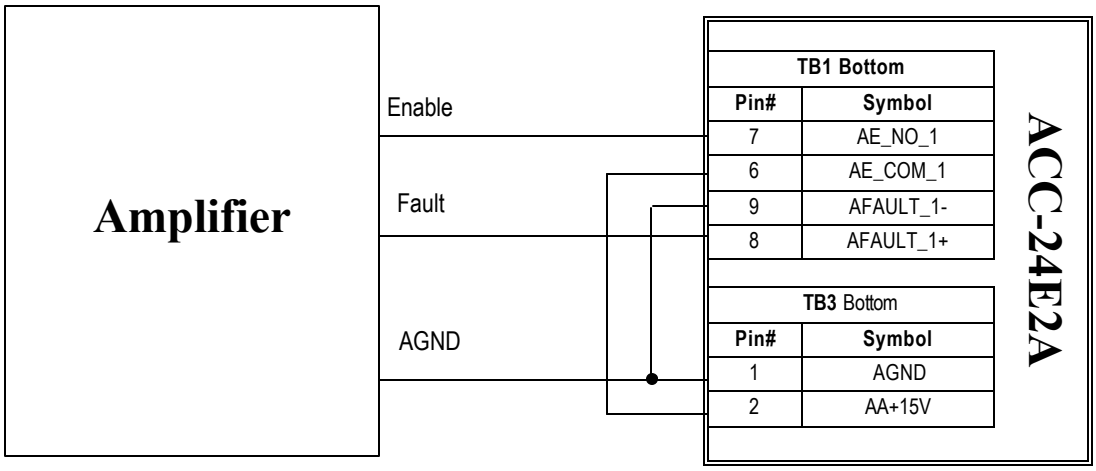
The amplifier enable signal of the axes accessory boards is controlled by a relay with normal open and normal close dry contacts:



This example shows the connection of an ACC-24E2A to an amplifier which in order to be enabled requires the enable line to be closed to ground. To indicate a fault condition the amplifier closes to ground the single ended amplifier fault line. **In these examples it is assumed an external ±15V power supply connected to the ACC-24E2A, which is then installed with jumpers E85, E87 and E88 removed to isolate the external power from the UBUS power supplies.**



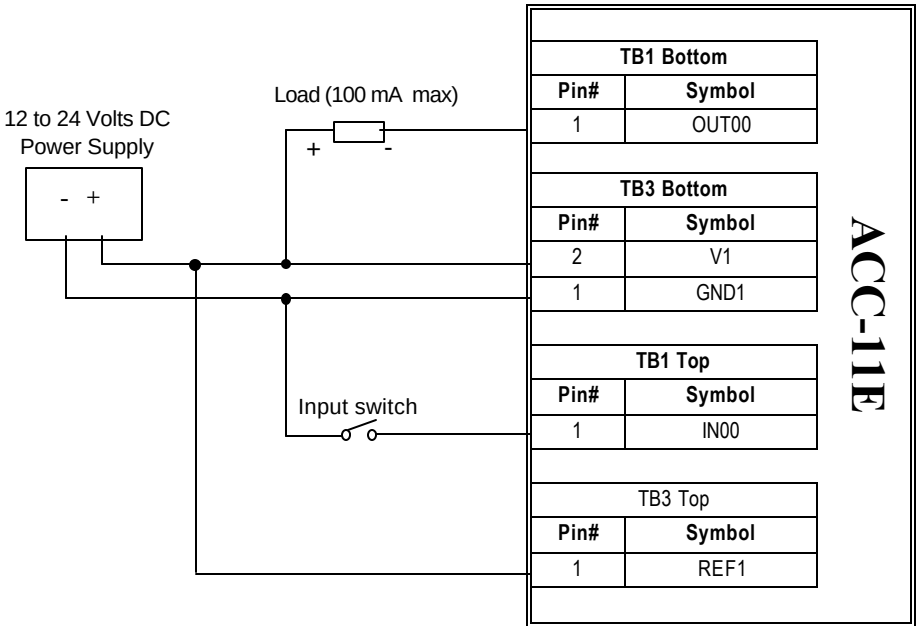
This example shows the connection of an ACC-24E2A to an amplifier which in order to be enabled requires the enable line to be closed to the voltage source. To indicate a fault condition the amplifier uses a single ended sourcing line.



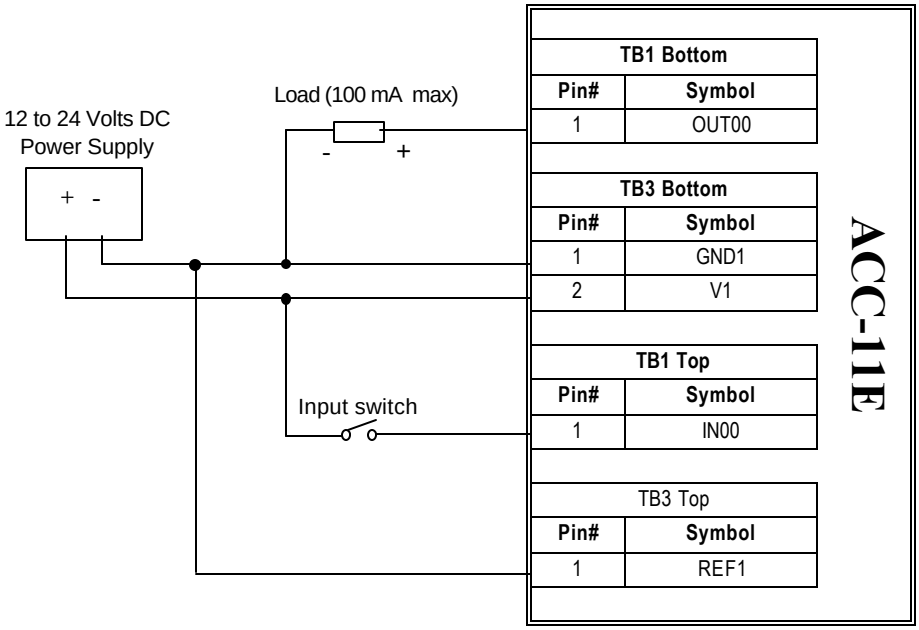
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– Connections example: digital I/O with ACC-11E

This example shows the typical connection of an ACC-11E digital I/O Board with sinking inputs and sinking outputs. The ACC-11E must be ordered with the appropriate output chips for either sinking or sourcing operation.



This example shows the typical connection of an ACC-11E digital I/O Board with sourcing inputs and sourcing outputs. The ACC-11E must be ordered with the appropriate output chips for either sinking or sourcing operation.



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PH: (818) 998-2095	Fax: +41-52-625-4482	FAX: 03-3665-6888	PH: +82-344-975-6156
FAX: (818) 998-7807	E-mail: bradp@deltatau.com	E-MAIL: info@pmac-j.com	FAX: +82-344-957-6155
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