

# CATALOG

## UMAC Catalog

UMAC Product Catalog

3A0-DTUMAC-xCxx

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## UMAC SYSTEM

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

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

The UMAC (Universal Motion and Automation Controller) is a modular PMAC system built with a set of 3U-format Eurocards. The configuration of any UMAC system starts with the selection of the PMAC CPU or MACRO fiber optic interface and continues with the addition of the necessary axes boards, I/O boards, communication interfaces (USB, Ethernet, etc.) and any other interface boards selected from the rich variety of available accessories. For example, accessory boards interface with virtually any kind of feedback sensor or to implement almost any kind of communication method with the host computer or external devices. In addition, a PC/104 computer can be installed inside the UMAC system yielding an incredibly powerful system inside a compact industrial package.

UMAC type boards are mounted inside 3U racks and the system is completed with the appropriate selection of power supplies and optional 3U servo amplifiers. UMAC 3U racks are available in different sizes, providing a CE compliant, rugged, and integrated package that puts all the electronics, built-in breakout connectors, and power supply in an enclosed system. Individual boards can slide in and out of the rack, making configuration and troubleshooting a snap.

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, because UMAC is based on the UBUS (Universal BUS), if a particular feature for the UMAC system is needed but not yet supported, Delta Tau provides all the necessary information for its development. Some examples of custom-designed UMAC boards include vision inputs cards, temperature control cards, etc.

Each UMAC system is expandable and scalable by connecting multiple racks together via the MACRO fiber optic protocol. Delta Tau's 3U and Geo servo amplifiers with MACRO interface capability can also reside in a MACRO fiber optic ring.

### Features

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- Up to 32 axes of motion control
- Analog  $\pm 10V$ , digital PWM or pulse and direction (stepper) command signals
- Quadrature, incremental, encoder inputs
- Parallel binary feedback inputs
- Laser interferometer feedback devices inputs
- Analog feedback inputs
- Sinusoidal encoder feedback inputs with 4096 interpolation lines
- SSI encoders inputs
- Yaskawa or Mitsubishi absolute encoders inputs
- 16-bit resolver-to-digital converter inputs
- MLDTs feedback inputs
- Thousands of I/O points
- High-power, sinking, sourcing or OPTO-22 compatible I/O
- Up to 256 analog-to-digital converted inputs (12-bits or 16-bits resolution)
- Stand-alone or host commanded operation

- PC/104, USB, Ethernet or RS-232/422 communication methods supported
- Device Net and Profibus protocols supported

## Ordering UMAC Parts

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

- 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. Alternatively, commands for the MACRO Interface/CPU board can 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.
- 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.
- 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, etc.
- 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.
- 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.
- 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<sup>®</sup> compatible computer: Optional CD-ROM, Hard Drive, Keyboard, Monitor or LCD Display, Mouse, Floppy Drive, etc.
- 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.
- 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 are also provided.

## UMAC Products Summary

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### CPU Options

The 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.

The MACRO Interface/CPU board can control up to 16 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 two or four digital PWM channels
- ACC-24E2A provides two or four analog  $\pm 10V$  channels
- ACC-24E2S provides two or four pulse and direction (stepper) channels
- ACC-69E provides six channels for SLM Technology amplifiers

### Digital I/O Boards

- ACC-5E is a MACRO Interface that allows the Turbo PMAC2-3U CPU to communicate with MACRO systems.
- ACC-11E provides 24 digital outputs (12-24 VDC, 100 mA/output max) and 24 digital inputs (12 to 24VDC).
- 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.

### 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 is a two or four channel high resolution 16-bit A/D converter board with  $\pm 10V$  input range.
- ACC-36E is a 16 channel 12-bit A/D converter board with  $\pm 10V$  input range.
- ACC-51E is a two or four axes 4096x high resolution Sinusoidal Analog Encoder Interpolator board.
- ACC-53E is a four or eight channel Synchronous Serial Encoder Interface (SSI) board.
- ACC-57E provides two or four channel encoder inputs for either Yaskawa or Mitsubishi Absolute Encoders.
- ACC-59E is a eight channel 12-Bit A/D Converter board plus eight channel 12-Bit DAC outputs.
- ACC-70E is a UMAC feedback interface for FA-CODER type encoders.

### Communication Boards (UMAC Turbo Only)

ACC-72E is the UMAC Field Bus Gateway.

### Power Supplies

ACC-E1 is a high-power AC-input power supply, input of 85-240VAC, output of 14A at +5V, 1.5A each at  $\pm 15V$ .

## **ACC-PC104: PC/104 Computer Assembly**

- CPU: Embedded VIA low power Eden processor, 128KB L1 cache memory on die Eden-667 (PCM-9372F-M0A1)
- System chipset: VIA PN133T (Twister T), VIA VT82C686B
- BIOS: Award 256 KB Flash memory
- System memory: 256Meg PC133 144pin SODIMM
- USB: Two universal serial bus ports, USB 1.1 compliant
- Serial ports: COM1: RS-232, COM2: RS-422
- Ethernet interface: IEEE 802.3u 100BASE-T Fast Ethernet
- MS Windows 2000 (when Option-1 is ordered)
- MS Windows 98 (when Option-2 is ordered)

## **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)

## **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
- ACC-R1: Integrated UMAC 6-slot rack including backplane and power supply
- ACC-R2: Integrated UMAC 12-slot rack including backplane and power supply
- ACC-R3: Integrated UMAC 18-slot rack including backplane and power supply

## **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

## UMAC CPU

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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 16 axes. However, two 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 can be installed in the machine as a stand-alone unit controlling up to 32 axes. As an option, a PC/104 computer can be added inside the UMAC Turbo or the UMAC Turbo can be connected to a main host computer by different means of fast communication interfaces: serial, Ethernet or USB.

## UMAC Turbo CPU/Communications Board

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The UMAC (Universal Motion and Automation Controller) is a modular system built with a set of 3U-format Eurocards. The configuration of any UMAC System starts with the selection of the UMAC Turbo CPU/Communications Board and continues with the addition of the necessary axes boards, I/O boards, and any other interface boards selected from a variety of available accessories.

The UMAC Turbo CPU/Communications board is a member of the Turbo PMAC2 family of boards. Its software is capable of 32 axes of control. Accessory boards installed in the UMAC Turbo System interface between the UMAC Turbo CPU/Communications Board and the machine to output amplifier command signals, to input feedback information, and to input flags information including end-of-travel limits and machine home sensors. Different kinds of axes interface boards can be selected to control analog  $\pm 10V$  amplifiers, stepper drivers and direct digital PWM amplifiers.

Several methods of communications can be implemented between the UMAC Turbo System and the host computer. These methods include two RS-232 serial ports, USB, Ethernet and PC/104 bus communications. The UMAC Turbo CPU/Communications Board can communicate with the two RS-232 ports, USB or Ethernet ports at the same time. However, if PC/104 bus communications is used, the USB or Ethernet ports cannot be used.

**Part Number:** 3x0-603766-10x  
**Number of slots:** 1  
**Resources:** only one CPU board allowed per each UMAC Turbo system

## Number of Channels

The Turbo PMAC2 3U CPU board does not have any on-board channels for controlling amplifiers and motors. Accessory boards in the UBUS backplane configuration, provide the necessary channel circuitry. 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 must be saved manually 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 battery-backed parameter RAM is suggested.

- 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 DSP56303 CPU w/8Kx24 internal memory, 128Kx24 SRAM compiled/ assembled program memory, 128Kx24 SRAM user data memory, 1Mx8 flash memory.
- Option 5C3: This provides an 80 MHz DSP56303 CPU w/8Kx24 internal memory, expanded 512Kx24 SRAM compiled/assembled program memory, expanded 512Kx24 SRAM user data memory, 4Mx8 flash memory. Firmware support for PMAC Ladder graphical PLC programming.
- Option 5D0: This provides a 100 MHz DSP56309 CPU w/34Kx24 internal memory, 128Kx24 SRAM compiled/ assembled program memory, 128Kx24 SRAM user data memory, 1Mx8 flash memory.
- Option 5D3: This provides a 100 MHz DSP56309 CPU w/34Kx24 internal memory, expanded 512Kx24 SRAM compiled/assembled program memory, expanded 512Kx24 SRAM user data memory, 4Mx8 flash memory. Firmware support for PMAC Ladder graphical PLC programming.
- Option 5E0: This provides a 160 MHz DSP56311 CPU w/128Kx24 internal memory, 128Kx24 SRAM compiled/ assembled program memory, 128Kx24 SRAM user data memory, and 1Mx8 flash memory. Requires V1.939 or newer firmware.
- Option 5E3: This provides a 160 MHz DSP56311 CPU w/128Kx24 internal memory, expanded 512Kx24 SRAM compiled/assembled program memory, expanded 512Kx24 SRAM user data memory, and 4Mx8 flash memory. Requires V1.939 or newer firmware. Firmware support for PMAC Ladder graphical PLC programming.
- Option 5F0: This provides a 240 MHz DSP56321 CPU w/192Kx24 internal memory, 128Kx24 SRAM compiled/ assembled program memory, 128Kx24 SRAM user data memory, and 1Mx8 flash memory. Requires V1.940 or newer firmware.
- Option 5F3: This provides a 240MHz DSP56321 CPU w/192Kx24 internal memory, expanded 512Kx24 SRAM compiled/assembled program memory, expanded 512Kx24 SRAM user data memory, and 4Mx8 flash memory. Requires V1.940 or newer firmware. Firmware support for PMAC Ladder graphical PLC programming.
- Option-16A: This provides 32Kx24 SRAM battery-backed parameter memory

## Communications

Several methods of communications can be implemented between the UMAC Turbo System and the host computer. These methods include two RS-232 serial ports, USB, Ethernet and PC/104 bus communications. The UMAC Turbo CPU/Communications Board can communicate with the two RS-232 ports, USB or Ethernet ports at the same time. However, if PC/104 bus communications is used, the USB or Ethernet ports cannot be used.

Option-2B: This provides the dual-ported RAM for PC/104, USB, or Ethernet interface. It provides a method of sharing memory between Turbo PMAC and the host computer for fast interchange of data.

## Firmware Version

Turbo PMAC is provided with the latest firmware version 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 can be ordered on-board. When possible, use the same firmware revision for similar machines. This is important in cases

where the new PMAC is a replacement in an already existing machine or a new machine using existing programs is developed.

## Miscellaneous

Most options to the Turbo PMAC board can be installed only in the 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 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 stand-alone configuration, not mounted in any 3U rack.
- Option-8A: The standard clock crystal in PMAC has  $\pm 100$  ppm accuracy. Through this option, a high-accuracy clock crystal ( $\pm 15$  ppm) is installed instead. This option is required only for an accurate synchronization and velocity accuracy for long-term applications. Generally, this will be noticeable only if a continuous move sequence lasts more than ten minutes.

## MACRO Interface/CPU Board – 8-Axis Version

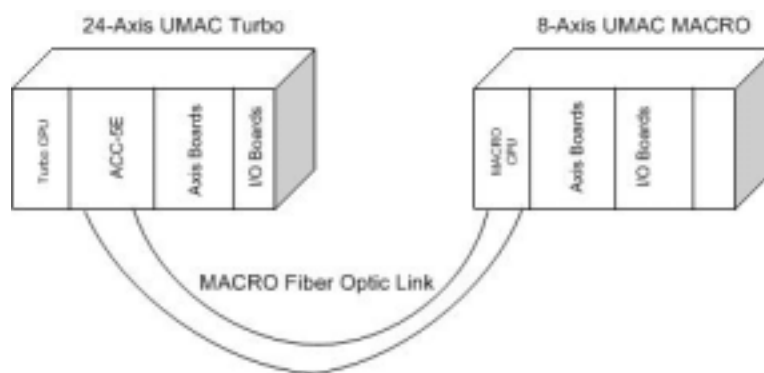
MACRO is an acronym for Motion and Control Ring Optical. This is a non-proprietary digital interface developed by Delta Tau Data Systems for connection of multi-axis motion controllers, amplifiers, and I/O on a fiber optic or twisted pair copper (RJ45 connector) ring. Since the fiber optic cable transmits 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 to 32 axes. A single UMAC MACRO can connect up to eight axes. Therefore, 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 one CPU board allowed per each UMAC MACRO system

### 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 in the UBUS backplane configuration, provide the necessary channel circuitry. A maximum of eight channels can be connected to the MACRO Interface/CPU board for a maximum of eight 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 are 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 also has 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 can be ordered on-board. When possible, use the same firmware revision for similar machines. This is important in cases where the new PMAC is a replacement in an already existing machine or a new machine using existing programs is developed.

## Miscellaneous

Typically, a PMAC2 Ultralite board, one without any of its own servo interface circuitry, is used with the UMAC MACRO to provide eight 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 can 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.
- If ordered with the 300 part number prefix, this board comes with no front, top, or bottom panels. This configuration is appropriate for a stand-alone configuration, not mounted in any 3U rack.
- Option-A: The MACRO interface is provided with the fiber optic connectors. This option must match the connectors present on the ACC-5E or the PMAC2 Ultralite board communicating with the MACRO Interface.

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



UMAC MACRO with the PMAC2 Ultralite

## MACRO Interface/CPU Board – 16-Axis Version

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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 three kilometers (two 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 to 32 axes. A single UMAC MACRO can connect up to 16 axes. Therefore, two UMAC MACRO systems can be tied together in a single ring for a convenient motion control distribution.

**Part Number:** 3x0-603719-10x

**Number of slots:** 1

**Resources:** only one CPU board allowed per each UMAC MACRO system

### Number of Channels

The MACRO Interface/CPU board does not have any on-board channels for controlling amplifiers and motors. Accessory boards in the UBUS backplane configuration provide the necessary channel circuitry. A maximum of 16 channels can be connected to the MACRO Interface/CPU board for a maximum of 16 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 are no 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 also has 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 can be ordered on-board. When possible, use the same firmware revision for similar machines. This is important in cases where the new PMAC is a replacement in an already existing machine or a new machine using existing programs is developed.

## Miscellaneous

Typically, a PMAC2 Ultralite board, one without any of its own servo interface circuitry, is used with the UMAC MACRO to provide eight 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 can 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.
- If ordered with the 300 part number prefix, this board comes with no front, top, or bottom panels. This configuration is appropriate for a stand-alone configuration, not mounted in any 3U rack.
- Option-A: The MACRO interface is provided with the fiber optic connectors. This option must match the connectors present on the ACC-5E or the PMAC2 Ultralite board communicating with the MACRO Interface.
- Option-C: The MACRO interface is provided with the RJ-45 electrical MACRO connectors. This option must 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 can 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 to as Nodes. All these terms will be explained in 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 has 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, either Turbo or non-Turbo, in its different available bus formats.

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.

Node structure using four consecutive memory registers:

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

### 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. Typically, this is how a servo node looks before and after the MACRO Slave processes it:

Node from Master to Slave	
Command Output A	
Command Output B	Not used
Command Output C	Not used
Amplifier Enable	Not used

Node from Slave to Master	
Encoder Feedback	
First Current Feedback	Not used
Second Current Feedback	Not used
Flags Status, Amplifier Fault	Not used

## I/O Nodes

In MACRO type 1 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 can be used also for any other purpose. If, for example, an extra encoder is needed for a particular motor with dual feedback, an I/O node can 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. Typically, this is how a servo node looks before and after the MACRO Slave processes it:

<b>Node from Master to Slave</b>	
<b>24-Bits Digital Output Write</b>	
16-bits digital outputs write	Not Used
16-bits digital outputs write	Not Used
16-bits digital outputs write	Not Used

<b>Node from Slave to Master</b>	
<b>24-Bits Digital Input Read</b>	
16-bits digital inputs read	Not Used
16-bits digital inputs read	Not Used
16-bits digital inputs read	Not Used

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.

## UMAC AXIS INTERFACE AND BREAKOUT BOARDS

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### PMAC2 Servo IC Circuitry

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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 IC has four motor channels and each motor channel has the following features that allow control of virtually any kind of motor or amplifier:

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

### Backplane Axis Accessory Boards

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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 allow it). The MACRO Interface/CPU board can interface to only four backplane SERVO ICs providing up to sixteen axes of motion control.

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

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<b>Part Number:</b>	3x0-603397-10x
<b>Number of slots:</b>	One slot per two axes, two slots per four axes
<b>Resources:</b>	One Servo IC for either two or four axes

The ACC-24E2 axis interface and breakout board provides the interface circuitry and breakout connectors for either two or four 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 can 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 a removable encoder terminal block and a removable flag terminal block for each axis. The ACC-24E2 can have either Option-1A for two additional analog servo interface channels or Option-1D for two additional digital servo interface channels. This means that this accessory can be populated with a half digital interface and a half analog interface. 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-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 four digital PWM channels on-board. Any of the extra two channels can 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  $\pm 10V$  DAC outputs per channel for velocity, torque or sinusoidal commutation amplifiers. If a single DAC amplifier is used, the second DAC of the channel can be used for any other general purpose. Any of the extra two channels can be set also 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 module.



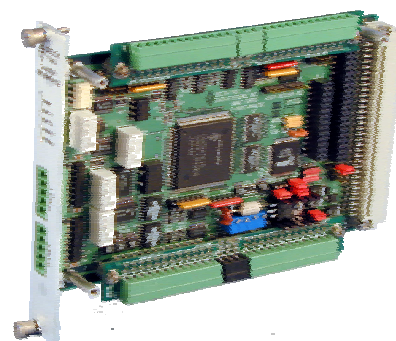
## Built-in MLDT interface

Any channel of an accessory ACC-24E2 that is not being used for digital PWM or stepper PFM signals can be set up to interface with a MLDT position feedback device. MLDT position feedback devices are in most cases used with analog  $\pm 10V$  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.

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

<b>Part Number:</b>	3x0-603398-10x
<b>Number of slots:</b>	One slot per two axes, two slots per four axes
<b>Resources:</b>	One Servo IC for either two or four axes

The ACC-24E2A axis interface and breakout board provides the interface circuitry and breakout connectors for either two or four channels of analog servo interface. The two analog channels provided have two  $\pm 10V$  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 can be used for any other general purpose. Alternatively, any individual channel of this accessory can be set up 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 two additional analog servo interface channels or Option-1D for two additional digital servo interface channels. This means that this accessory can be populated with a half digital interface and a half analog interface. 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-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 can 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.
- Option-1A: This option provides two extra analog channels for a total of four on-board analog channels. Each extra channel has two  $\pm 10V$  DAC outputs per channel for velocity, torque or sinusoidal commutation amplifiers. If a single DAC amplifier is used, the second DAC of the channel can be used for any other general purpose. Any of the extra two channels can 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.



## Built-in MLDT interface

Any channel of an accessory ACC-24E2A that is not being used for digital PWM or stepper PFM signals can be set up to interface with an MLDT position feedback device. MLDT position feedback devices are in most cases used with analog  $\pm 10V$  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.

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

<b>Part Number:</b>	3x0-603441-10x
<b>Number of slots:</b>	One slot per four axes
<b>Resources:</b>	One Servo IC per four axes

The ACC-24E2S axis interface and breakout board provides the interface circuitry and breakout connectors for four 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.



## 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.

## Built-in MLDT interface

Any channel of an accessory ACC-24E2S that is not being used for digital PWM or stepper PFM signals can be set up to interface an MLDT position feedback device. MLDT position feedback devices are in most cases used with analog  $\pm 10V$  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.

## ACC-69E: Axis Interface for SLM Technology Amplifiers

The ACC-69E axis interface board allows a UMAC system to interface with up to six amplifiers compatible with SLM Technology. The amplifier command signals and encoder feedback information is passed through the high-speed Control Techniques' SLM Technology protocol using a convenient 2-wire long-distance connection. Up to six ACC-69E cards may be installed in a UMAC system for up to 32 axes of motion control.

**Part Number** 3x0-603621-10x

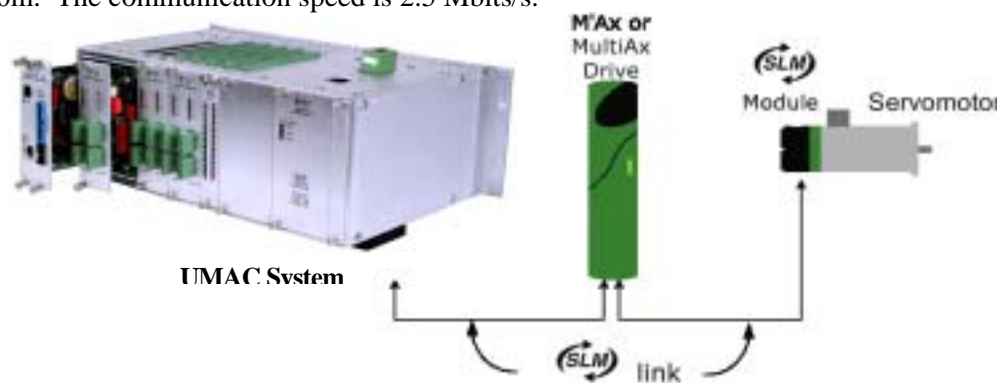


## Features

- Six channels of SLM Technology for controlling M'Ax servo drives
- Velocity-based output commands (selectable to Torque mode by user)
- High-resolution absolute encoder feedback (up to 22 bits)
- Four channels of timestamp based trigger position capture capability
- Up to six ACC-69E cards may be installed in a UMAC system for up to 32 axes of motion control

## About SLM Technology

Control Techniques achieves high performance from its M'Ax range of servo drives by integrating a high-resolution SinCos encoder and position/velocity loop processor within the feedback module on a permanent magnet AC servomotor. This is the Speed Loop Module that replaces the more traditional transducer such as a resolver or incremental encoder. The SinCos encoder is recognized as the ultimate position acquisition device for high performance motion control. By mounting the encoder, interface and position/velocity control directly on the servomotor the wiring complexity and electromagnetic noise is greatly reduced. This technique enables very high resolution (up to 8 million counts / revolution) position information plus excellent synchronization (50ns), which is crucial to a high bandwidth servo drive. In addition, a high-speed serial communications link, SLM Technology, is used between motion controller, servo amplifier and position feedback module. This proprietary SLM Technology ASIC developed by Control Techniques is used throughout the range of drives. Its physical layer is a balanced differential digital transmission line, conforming to the RS485 2-wire specification. This allows a cable length limit of up to 50m. The communication speed is 2.5 Mbits/s.



## **UMAC-Option-5x: Mini-D 36-Pin PWM Cable for Digital Amplifiers**

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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



## UMAC I/O BOARDS

### 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.

### 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 board 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 four backplane IOGATE chips. A variety of I/O boards are available for potentially hundreds of I/O control lines. The selection can be made from TTL I/O, OPTO22 compatible boards, high or low power outputs, optically isolated boards, AC or DC I/O signals, etc.

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

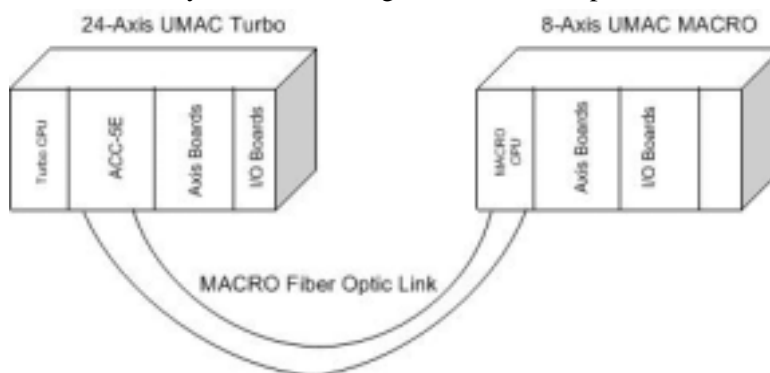
<b>Part Number:</b>	3x0-603437-10x
<b>Number of slots:</b>	One slot
<b>Resources:</b>	One MACRO chip per 16 MACRO nodes

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.

**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-11E: Isolated 24-Input/24-Output Backplane Board

<b>Part Number:</b>	3x0-603307-10x
<b>Number of slots:</b>	One slot
<b>Resources:</b>	One IOGATE IC

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. Sourcing or sinking output drivers must be designated 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.



## 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.
- 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-14E: 48-TTL-I/O Backplane Board

<b>Part Number:</b>	3x0-603474-10x
<b>Number of slots:</b>	One slot
<b>Resources:</b>	One IOGATE IC

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 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<sup>TM</sup> or compatible I/O module boards. Two 50-pin IDC headers, top edge and bottom edge, are provided for connection to I/O points.



## 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

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**Part Number:** 3x0-603575-10x  
**Number of slots:** One slot  
**Resources:** One IOGATE IC

The ACC-65E is a 3U-size rack-mounted board with 24 isolated self-protected digital inputs and 24 isolated self-protected digital outputs. The inputs are sourcing at 12V to 24V levels. The outputs are sourcing, each at up to 24VDC with 600mA continuous and 1.2A peak for up to two seconds. Removable terminal blocks are provided for the connection to I/O points. This board 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-66E: Isolated, Self-Protected Sourcing 48-Input Board

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**Part Number:** 3x0-603576-10x  
**Number of slots:** One slot  
**Resources:** One IOGATE IC

The ACC-66E is a 3U-size rack-mounted board with 48 isolated self-protected digital inputs. These inputs are sourcing at 12V to 24V levels. Removable terminal blocks are provided for the connection to I/O points. This board 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.

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## ACC-67E: Isolated, Self-Protected Sourcing 48-Outputs Board

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**Part Number:** 3x0-603577-10x  
**Number of slots:** One slot  
**Resources:** One IOGATE IC

The ACC-67E is a 3U-size rack-mounted board with 48 isolated self-protected digital outputs. The outputs are sourcing, each at up to 24VDC with 600mA continuous and 1.2A peak for up to two seconds. Removable terminal blocks are provided for the connection to I/O points. This board 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.

## UMAC PC/104 AND COMMUNICATION BOARDS

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A wide selection of communication accessory boards is provided only for the UMAC Turbo 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.

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*Note:*

Communication accessory boards are not available for the UMAC MACRO system.

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### Dual-Ported RAM Circuitry

Most communication accessories for the UMAC Turbo system use a circuitry similar to the onboard 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-72E: UMAC Fieldbus Gateway

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**Part Number:** 3x0-603777-10x  
**Number of slots:** One Slot  
**Resources:** One DPRAM IC

This accessory allows the UMAC Turbo system to communicate with other external devices using a field bus communication protocol like DeviceNet, Profibus, ControlNet and CanOpen as required. This board can act as a master or a slave in the field bus connections. The specific option must be ordered to specify the type of field bus communications required. This accessory is intended for UMAC Turbo use only.

### Options

- If ordered with the 3Ax 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 3Rx 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-72E OPT-1: Profibus Master with front panel (Part Number: 3A1-603777-10X)
- ACC-72E OPT-1: Profibus Master with front, top and bottom panel (Part Number: 3R1-603777-10X)
- ACC-72E OPT-2: Profibus Slave with front panel (Part Number: 3A2-603777-10X)
- ACC-72E OPT-2: Profibus Slave with front, top and bottom panel (Part Number: 3R2-603777-10X)
- ACC-72E OPT-3: DeviceNet Master with front panel (Part Number: 3A3-603777-10X)
- ACC-72E OPT-3: DeviceNet Master with front, top and bottom panel (Part Number: 3R3-603777-10X)
- ACC-72E OPT-4: DeviceNet Slave with front panel (Part Number: 3A4-603777-10X)
- ACC-72E OPT-4: DeviceNet Slave with front, top and bottom panel (Part Number: 3R4-603777-10X)
- ACC-72E OPT-5: CanOpen Master with front panel (Part Number: 3A5-603777-10X)
- ACC-72E OPT-5: CanOpen Master with front, top and bottom panel (Part Number: 3R5-603777-10X)
- ACC-72E OPT-6: CanOpen Slave with front panel (Part Number: 3A6-603777-10X)
- ACC-72E OPT-6: CanOpen Slave with front, top and bottom panel (Part Number: 3R6-603777-10X)
- ACC-72E OPT-7: ControlNet Slave w/ front panel (Part Number: 3A7-603777-10X)
- ACC-72E OPT-7: ControlNet Slave w/ front, top and bottom panel (Part Number: 3R7-603777-10X)

## ACC-PC104: PC/104 Computer Assembly

**Part Number:** 3R0-PC104C-10X  
**Number of Slots:** Five Rack (no UBUS) positions  
**Resources:** None

When the Turbo PMAC2 3U CPU Option-2 is ordered, the PC/104 interface is installed which allows mounting of an entire PC-compatible computer inside the UMAC Turbo system. Delta Tau can provide this computer. 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 form-factor compliant (most are not). The PC/104 assembly occupies five rack positions. Since this assembly does not plug into the UBUS backplane, the five positions are counted for the pack frame selection (ACC-Px) but not for the UBUS selection (ACC-Ux). The PC/104 assembly provided by Delta Tau includes:

- CPU: Embedded VIA low power Eden processor, 128KB L1 cache memory on die Eden-667 (PCM-9372F-M0A1)
- System chipset: VIA PN133T (Twister T), VIA VT82C686B
- BIOS: Award 256 KB Flash memory
- System memory: 256Meg PC133 144pin SODIMM
- USB: Two universal serial bus ports, USB 1.1 compliant
- Serial ports: COM1: RS-232, COM2: RS-422
- Ethernet interface: IEEE 802.3u 100BASE-T Fast Ethernet
- MS Windows 2000 (when Option-1 is ordered)
- MS Windows 98 (when Option-2 is ordered)



## UMAC MISCELLANEOUS BOARDS

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A wide 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

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**Part Number:** 3x0-603404-10x  
**Number of slots:** One slot  
**Resources:** One IOGATE IC

The ACC-28E is a 3U-size rack-mounted board that provides two or four channels of 16-bit A/D converters for analog inputs with  $\pm 10V$  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 number 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 number 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: Two additional on-board 16-bit A/D converters

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

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**Part Number:** 3x0-603483-10x  
**Number of slots:** One slot  
**Resources:** One IOGATE IC

The ACC-36E is a 3U-size rack-mounted board that provides 16 channels of 12-bit A/D converters for analog inputs with  $\pm 10V$  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, 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:** One slot  
**Resources:** One Servo IC

The ACC-51E is a 3U-size rack-mounted board with interpolation circuitry for two 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

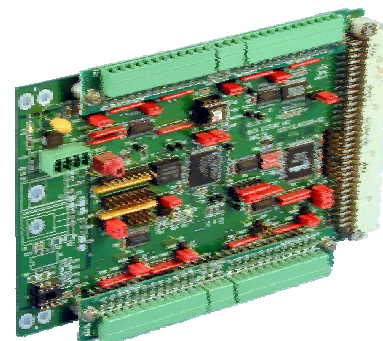
- If ordered with the 3A0 part number prefix, this accessory comes with a front panel attached to the board, but no top or bottom panels. This configuration is appropriate for mounting in an open 3U rack.
- If ordered with the 3R0 part number prefix, this accessory comes with a front panel attached to 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:** One slot  
**Resources:** One IOGATE IC

The ACC-53E provides four or eight 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 one error bit.

For use with 24-bits gray code SSI encoders only.



### Options

- If ordered with the 3A0 part number prefix (part number 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.
- If ordered with the 3R0 part number prefix (part number 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 four channels of on-board SSI encoder interface
- Option-2: Kawasaki Serial Encoder Interface

## ACC-57E: Yaskawa or Mitsubishi Encoder Interface

<b>Part Number:</b>	3x0-603484-10x
<b>Number of slots:</b>	One per two channels, two per four channels
<b>Resources:</b>	One Thumbwheel address (Middle Thumbwheel row)

The ACC-57E is a 3U-size rack-mounted board that provides two or four channels of either Yaskawa or Mitsubishi absolute encoder interface (not both). 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 four 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 number 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 number 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 provides two axes Yaskawa absolute encoder inputs.
- Option-1 provides two additional axes for a total of four Yaskawa absolute encoder inputs. Requires Option-Y.
- Option-M provides four axes of Mitsubishi absolute encoder inputs.

## ACC-59E: 12-bits DAC/ADC Converter

<b>Part Number:</b>	3x0-603494-10x
<b>Number of slots:</b>	-
<b>Resources:</b>	-

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.



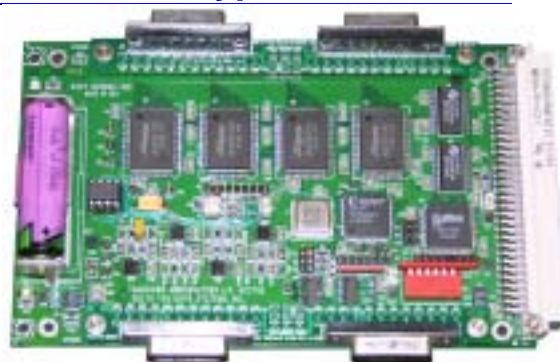
### Options

- 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-70E: UMAC Feedback Interface for FA-CODER Type Encoders

The ACC-70E feedback interface board allows a UMAC system to interface with up to four FA-CODER absolute encoders. Data from the TAMAGAWA-SEIKI FA-CODER absolute type encoders is serially transmitted to the ACC-70E board, which then translates it for UMAC position feedback use. Up to eight ACC-70E can be used with any UMAC system for up to 32 axes of position feedback.

**Part Number**                    3x0-603692-10x



### TS5667N420 Encoder Features

- Full absolute signal output
- 17 bit/1 Turn, multi-turn 16 bit (at 6000rpm max.)
- Two-way serial communication
- Small size
- Serial data transmission
- Fail-check operation
- Even during power outage, multi-turn data is backed up by external battery and built-in capacitor

## POWER SUPPLIES AND BACKPLANE OPTIONS

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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 it 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

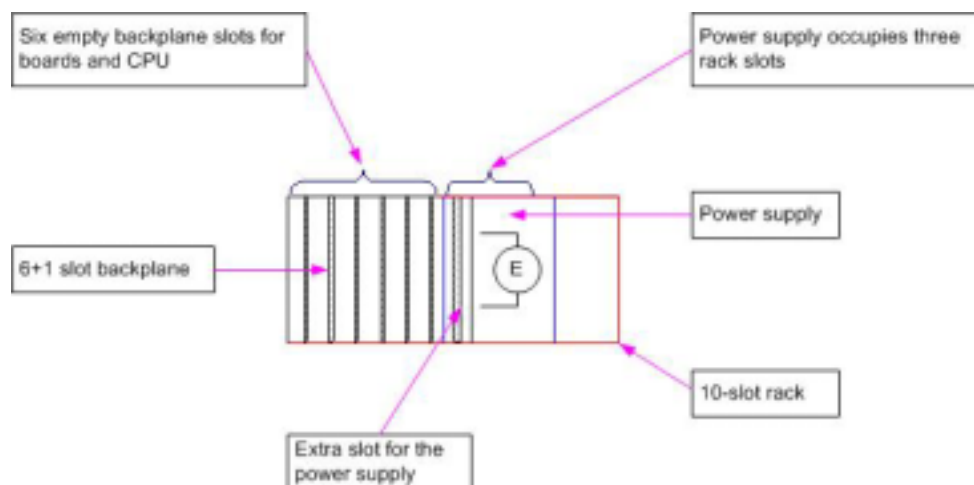
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#### Rack Slots

The width of each rack ordered through the ACC-Px UMAC accessory determines the number of components that can be fit inside the rack, regardless if these components are plugged in a backplane or not. The power supply, for example, occupies rack slots but only one backplane slot. Each UMAC backplane has a dedicated slot for the power supply located on its right hand side.

#### Backplane Slots

Each backplane ordered through the ACC-Ux UMAC accessory has a limited number of slots to plug in the corresponding accessory boards that are part of the UMAC system. Each board is described in this product guide including the number of slots that it occupies. For example, the Turbo PMAC2 3U CPU board occupies one slot whereas the ACC-24E2 with the Option-1A occupies two slots. The backplane must be selected according to the number of slots necessary based on the number of accessory boards that are part of the UMAC system. ACC-U6, for example, has six slots for accessory boards plus one extra slot for the power supply connection:



In the above example, a 6-slot 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 nine slots. Therefore, the rack selected is ACC-P1, a 10-slot rack.

### ACC-Rx: Integrated UMAC Racks

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#### ACC-R1

ACC-R1 is an integrated UMAC Rack composed of a 10-slot (42T) pack frame, a 6-slot backplane and power supply. Dimensions are: 218.4 mm (8.60 inch) Wide X 222.2 mm (8.75 inch) Deep X 132.1 mm (5.20 inch) High. The power supply characteristics are: AC-Input power supply, input of 85-240VAC, output of 14A at +5V, 1.5A each at  $\pm 15V$ .

## ACC-R2

ACC-R2 is an integrated UMAC Rack composed of a 15-slot (63T) pack frame, a 12 slot backplane and power supply. Dimensions are: 325.1 mm (12.80 inch) Wide X 222.2 mm (8.75 inch) Deep X 132.1 mm (5.20 inch) High. The power supply characteristics are: AC-Input power supply, input of 85-240VAC, output of 14A at +5V, 1.5A each at  $\pm 15V$

## ACC-R3

ACC-R3 is an integrated UMAC Rack composed of a 21-slot (84T) pack frame, a 18 slot backplane and power supply. Dimensions are: 431.8 mm (17.00 inch) Wide X 222.2 mm (8.75 inch) Deep X 132.1 mm (5.20 inch) High. The power supply characteristics are: AC-Input power supply, input of 85-240VAC, output of 14A at +5V, 1.5A each at  $\pm 15V$

## ACC-E1: AC Input Power Supply

To connect the UMAC directly to the AC line, Delta Tau provides the ACC-E1 power supply. With this power supply, the  $\pm 15V$  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 ACC-E1 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-E1 (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  $\pm 15V$ . This power supply occupies three slots.



## 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 number 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

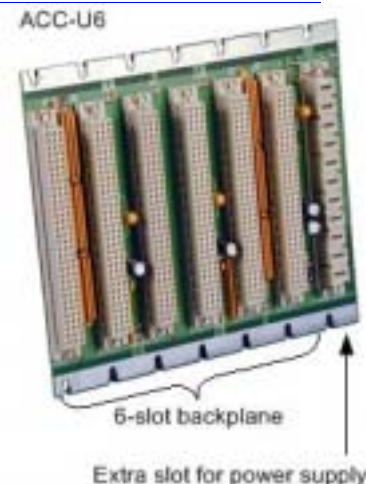
(Part number 563-602932-10x) provides a 15-slot (63T) pack frame with provisions for mounting top, front, and back panels for all boards and modules. It is 325.1 mm (12.80") wide by 222.2 mm (8.75") deep by 132 mm (5.2") high.

## ACC-P3: 21 Slot

(Part number 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.

## 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-E1 power supply, 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-Slot UBUS Backplane (300-603462-10x)

Provides a backplane board for connecting four 3U-format circuit boards plus an ACC-E1 power supply with a total width of five slots.

### ACC-U6: 6-Slot UBUS Backplane (300-603403-10x)

Provides a backplane board for connecting six 3U-format circuit boards plus an ACC-E1 power supply with a total width of seven slots.

### ACC-U8: 8-Slot UBUS Backplane (300-603463-10x)

Provides a backplane board for connecting eight 3U-format circuit boards plus an ACC-E1 power supply with a total width of nine slots.

### ACC-U10: 10-Slot UBUS Backplane (300-603464-10x)

Provides a backplane board for connecting ten 3U-format circuit boards plus an ACC-E1 power supply, with a total width of 11 slots.

### ACC-U12: 12-Slot UBUS Backplane (300-603465-10x)

Provides a backplane board for connecting 12 3U-format circuit boards plus an ACC-E1 power supply, with a total width of 13 slots.

### ACC-U14: 14-Slot UBUS Backplane (300-603466-10x)

Provides a backplane board for connecting 14 3U-format circuit boards plus an ACC-E1 power supply, with a total width of 15 slots.

### ACC-U16: 16-Slot UBUS Backplane (300-603471-10x)

Provides a backplane board for connecting 16 3U-format circuit boards plus an ACC-E1 power supply, with a total width of 17 slots.



**ACC-U18: 18-Slot UBUS Backplane (300-603491-10x)**

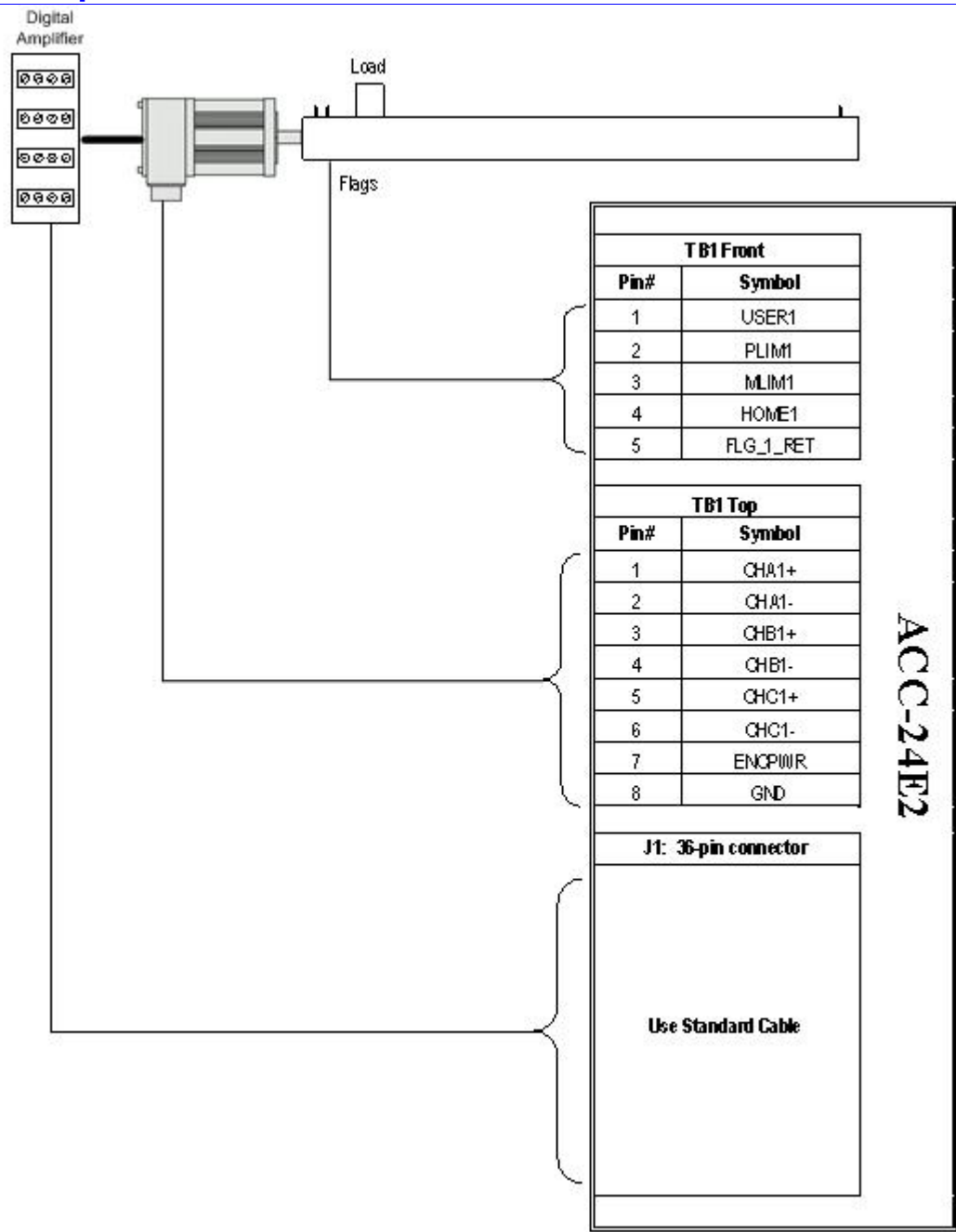
Provides a backplane board for connecting 18 3U-format circuit boards plus an ACC-E1 power supply, with a total width of 19 slots.

**ACC-56: Backplane Extender Board (3x0-603401-10x)**

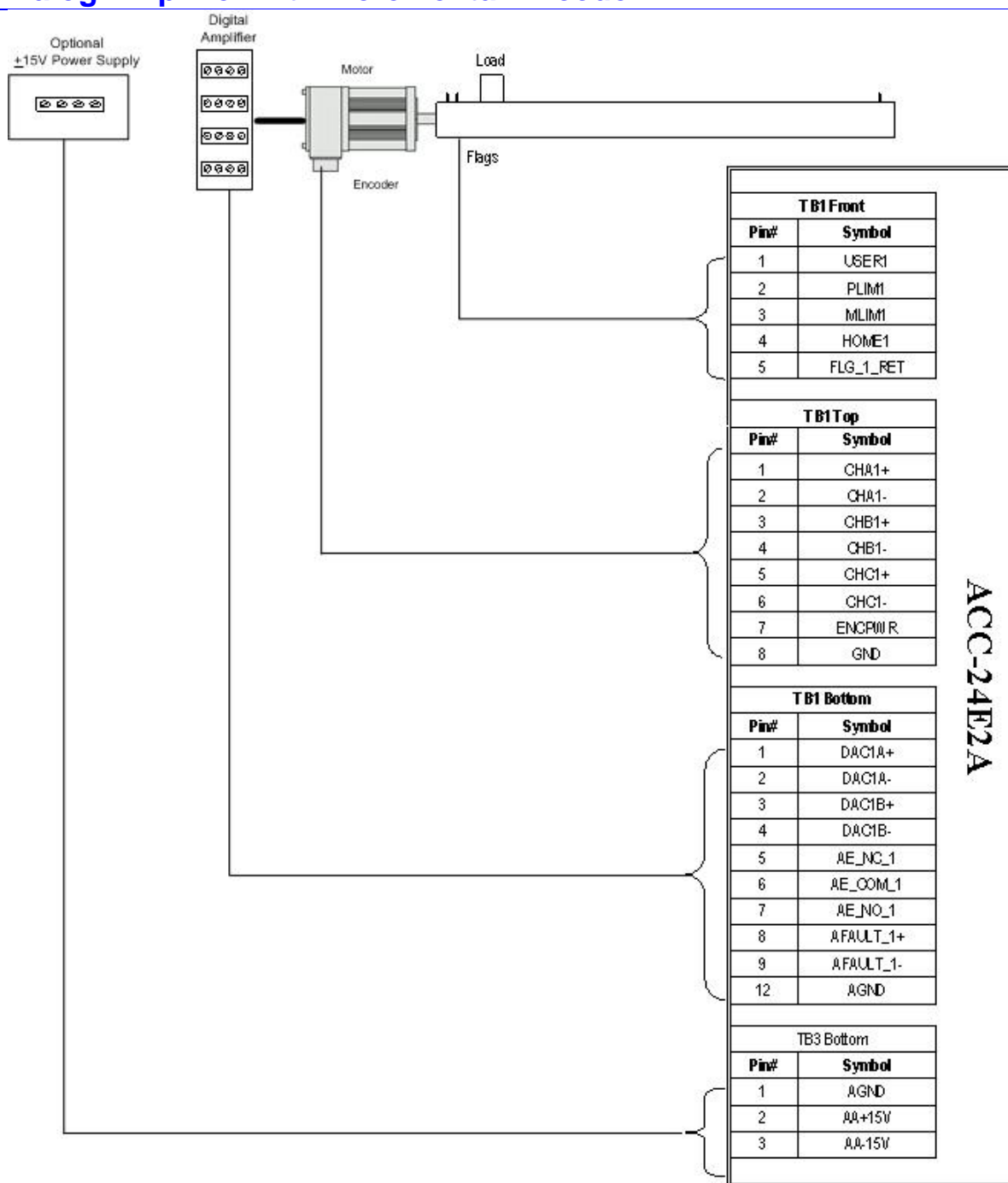
This accessory occupies one slot and is a 3U size fused backplane extender for test purposes.

CONNECTION DIAGRAMS

Digital Amplifier with Incremental Encoder



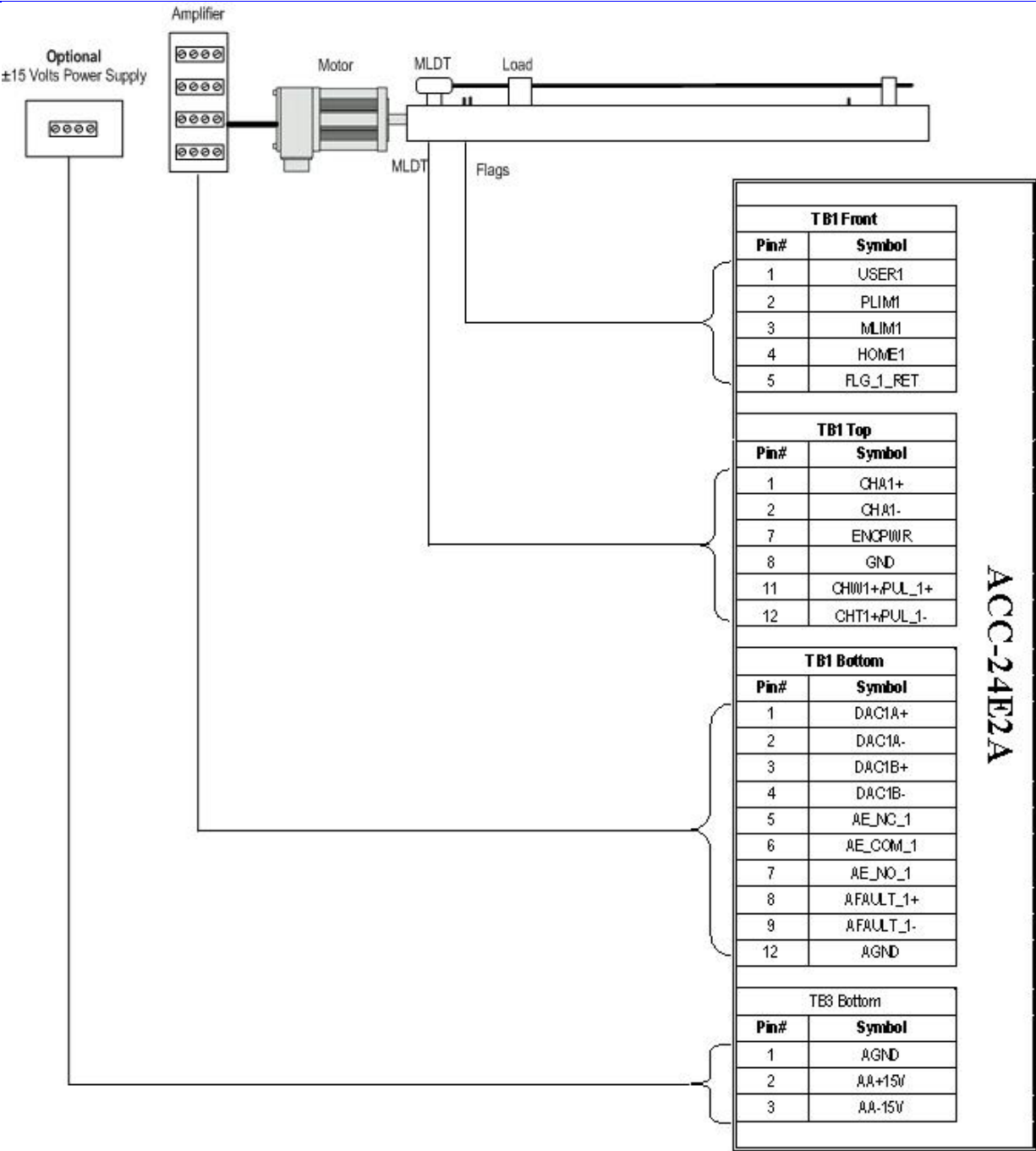
## Analog Amplifier with Incremental Encoder



### Note:

Most UMAC systems are ordered with an internal  $\pm 15V$  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.

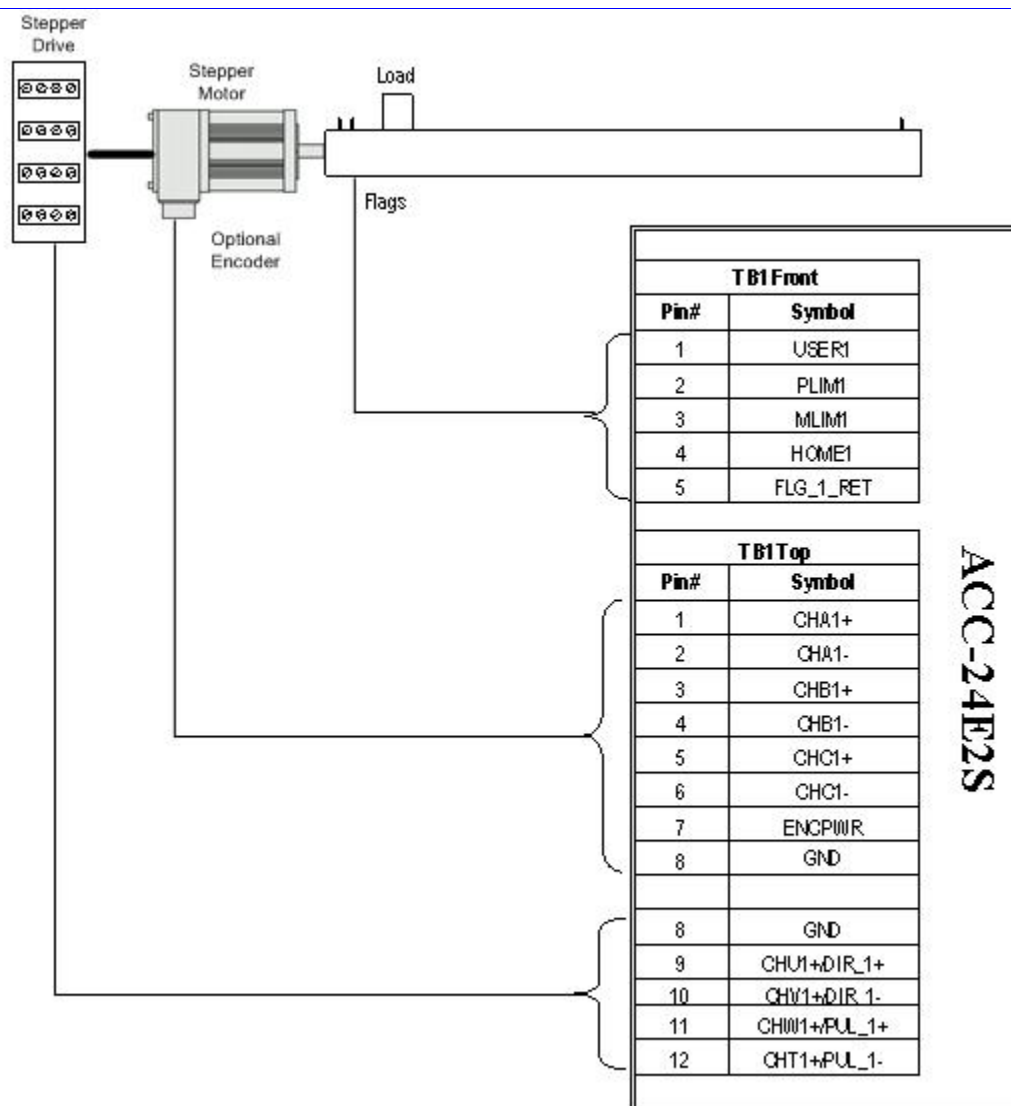
Analog Amplifier with MLDT Feedback



*Note:*

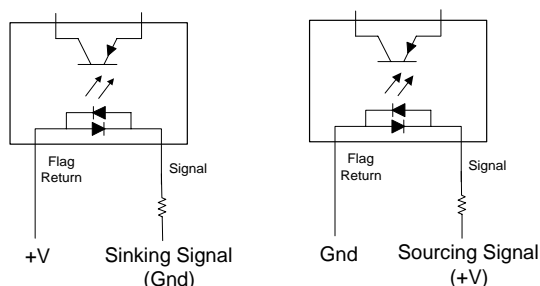
Most UMAC systems are ordered with an internal  $\pm 15V$  power supply. The optional external power supply shown in this diagram provides greater electrical noise immunity separating the analog and digital circuits ground reference. In most cases the analog amplifier provides this power supply. Jumpers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

## Stepper Driver with Incremental Encoder



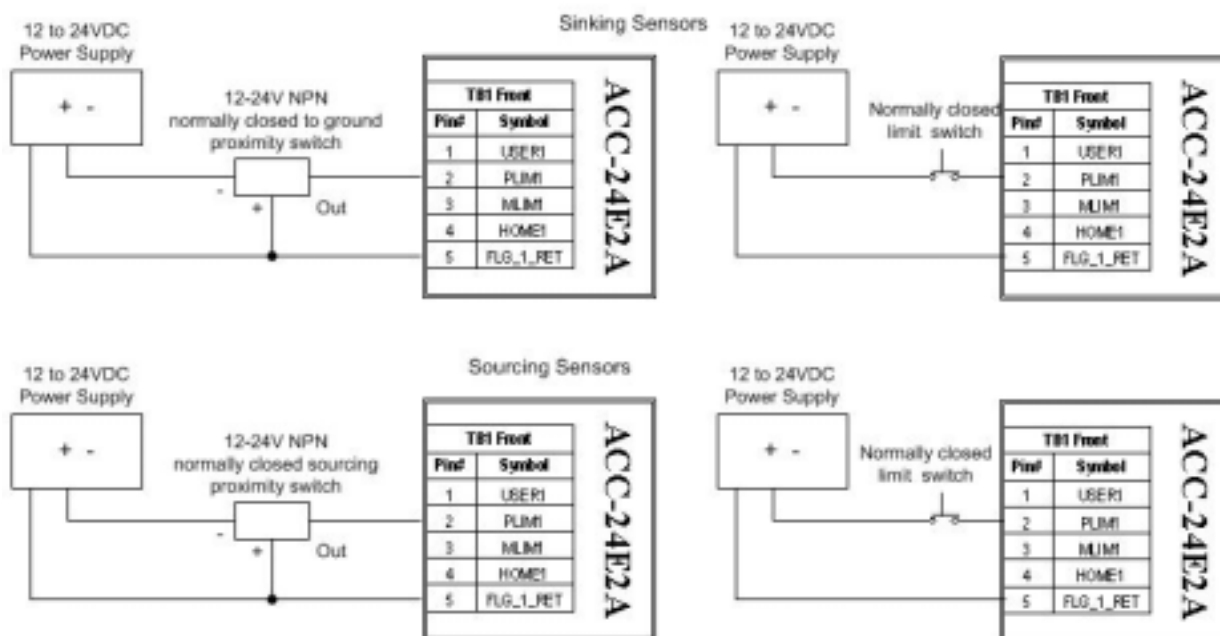
## ACC-24E2A Axis Flag Signals

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



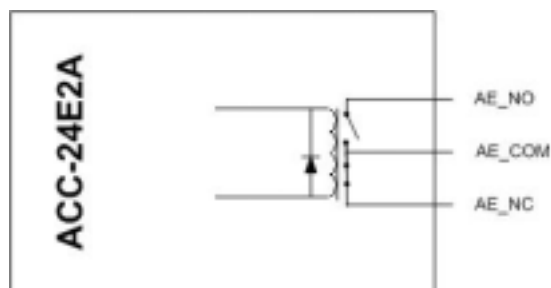
### Example

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.

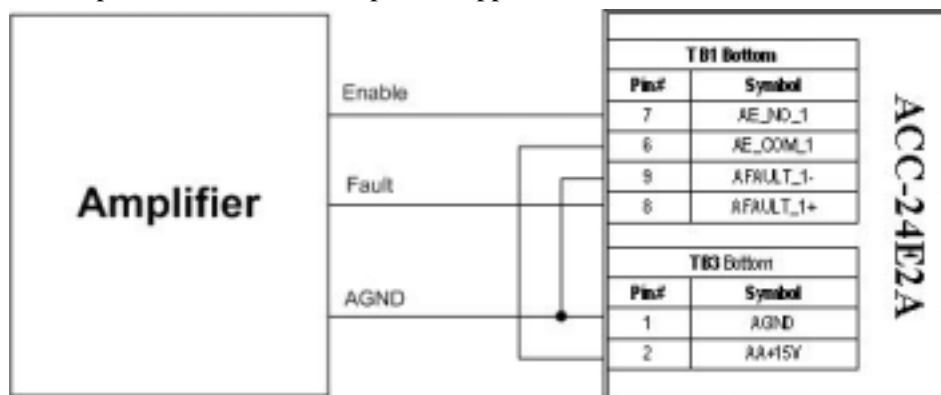


## ACC-24E2A Amplifier Fault/Enable Signals

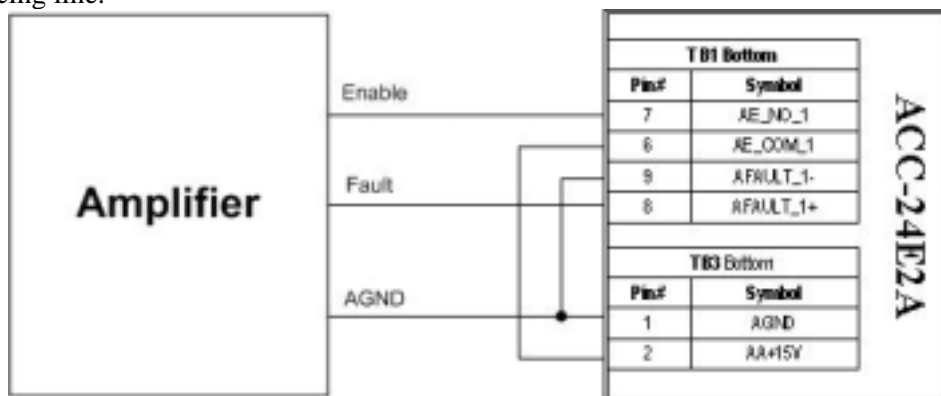
The amplifier enable signal of the axes accessory boards is controlled by a relay with normal open and normal close dry contacts:



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  $\pm 15V$  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.



## Digital I/O with ACC-65E

This example shows the typical connection of an ACC-65E digital I/O Board with sourcing inputs and sourcing outputs.

