USER MANUAL

UNIVERSAL SERIAL OPERATOR CONTROL LOGIC BOARD

Multi-Purpose I/O Controller

3Ax-603495-xUxx

January 2001

DELTA TAU
Data Systems, Inc.
NEW IDEAS IN MOTION ...

Single Source Machine Control *Power // Flexibility // Ease of Use*
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All Delta Tau Data Systems, Inc. motion controller products, accessories, and amplifiers contain static sensitive components that can be damaged by incorrect handling. When installing or handling Delta Tau Data Systems, Inc. products, avoid contact with highly insulated materials. Only qualified personnel should be allowed to handle this equipment.

In the case of industrial applications, we expect our products to be protected from hazardous or conductive materials and/or environments that could cause harm to the controller by damaging components or causing electrical shorts. When our products are used in an industrial environment, install them into an industrial electrical cabinet or industrial PC to protect them from excessive or corrosive moisture, abnormal ambient temperatures, and conductive materials. If Delta Tau Data Systems, Inc. products are exposed to hazardous or conductive materials and/or environments, we cannot guarantee their operation.

Contents

INTRODUCTION

Overview

The "Universal SOCLB" (Serial Operator Controller Logic Board, henceforth referred to as "SOCLB") is Delta Tau's latest innovation for the CNC industry. The SOCLB represents Delta Tau's latest advance in providing industry-standard open-architecture solutions for the machine tool industry.

The SOCLB is a true USB (Universal Serial Bus) "plug and play" multi-purpose I/O controller specifically designed to control "machine tool front panel I/O" for Delta Tau's "Advantage CNC" systems. Machine tool front panel I/O are those inputs and outputs that are commonly required to operate most machine tools. The SOCLB interfaces to the Advantage CNC system through a single USB (Universal Serial Bus) interface connection. This unique interface design dramatically reduces overall system wiring and wiring complexity.

Important Notice

Delta Tau has qualified the SOCLB for operation under the Windows '98, Windows '98SE (Second Edition), Windows ME (Millennium Edition), and Windows 2000 operating systems. The SOCLB will not operate with Windows 3.0 & 3.1, Windows '95, Windows N.T. version 3.51, or Windows N.T. version 4.0 operating systems. None of these operating systems support USB devices properly, and will not allow the SOCLB to operate reliably.

This manual details the software installation and normal operation of the SOCLB with the Advantage CNC system, and lists the optional hardware configurations for the SOCLB.

The SOCLB operates seamlessly with Delta Tau's Advantage 8xx series CNC systems. Optional interfacing is possible with the Advantage 600 or Advantage 700 operator control switch panel with the addition of SOCLB Option 3.

The Advantage 8xx Operator Control Panel

The standard SOCLB provides easy interfacing to the standard Advantage 8xx series of CNC systems. The standard SOCLB features the following machine control functions:

Machine Control Function	Action
Auto Mode	Make pushbutton, one input
Axis Select	16 position grayscale (X, Y, Z, A, B, C, U, V, W standard)
Block Delete	Make pushbutton, one input
Coolant On / Off	Make pushbutton, one input
Cycle Start	Make pushbutton, one input
Feed Hold	Make pushbutton, one input
Feedrate Override (0 ~ 150%, Typical)	Analog input, 8 bit
Jog Minus (-)	Make pushbutton, one input
Jog Plus (+)	Make pushbutton, one input

Machine Zero	Make pushbutton, one input
Manual Pulse Generator (Handwheel)	100 pulses per revolution encoder generator
MDI (Manual Data Input) Mode	Make pushbutton, one input
Optional Stop	Make pushbutton, one input
Single Block	Make pushbutton, one input
Speed Multiply Low (x1)	Make pushbutton, one input
Speed Multiply Medium (x10)	Make pushbutton, one input
Speed Multiply High (x100)	Make pushbutton, one input
Spindle Forward	Make pushbutton, one input
Spindle Override (50 ~ 120%, Typical)	Analog input, 8 bit
Spindle Reverse	Make pushbutton, one input

The Advantage 8xx and the SOCLB also feature eight user-assignable pushbuttons standard for additional machine functionality. These inputs can have either a green or a red LED assigned to the button when their condition is true.

User 1	Make pushbutton, one input
User 2	Make pushbutton, one input
User 3	Make pushbutton, one input
User 4	Make pushbutton, one input
User 5	Make pushbutton, one input
User 6	Make pushbutton, one input
User 7	Make pushbutton, one input
User 8	Make pushbutton, one input

Additional SOCLB functionality includes interfacing for the standard manual pulse generator (100 pulse per revolution handwheel) provided on the Advantage 8xx CNC system, as well as interfacing for an optional Delta Tau “Remote Handwheel.”

The SOCLB has one on-board status LED to indicate that DC power is applied. The following details the status LED:

Label	Color	Comment
D3	Red	When on, indicates either +12vdc or +5vdc is present at J28

SOCLB Options

The SOCLB has several options available for additional features and functionality. These options and their associated functionalities are listed below.

- **SOCLB Option 1, 12 Additional Pushbutton Panel LED Indicator Lamps.** The standard Advantage 8xx has 12 pushbuttons with associated green and red LED outputs. These LEDs are for the eight user assignable pushbuttons, cycle start, feed hold, jog plus and jog minus pushbuttons. If the application either requires or desires additional pushbutton panel LEDs, then order “SOCLB Option 1”.

Option Number	Additional LEDs	Comment
SOCLB Option 1	12 Green & 12 Red LEDs	J16, J17, J18, J19, J20, J21, U21, U22, & U23 added

- **SOCLB Option 3, Advantage 600/700 Switch Panel Support.** The SOCLB can interface with an Advantage 600/700 operator control switch panel if desired. When SOCLB Option 3 is purchased, a 37-pin DB connector is added to the SOCLB (J37) to interface with the Advantage 600/700 operator control switch panel. Additionally, two relays (K1 & K2) and two 2-screw Phoenix terminals (TB1 & TB2) are added to the board.

- **SOCLB Option 4, 2x 1 x 4 Button Key Pad.** Some Advantage 8xx applications may not require the rotary axis select switch provided with the standard Advantage 8xx CNC system, but still need an input device. Delta Tau has designed "SOCLB Option 4" for these applications. When SOCLB Option 4 is ordered, two additional four button key pads can be interfaced to the SOCLB. SOCLB Option 4 supporting hardware includes J30, J31, J32, J33, J34 & J35 (10 pin IDC connectors to interface with the two key pads), and U10, U24 and U25 (one input driver device and two output driver devices so each key pad can have a green and red LED associated with each button).

Operator Control Panel Functions

Auto Mode Pushbutton

When the "Auto Mode" pushbutton is pressed, the Advantage 8xx CNC system enters the "Auto" operational mode. Auto mode permits the Advantage 8xx CNC system to execute G-code programs. Prerequisites for "Auto Mode" operation are that all machine axes must have been "referenced" (homed) during machine startup, and that no axis can be on a position (software) limit or overtravel switch.

Axis Select Switch

The "Axis Select" rotary switch is a "grayscale" type switch, which is used for selecting an axis that is to be moved. The Advantage 8xx CNC system supports up to nine (9) valid axis names, these are X, Y, Z, A, B, C, U, V, W. The X, Y, Z, U, V, W axes will typically be linear axis, and the A, B, C axis will typically be the rotary axes.

Block Delete Pushbutton

When the "Block Delete" pushbutton is pressed, the Advantage 8xx CNC system will skip (not execute) any G code lines that start with a / symbol (a right leaning forward slash). The Block Delete function is operative only when the Advantage 8xx CNC system is either in MDI (Manual Data Input) or Auto mode.

Coolant On / Off Pushbutton

When the "Coolant On/Off" pushbutton is pressed, the Advantage 8xx CNC system will send a command to a PMAC-NC32 *for Windows* PLC program to turn on the machine tool coolant. The type of coolant control (typically either flood or mist) is machine dependant, and is the responsibility of the machine integrator to implement.

Cycle Start Pushbutton

When the Advantage 8xx CNC system is in either the MDI or Auto mode, and the "Cycle Start" pushbutton is pressed, the Advantage 8xx CNC system will begin to execute the G-code program that is currently loaded. Prerequisites are that all machine axes must have been "referenced" (homed) during machine startup, and that no axis is on either a position (software) limit or overtravel (hardware) switch.

Feed Hold Pushbutton

The "Feed Hold" pushbutton is only active when the Advantage 8xx CNC system is in either the MDI or Auto mode. When the Feed Hold pushbutton is pressed, the Advantage 8xx CNC system will turn the "Cycle Start" command off and immediately stop executing the current G-code program. This means that all axis movement will stop, but miscellaneous (M code) commands may still continue to execute (i.e., coolant on) . To continue executing the G-code program, the operator presses the Cycle Start pushbutton, which will turn off the Feed Hold command, and allow axis motion to resume.

Feedrate Override Analog Switch

When the Advantage 8xx CNC system is in either the MDI or Auto mode, the "Feedrate Override" analog potentiometer allows the operator to adjust the currently executed axis speed from 0% to 150% of the currently programmed speed. The setting range of 0% to 150% is typical for the Feedrate Override switch; the exact value is application-specific. Refer to Delta Tau's "NC Autopilot" software program (provided with the PMAC-NC32 *for Windows* program) for the appropriate locations to change these upper and lower limits.

Jog Minus (-) Pushbutton

When the Advantage 8xx CNC system is in manual mode, the operator can press the "Jog Minus (–)" pushbutton to drive the currently selected axis in the minus direction ("continuous jog mode"). The actual minus direction is machine dependant; consult your machine setup guide for actual travel direction.

Jog Plus (+) Pushbutton

When the Advantage 8xx CNC system is in manual mode, the operator can press the "Jog Plus (+)" pushbutton to drive the currently selected axis in the plus direction ("continuous jog mode"). The actual plus direction is machine dependent; consult your machine setup guide for actual travel direction.

Machine Zero Pushbutton

When you power up the Advantage 8xx CNC system, all the axes must be home referenced before you can execute either an MDI or Auto mode program. When you press the "Machine Zero" pushbutton, the currently selected axis on the "Axis Select" switch will travel to it's "home" or "referenced position." The speed, direction, and location of each axis home position are machine dependent. See your machine tool builders manual for more details regarding the actual home position of each axis on your machine.

Manual Pulse Generator (Handwheel)

The manual pulse generator is a 100-pulses-per-revolution incremental-distance jog generator, which provides a simplified method of incremental feed. The axis to be moved is determined by the position of the "Axis Select" switch, and the distance that the selected axis is to be moved is determined by which speed multiply switch is active (pressed, either x1, x10, or x100). Typically, the Advantage 8xx CNC system will move the below listed incremental distances, but these can be altered by the machine tool builder:

Speed Multiply Position	Inch Mode	Metric Mode
Low	0.0001 Inch Per Pulse	0.001 Mm Per Pulse
Medium	0.001 Inch Per Pulse	0.01 Mm Per Pulse
High	0.01 Inch Per Pulse	0.1 Mm Per Pulse

MDI (Manual Data Input) Mode Pushbutton

One of the more powerful features of the Advantage 8xx CNC system is the "MDI" (Manual Data Input) Mode. When the MDI pushbutton is pressed on the Advantage 8xx CNC system, an MDI editor screen will appear in the PMAC-NC32 *for Windows* program. The operator can then enter data into the MDI editor screen for execution. Unlike most CNC systems, you can enter hundreds of lines of G code into the MDI editor for execution (up to 32k worth of G code), and the same MDI program can be executed as many times as desired without having to retype the G code.

Notes

Note 1: Before an MDI program can be executed, all machine axes must be home referenced. If the axes are not home referenced and the operator attempts to execute an MDI program by pressing the Cycle Start pushbutton, an error message will appear in the PMAC-NC32 *for Windows* program informing the operator that all the axes must be homed before the MDI program can be executed.

Note 2: The **last line** of any program typed into the MDI editor must be either an M2 or an M30. By providing either an M2 or M30 on the last line of G code in the MDI editor, the operator can then execute the G code in the MDI editor as many times as desired.

Note 3: After typing the desired G code into the MDI editor, the operator must press the "Write To Buffer" button at the bottom of the MDI editor to execute the G code.

Optional Stop Pushbutton

When the Advantage 8xx CNC system is executing a G-code program in either MDI or Auto mode, and the "Optional Stop" pushbutton is pressed, it commands the Advantage 8xx CNC system to stop executing the current G-code program when an M01 (or M1) is encountered in the G-code program. Typical uses for the Optional Stop (M01 or M1) command includes stopping the machine tool when a tool change is required in a G-code program on a machine that does not have a tool changer.

Note

If the G-code program has an M01 (or M1) command entered, and the Optional Stop pushbutton is not pressed, the Advantage 8xx CNC system will ignore the M01 (or M1) command and continue to execute the G-code program without stopping.

Single Block Pushbutton

When the Advantage 8xx CNC system is executing a G-code program in either MDI or Auto mode, and the "Single Block" pushbutton is pressed, it commands the Advantage 8xx CNC system to stop executing the G-

code program after executing the current line of G code. When the Single Block pushbutton is left on, the Advantage 8xx CNC system will execute only one line of G code; then the Cycle Start command will be removed and the machine will go into a Feed Hold condition. The Single Block feature is very helpful when proving out a new program.

Speed Multiply Low (x1) Pushbutton

When the Advantage 8xx CNC system is in manual mode and the "Speed Multiply Low" pushbutton is pressed, the machine either will jog continuously at the slowest programmed rate, or will move the least possible increment as determined by the machine tool builder.

Speed Multiply Medium (x10) Pushbutton

When the Advantage 8xx CNC system is in manual mode and the "Speed Multiply Medium" pushbutton is pressed, the machine either will jog continuously at the medium programmed selected rate, or will move the medium possible increment as determined by the machine tool builder.

Speed Multiply High (x100) Pushbutton

When the Advantage 8xx CNC system is in manual mode and the "Speed Multiply High" pushbutton is pressed, the machine either will jog continuously at the highest programmed selected rate, or will move the greatest possible increment as determined by the machine tool builder.

Spindle Forward Pushbutton

When the Advantage 8xx CNC system is in manual mode and the "Spindle Forward" pushbutton is pressed, the spindle will rotate in a clockwise (CW) manner at the last programmed spindle speed. When the Spindle Forward (CW) is pressed, the spindle will continue to rotate until the Spindle Forward pushbutton is pressed again, which turns off the spindle, or if the Spindle Reverse (CCW) pushbutton is pressed, at which time the spindle will stop rotating clockwise, and reverse direction to rotate the spindle counter-clockwise.

Spindle Override Analog Switch (50 ~ 120%)

The "Spindle Override" analog switch allows the operator to adjust the rotational speed of the spindle while the spindle is rotating. The Spindle Override switch is operational regardless of the currently selected mode as long as the spindle is rotating. The setting range of 50% to 120% is typical for the Spindle Override switch, but the exact value is application-specific. Refer to Delta Tau's "NC Autopilot" software program (provided with the PMAC-NC32 *for Windows* program) for the appropriate locations to change these upper and lower limits.

Spindle Reverse Pushbutton

When the Advantage 8xx CNC system is in manual mode and the "Spindle Forward" pushbutton is pressed, the spindle will rotate in a counter-clockwise (CCW) manner at the last programmed spindle speed. When the Spindle Reverse (CCW) is pressed, the spindle will continue to rotate until the Spindle Reverse pushbutton is pressed again, which turns off the spindle. If the Spindle Forward (CW) pushbutton is pressed, the spindle will stop rotating counter-clockwise, and reverse direction to rotate clockwise.

SOCLB HARDWARE CONFIGURATION

Connections

The following tables detail the standard hardware configuration connections and several optional hardware configuration connections for the SOCLB. The Advantage 8xx SOCLB is a true USB (Universal Serial Bus) "plug and play" I/O device. If you are purchasing an Advantage 8xx CNC system, all the necessary hardware settings will be properly configured.

Power Connection, J28

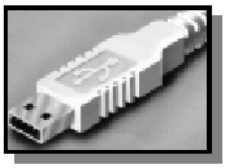
The SOCLB will operate properly with **EITHER** +5vdc (minimum 1 amp current) or +12vdc (minimum .75 amp current) voltage applied at J28, which uses a four-pin Molex connector. Care should be taken to insure that the proper signal is applied to the proper pin on J28. The table below lists the J28 pin number and the proper signal connection.

Pin Number	Connection
Pin 1	+12 vdc
Pin 2	Ground
Pin 3	Ground
Pin 4	+5 vdc

USB Interface Port, J1

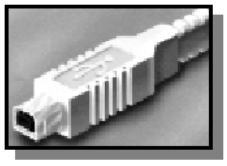
The SOCLB has one (1) USB "B" port connector and three (3) USB "A" port connectors. The current SOCLB only supports the "B" port connector that interfaces to the "A" port of the computer motherboard. Future releases of the SOCLB will include support for the "A" port connectors.

- Series "A" plugs are always oriented **upstream** towards the PC or Hub



- Series "B" plugs are always oriented **downstream** towards the *USB Device*

(To The SOCLB)



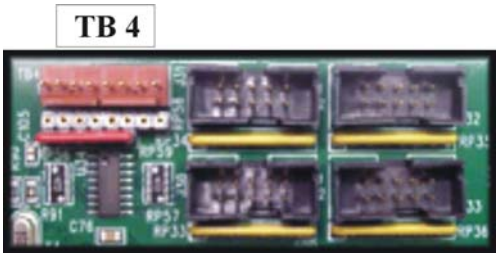
USB Maximum Cable Length

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

There are various USB cables available on the market today. Use only a high quality USB cable (shielded). Using higher quality USB cables, Delta Tau has managed to operate with 10m (30ft) cables without the use of an active extension cable or hub. However, a shorter cable is always a better choice. When distances of greater than 10m (~30 ft.) are required, a product called USB Extend-It can be used for up to 90m (~300 ft.)

Manual Pulse Generator Connector, TB4

The SOCLB can easily interface a 100 pulse-per-revolution manual pulse generator. The following table details the connection for the manual pulse generator. TB4 is the 8- pin connector located on the left side of the following picture.



Connector	Signal
TB 4, Pin 1	Channel A+
TB 4, Pin 2	Channel A-
TB 4, Pin 3	Channel B+
TB 4, Pin 4	Channel B-
TB 4, Pin 5	Ground
TB 4, Pin 6	+5 vdc
TB 4, Pin 7	Ground
TB 4, Pin 8	+5 vdc

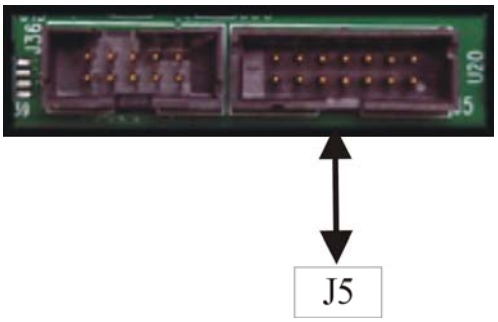
SOCLB E-Point Jumper Configuration

When you are installing or replacing a SOCLB to operate with a new computer system, there are 6 hardware "E-point" jumper settings that must be configured and verified. The table below lists the E-point numbers with their default settings and purpose.

Jumper	Settings	Purpose
E1	Not Present	Reserved For Future Use
E2	Not Present	Reserved For Future Use
E3	Not Present	Install Jumper When SOCLB Is Interfacing With Advantage 600 Operator Switch Panel
E4	Not Present	Reserved For Future Use
E5	Not Present	Reserved For Future Use
E6A ~ E6D	Installed 2-3	USB Hub Circuit Not Present Is Default

J5, Axis Select Switch

The Advantage 8xx CNC system Axis Select switch is a rotary grayscale switch. The following table details the pin configuration for the Axis Select switch.

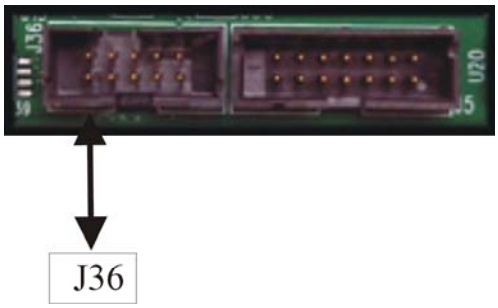


Connector	Signal
Pin 1	Ground
Pin 2	Axis Select 0
Pin 3	Axis Select 1
Pin 4	Axis Select 2
Pin 5	Axis Select 3
Pin 6	Not Used
Pin 7	Reserved For Future Use
Pin 8	Reserved For Future Use
Pin 9	Reserved For Future Use
Pin 10	Reserved For Future Use
Pin 11	Reserved For Future Use
Pin 12	Not Used
Pin 13	+5 vdc
Pin 14	Ground

J36, Feedrate & Spindle Override Analog Switches

The Advantage 8xx CNC system Feedrate and Spindle Override analog switches are interfaced through J36. J36 interfaces with U12, which is a 4 channel, 8- bit resolution, 0 to +5vdc analog-to-digital converter. The following table details the pin configuration for the Feedrate and Spindle Override switches.

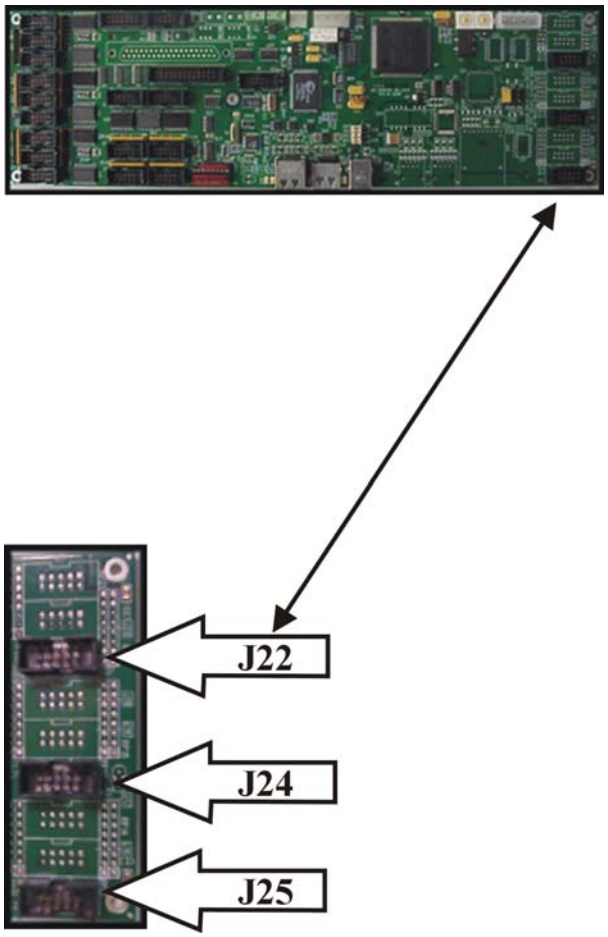
Connector	Signal
Pin 1	Analog Input 1
Pin 2	Analog Input 2
Pin 3	Analog Input 3, Not Used
Pin 4	Analog Input 4, Not Used
Pin 5	+5 vdc
Pin 6	Ground
Pin 7	+5 vdc
Pin 8	Ground
Pin 9	+5 vdc
Pin 10	Ground



J22, J24, J25, Operator Panel Signal Inputs

The following table details the signal connections for the operator panel signal inputs. The standard SOCLB configuration for J22, J24, & J25 does not include indicator lamps for these inputs. Lamps for these inputs can be purchased with SOCLB Option 1. J22 interfaces the Machine Zero, Speed Multiply High, Speed Multiply Medium and Speed Multiply Low pushbuttons. J24 interfaces the Coolant, Block Delete, Optional Stop and Single Block pushbuttons. J25 interfaces the Auto mode, MDI mode, Spindle Reverse (CCW) and Spindle Forward (CW) pushbuttons.

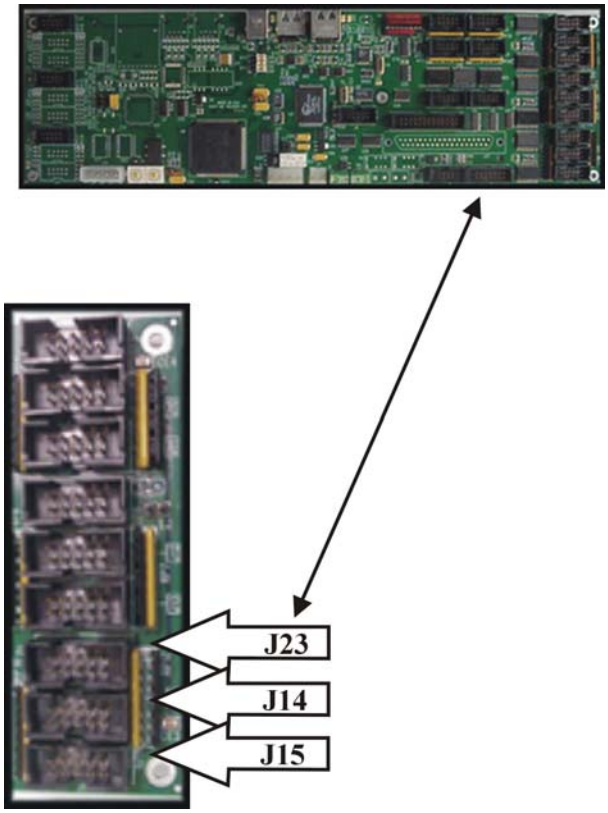
Connector	Signal
J22, Pin 1	Ground
J22, Pin 2	Ground
J22, Pin 3	Machine Zero
J22, Pin 4	Machine Zero
J22, Pin 5	Speed Multiply High Push Button
J22, Pin 6	Speed Multiply High Push Button
J22, Pin 7	Speed Multiply Medium Push Button
J22, Pin 8	Speed Multiply Medium Push Button
J22, Pin 9	Speed Multiply Low Push Button
J22, Pin 10	Speed Multiply Low Push Button
J24, Pin 1	Ground
J24, Pin 2	Ground
J24, Pin 3	Coolant Push Button
J24, Pin 4	Coolant Push Button
J24, Pin 5	Block Delete Push Button
J24, Pin 6	Block Delete Push Button
J24, Pin 7	Optional Stop Push Button
J24, Pin 8	Optional Stop Push Button
J24, Pin 9	Single Block Push Button
J24, Pin 10	Single Block Push Button
J25, Pin 1	Ground
J25, Pin 2	Ground
J25, Pin 3	Auto Mode Push Button
J25, Pin 4	Auto Mode Push Button
J25, Pin 5	MDI Mode Push Button
J25, Pin 6	MDI Mode Push Button
J25, Pin 7	Spindle Reverse (CCW) Push Button
J25, Pin 8	Spindle Reverse (CCW) Push Button
J25, Pin 9	Spindle Forward (CW) Push Button
J25, Pin 10	Spindle Forward (CW) Push Button



J14, J15, J23, Operator Panel Signal Inputs

The following table details the standard signal connections for the operator panel signal inputs and outputs for J14, J15, and J23. J14 interfaces the Cycle Start green output lamp, Jog Plus green output lamp, Jog Minus green output lamp and the Feed Hold green output lamp. J15 interfaces the Cycle Start red output lamp, Jog Plus red output lamp, Jog Minus red output lamp and the Feed Hold red output lamp. J23 interfaces the Cycle Start pushbutton, Jog Plus pushbutton, Jog Minus pushbutton and the Feed Hold pushbutton.

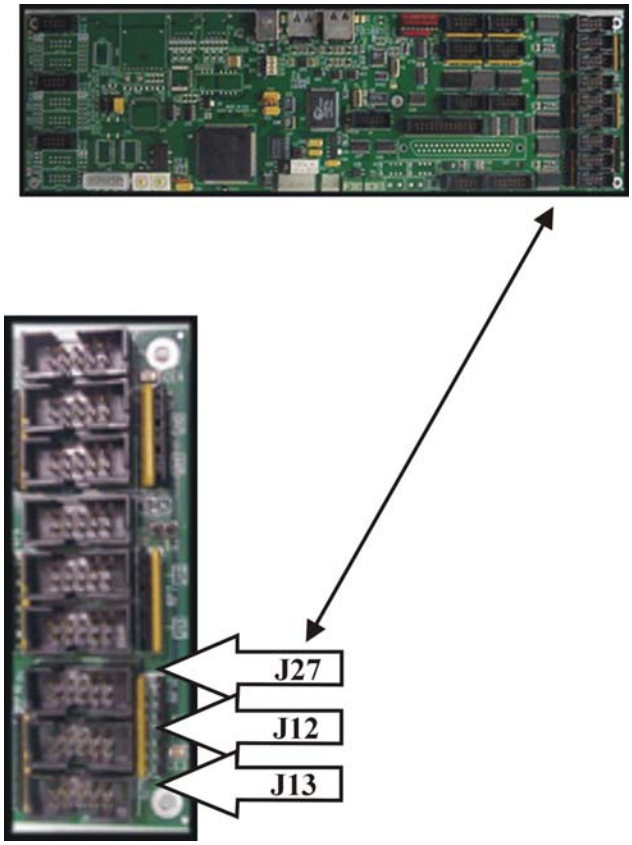
Connector	Signal
J23, Pin 1	Ground
J23, Pin 2	Ground
J23, Pin 3	Cycle Start Push Button
J23, Pin 4	Cycle Start Push Button
J23, Pin 5	Jog Plus Push Button
J23, Pin 6	Jog Plus Push Button
J23, Pin 7	Jog Minus Push Button
J23, Pin 8	Jog Minus Push Button
J23, Pin 9	Feed Hold Push Button
J23, Pin 10	Feed Hold Push Button
J14, Pin 1	+5 vdc
J14, Pin 2	+5 vdc
J14, Pin 3	Cycle Start Green Lamp
J14, Pin 4	Cycle Start Green Lamp
J14, Pin 5	Jog Plus Green Lamp
J14, Pin 6	Jog Plus Green Lamp
J14, Pin 7	Jog Minus Green Lamp
J14, Pin 8	Jog Minus Green Lamp
J14, Pin 9	Feed Hold Green Lamp
J14, Pin 10	Feed Hold Green Lamp
J15, Pin 1	+5 vdc
J15, Pin 2	+5 vdc
J15, Pin 3	Cycle Start Red Lamp
J15, Pin 4	Cycle Start Red Lamp
J15, Pin 5	Jog Plus Red Lamp
J15, Pin 6	Jog Plus Red Lamp
J15, Pin 7	Jog Minus Red Lamp
J15, Pin 8	Jog Minus Red Lamp
J15, Pin 9	Feed Hold Red Lamp
J15, Pin 10	Feed Hold Red Lamp



J12, J13, J27, Operator Panel Signal Inputs

The following table details the standard signal connections for the operator panel signal inputs and outputs for J12, J13, and J27. J12 interfaces the User 8 green output lamp, User 7 green output lamp, User 6 green output lamp and the User 5 lamp. J13 interfaces the User 8 red output lamp, User 7 red output lamp, User 6 red output lamp and the User 5 red output lamp. J27 interfaces the User 8 pushbutton, User 7 pushbutton, User 6 pushbutton and the User 5 pushbutton.

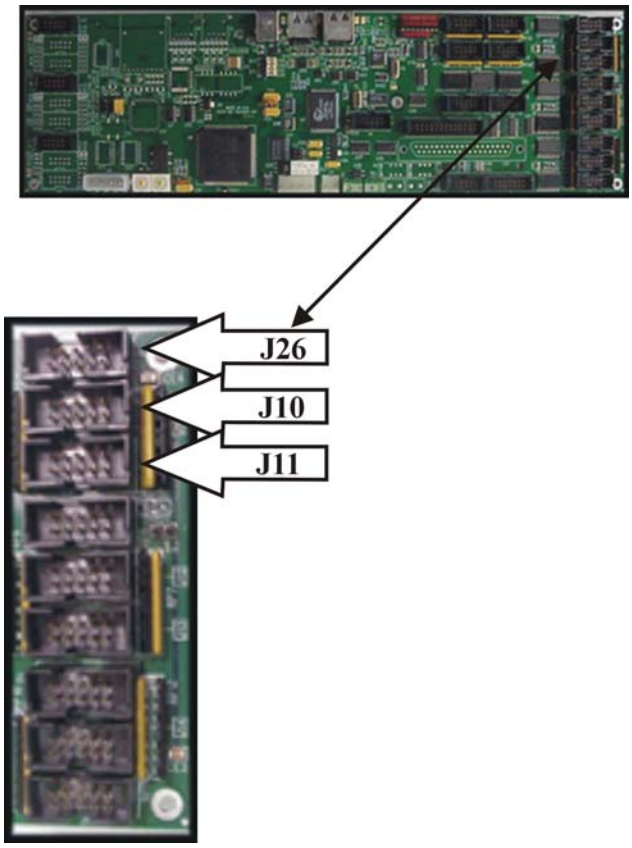
Connector	Signal
J27, Pin 1	Ground
J27, Pin 2	Ground
J27, Pin 3	User 8 Push Button
J27, Pin 4	User 8 Push Button
J27, Pin 5	User 7 Push Button
J27, Pin 6	User 7 Push Button
J27, Pin 7	User 6 Push Button
J27, Pin 8	User 6 Push Button
J27, Pin 9	User 5 Push Button
J27, Pin 10	User 5 Push Button
J12, Pin 1	+5 vdc
J12, Pin 2	+5 vdc
J12, Pin 3	User 8 Green Lamp
J12, Pin 4	User 8 Green Lamp
J12, Pin 5	User 7 Green Lamp
J12, Pin 6	User 7 Green Lamp
J12, Pin 7	User 6 Green Lamp
J12, Pin 8	User 6 Green Lamp
J12, Pin 9	User 5 Green Lamp
J12, Pin 10	User 5 Green Lamp
J13, Pin 1	+5 vdc
J13, Pin 2	+5 vdc
J13, Pin 3	User 8 Red Lamp
J13, Pin 4	User 8 Red Lamp
J13, Pin 5	User 7 Red Lamp
J13, Pin 6	User 7 Red Lamp
J13, Pin 7	User 6 Red Lamp
J13, Pin 8	User 6 Red Lamp
J13, Pin 9	User 5 Red Lamp
J13, Pin 10	User 5 Red Lamp



J10, J11, J26, Operator Panel Signal Inputs

The following table details the standard signal connections for the operator panel signal inputs and outputs for J10, J11, and J26. J10 interfaces the User 4 green output lamp, User 3 green output lamp, User 2 green output lamp and the User 1 green output lamp. J11 interfaces the User 4 red output lamp, User 3 red output lamp, User 2 red output lamp and the User 1 red output lamp. J26 interfaces the User 4 pushbutton, User 3 pushbutton, User 2 pushbutton and the User 1 pushbutton.

Connector	Signal
J26, Pin 1	Ground
J26, Pin 2	Ground
J26, Pin 3	User 4 Push Button
J26, Pin 4	User 4 Push Button
J26, Pin 5	User 3 Push Button
J26, Pin 6	User 3 Push Button
J26, Pin 7	User 2 Push Button
J26, Pin 8	User 2 Push Button
J26, Pin 9	User 1 Push Button
J26, Pin 10	User 1 Push Button
J10, Pin 1	+5 vdc
J10, Pin 2	+5 vdc
J10, Pin 3	User 4 Green Lamp
J10, Pin 4	User 4 Green Lamp
J10, Pin 5	User 3 Green Lamp
J10, Pin 6	User 3 Green Lamp
J10, Pin 7	User 2 Green Lamp
J10, Pin 8	User 2 Green Lamp
J10, Pin 9	User 1 Green Lamp
J10, Pin 10	User 1 Green Lamp
J11, Pin 1	+5 vdc
J11, Pin 2	+5 vdc
J11, Pin 3	User 4 Red Lamp
J11, Pin 4	User 4 Red Lamp
J11, Pin 5	User 3 Red Lamp
J11, Pin 6	User 3 Red Lamp
J11, Pin 7	User 2 Red Lamp
J11, Pin 8	User 2 Red Lamp
J11, Pin 9	User 1 Red Lamp
J11, Pin 10	User 1 Red Lamp



SOCLB SOFTWARE SETUP

Overview

The Advantage 8xx SOCLB is a true USB (Universal Serial Bus) "plug and play" I/O device. If you are purchasing an Advantage 8xx CNC system, all the required software drivers and PLC programs will be installed for proper operation.

Delta Tau has qualified the SOCLB for operation under the Windows '98, Windows '98SE (Second Edition), Windows ME (Millennium Edition), and Windows 2000 operating systems. The SOCLB ***will not*** operate with Windows 3.0 & 3.1, Windows '95, Windows N.T. version 3.51, or Windows N.T. version 4.0 operating systems. None of these operating systems support USB devices properly , and will not allow the SOCLB to operate reliably.

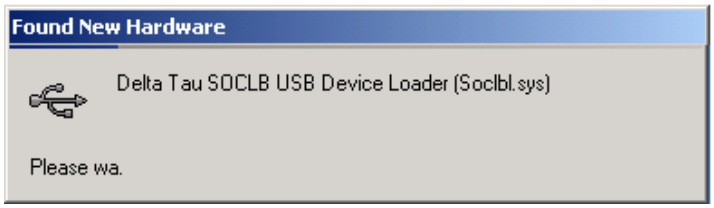
Installing the SOCLB Software Drivers

Four software driver files must be loaded into the Windows operating system for the SOCLB to operate properly. The SOCLB driver files are on the Advantage 8xx CNC system as well as the PMAC-NC32 *for Windows* installation CD-ROM. If for any reason you need to install or reinstall any of these files, the four files and appropriate Windows sub-directories are listed below:

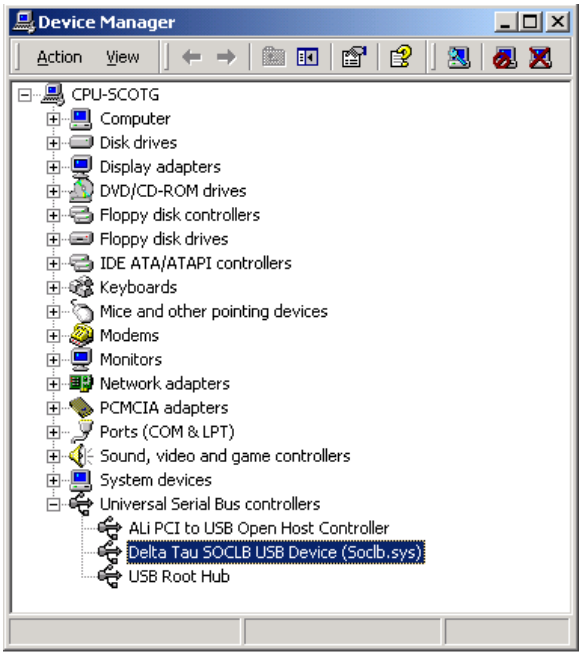
File Name	Windows '98, '98SE, ME	Windows 2000	Comments
SoclbServer.exe	Program Files/Common Files/Delta Tau Shared	Program Files/Common Files/Delta Tau Shared	Constantly copies data from SOCLB to PMAC's Dual Port Ram
Soclb.sys	Windows/System32/Drivers	WINNT/System32/Drivers	Communication device driver for SOCLB
SoclbL.sys	Windows/System32/Drivers	WINNT/System32/Drivers	Firmware loading device driver for SOCLB
Pmacusb.inf	Windows/INF	WINNT/INF	SOCLB device information file

To begin the installation process, apply power to the SOCLB. Plug the "A" port of the USB cable into the PC motherboard, and the "B" port into the SOCLB. Within a few seconds, the screen shown below should appear on your Windows desktop:

The screen shown above will be quickly followed by the next screen shown below:



When the above displayed screens disappear, the necessary device drivers for the SOCLB have been loaded. At this point, you can review the settings from the Windows "Control Panel." You should see "Delta Tau SOCLB USC Device (Soclb.sys)" (highlighted in the picture below) in the "Universal Serial Bus controllers" portion of Device Manager screen.



Installing Advantage 8xx Software Files

First, A VERY Brief CNC History Lesson

A highly misunderstood facet of machine tool control integration is the interaction between the machine servo's (axis motors) and the I/O (inputs and outputs, machine tool front panel and "real world" I/O). G, M, and PLC (or Programmable Logic Controller) programs are really what make a machine tool operate as a machine tool. Without machine execution commands, automatic coolant, lube, tool changers, drawbars, spindle gear changers, etc., all CNC machine tools become manual machines.

Since the advent of computer numerical control in the 1950's, "G" codes (technically called "preparatory commands") and "M" codes (known as "miscellaneous commands") have been the industry standard way of directing a machine tool to execute specific type of machine sequences and functionalities. In the 1960's, a standards committee adapted what we now call "RS-274D" in an attempt to define G codes. Unfortunately,

RS-274D fell short of being strictly adhered to by machine tool builders, and thus a myriad of different types of G and M codes now exist. It didn't get any better when it came to the PLC portion of the CNC.

At its very essence, a PLC controller is a "state controller" machine. Typically, a unique PLC logic program will be written in either "ladder logic" or "structured text" programming for each application requirement. A PLC program will normally reside within the PLC memory, and that logic program determines when a machine condition is sensed (input), then executes the appropriate logic result (output).

Most CNC systems on the market today have their G, M, and PLC codes embedded in firmware (EPROM devices). Most CNC systems have one monolithic PLC program control all the machine tool I/O functionality. These two factors make user modification at best expensive, and many times impossible.

Unlike most machine tool controller systems on the market today, Delta Tau's Advantage CNC systems have incredible flexibility and functionality. The difference is simple and elegant, all the G, M, and PLC codes in all Advantage CNC systems are written in software, not firmware or hardware.

Advantage 8xx CNC systems has been successfully integrated into up to eight axis machining, four axis turning, grinding, punch press, water jet, laser jet, plasma cutting, and wood routing applications.

This high degree of application configurability is achieved because all Advantage CNC systems have a PMAC (be it a UMAC, QMAC, Turbo PMAC, etc.) board as the servo and I/O controller. PMAC is a true multi-tasking controller board, which means that while the PMAC is taking care of motion calculations and execution, it also executes more than one PLC and motion program simultaneously. PMAC has on-board storage for to 32 PLC programs and 32 PLCC (high speed, compiled PLC) programs. PMAC's multi-tasking personality insures the fastest possible response time from a servo activity to I/O being controlled.

The purpose of this literary detour was to highlight that it is the PMAC and its' ability to be programmed via software that makes the Advantage CNC system such a powerful and flexible CNC system. This power and flexibility does come at a price, the price of knowledge. It is the responsibility of the integrator to fully understand the requirements of the machine tool project, and how to program the PMAC and the Advantage CNC system to successfully achieve the desired functionality.

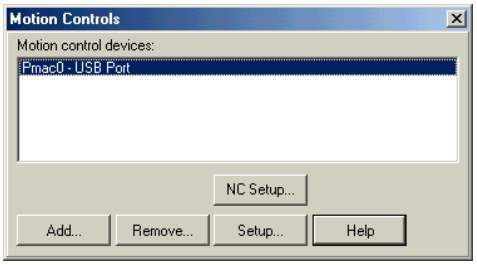
Advantage CNC Software Configuration

There are several system-specific software files that must be downloaded to either the UMAC, PMAC, or QMAC controller board for the SOCLB to operate properly with Delta Tau's Advantage 8xx CNC system. These PLC and PMC (motion program) configuration files contain the logic programs that provide the Advantage 8xx CNC system with it's application-specific functionality.

The integrator must use Delta Tau's "PMAC Executive-32 *for Windows*" program (henceforth referred to as PEWIN32) to download the appropriate configuration files (PLC's and PMC's) to the controller board. PEWIN32 is supplied with the PMAC-NC32 *for Windows* installation CD-ROM, or can be found by clicking on the Windows "Start"/Programs/Delta Tau/PEWIN sub-directory.

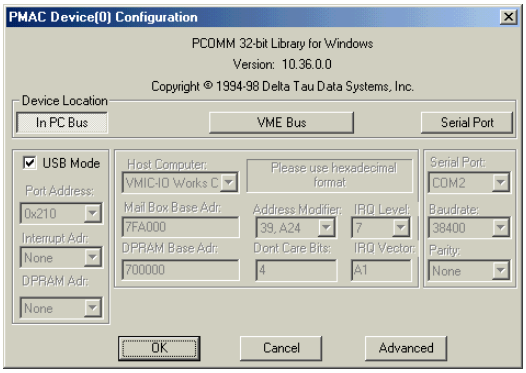
Step 1

Communications must be established between the PMAC and the host PC before any downloading can begin. This is accomplished by running a small Windows based application called "MOTION.EXE". Click on the Windows Start/Programs/Delta Tau/PMAC-NC/Motion.Exe icon as shown below. When you click on the Motion.exe icon, the "Motion Controls" screen appears.



Step 2

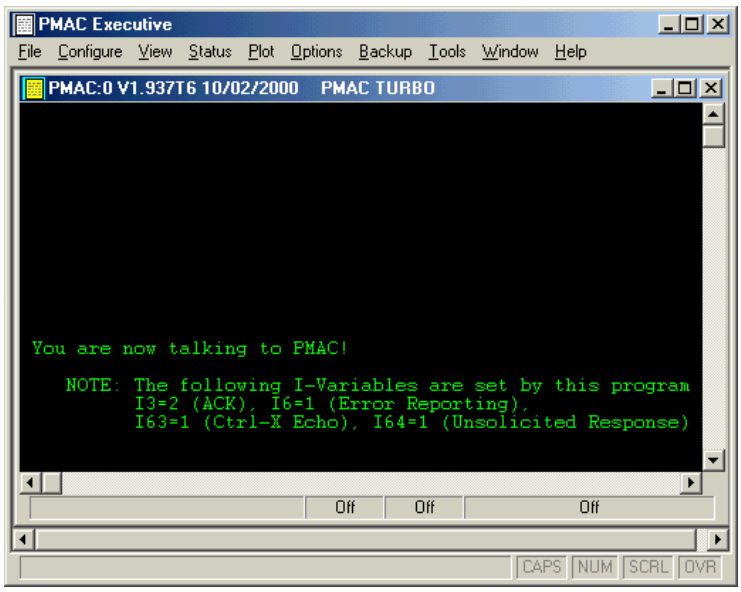
Click on the "Setup" button on the Motion Controls screen (if a PMAC board is not listed, simply click on the "Add" button first, and type a "0" for the device number, then click on "OK"). When you click on Setup, the below displayed screen appears.



Step 3

Make sure the "In PC Bus" button is selected (as shown above). PMAC-NC32 *for Windows* supports only the "In PC Bus" option. Click on the "OK" button, and the below displayed dialog box appears.

You've done it! The PMAC board is now recognized on the PC bus, and you can now communicate with the PMAC. To start communicating with the PMAC board, start the PEWIN32 program. Click on the PEWIN32 from the Windows Start Programs/Delta Tau/PEWIN32 icon. A display closely resembling the one shown below appears.



Important items to note about the PEWIN32 "Terminal" screen start in the title bar portion of the PEWIN32 Terminal. Starting from left to right, the information in the above displayed title bar tells us:

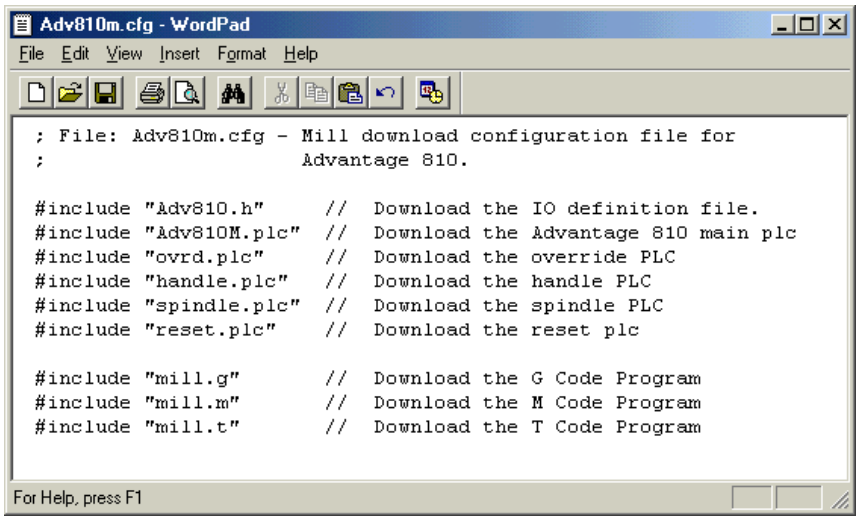
1. We are talking to PMAC: 0 (Device 0).
2. The current firmware revision is 1.937T6 (the "T" stands for test, not for general release).
3. The current firmware revision date is 10/02/2000.
4. We are talking to a "Turbo PMAC."

Configuration Files For The Advantage 810

The following is an example of downloading the basic setup files for an Advantage 810 CNC being interfaced with a milling machine. For basic milling machine operation, the following files must be downloaded to the PMAC board:

ADV810.H
ADV810M.PLC
ADDRESS.H
OEM.H
OVRD.PLC
SPINDLE.PLC
RESET.PLC
MILL.G
MILL.M
MILL.T

That's a lot of files to remember, and we're barely getting started. That's why Delta Tau has the "ADV810.CFG" file. The ADV810.CFG file is an ASCII text-based file that acts as a master download file to the PMAC. There are two basic ADV810.CFG files, one for mills (**ADV810M.CFG**), the other for lathes (**ADV810L.CFG**). The configuration file shown below is for a basic milling application.



As additional functionality is added to the Advantage 810 milling machine, additional PLC programs will be required. Simply add the name of the PLC program to the ADV810M.CFG file. Always remember that to add another PLC file name to either of the ADV810.CFG file, you must follow this format:

EXAMPLE:

#include "NewPLC.plc" // (**DO NOT FORGET** the **#include** or the **"quote"** marks around the PLC name).

Notes About The Configuration (.CFG) Files

Although configuration files are merely ASCII text based files downloaded to the PMAC board, several rules must be strictly followed. They are:

The pound sign (**#**) with the word **include** directly after it must be at the beginning of every file name that will be downloaded.

The file name must be inside quotation marks (example, "NewPLC.plc").

All text to the right of a semicolon (;) is considered a comment.

All text to the right of the double forward slash (//) is considered a comment.

Typical Basic Configuration Files

The table below lists most of the basic files (with some options) that will be required for most Advantage CNC systems.

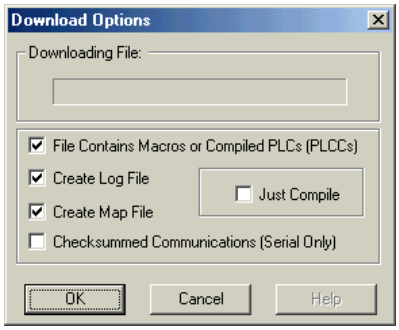
File Name	File Type	File Purpose
ADV810.CFG	Configuration File	Master download file for Advantage 810.
ADV810.H	Header File	M-variable assignments to support standard SOCLB operation.
ADV810M.PLC or ADV810L.PLC	PMAC PLC File, **PLC #1**	Logic for either mill or lathe operator control panel.
ADV810User.H	Header File	M-variable assignments for customer assignable User 1 through User 8 pushbuttons & LED's.
ADDRESS.H	Header File	M-variable assignments for standard PMAC-NC32 PLC programs
OEM.H	Header File	M, P, & Q variable assignments for standard PMAC-NC32 PLC programs.
HANDLE.PLC	PMAC PLC File, **PLC #4**	Interface logic for Manual Pulse Generator controlled through I/O.
OVRD.PLC	PMAC PLC File, **PLC #2**	Control logic for PMAC-NC32 changing time bases without user intervention.
MILL.G **or** LATHE.G	PMAC Motion Program, **PMC #1000**	Operational logic to interpret G code commands to PMAC commands.
MILL.M **or** LATHE.M	PMAC Motion Program, **PMC #1001**	Control logic to interpret M code commands to PMAC commands.
MILL.T or LATHE.T	PMAC Motion Program, **PMC #1002**	Interpreter file for T codes.
SPINDLE.PLC	PMAC PLC File, **PLC #5**	Control logic for open and closed loop spindle systems. Not required in all applications.
RESET.PLC	PMAC PLC File, **PLC #13**	Provides orderly reset sequence between PMAC and host PC
IO810.H	Header File	M-variable assignments & I/O declaration file for UMAC controlled I/O.

Downloading The Configuration File

Once you've included all the PLC and PMC (G, M & T code files) programs required for your application in your configuration file, you're ready to download these files to the PMAC board. To download the configuration file:

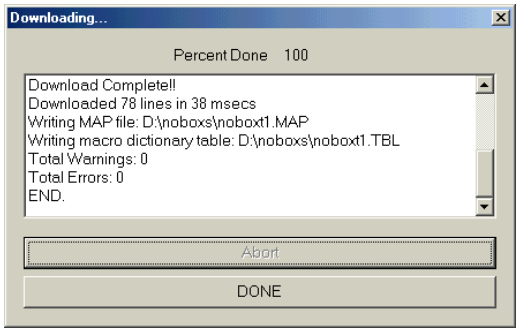
1. Start the PEWIN32 program.
2. Go to the menu bar and select "File," "Download File". A "Download File" dialog box will appear.
3. Select the Adv810.cfg (or appropriate configuration file) from the sub-directory that contains the configuration file.
4. Press the "Open" button.

A "Download Options" dialog box appears as shown below.



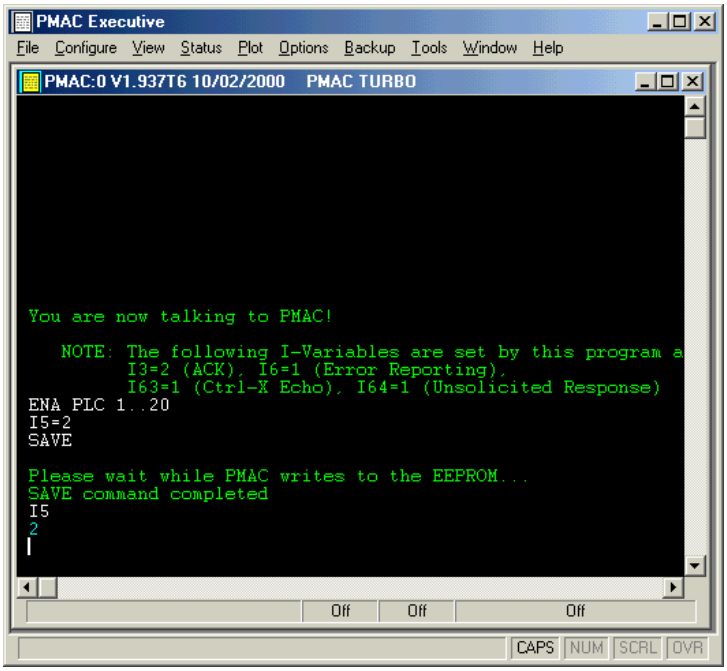
Make sure the "File Contains Macros or Compiled PLCs (PLCCs)" checkbox is checked as shown above. It is very useful to have the "Create Log File" and "Create Map File" checkboxes checked as well. These options create .LOG and .MAP files after the download is completed. These files are ASCII text based files (that can be opened in either Notepad or WordPad) containing the actual code that was downloaded to the PMAC board, and can be helpful for troubleshooting any PLC or PMC coding problems encountered during the download. After you have set the Download Options, press the "OK" button to begin the actual download process.

A "Downloading…" dialog box appears as shown below:



After the downloading is complete, verify that there were no errors during the download. To verify this, check the "Total Warnings" (should be 0) and "Total Errors (should be 0) at the bottom of the Downloading dialog box. Click on the "Done" button, and you will be returned to the PEWIN32 terminal.

Remember To Enable & Save!



To enable the PLCs, type "I5=2" and press [ENTER] in the PEWIN32 terminal window, then type SAVE and press [ENTER] in the PEWIN32 terminal window. Your new configuration is now saved on the PMAC board.

Note

If this step is forgotten, your work in downloading the configuration file will be lost upon exiting the program.

Check Out Our Examples

Most machine tool applications will require more than the basic PLC files that have been discussed. It is the responsibility of the integrator or programmer to create all additional PLC files that the machine will require (i.e. coolant, lube, emergency stop, drawbar, etc.). In many cases, Delta Tau has already written an example PLC for the specific required functionality. These example programs typically require only minor modification, versus having to write a new PLC from scratch. These example PLC programs can be found in the "Program Files/Delta Tau/NC 3.xx/Examples" sub-directory.

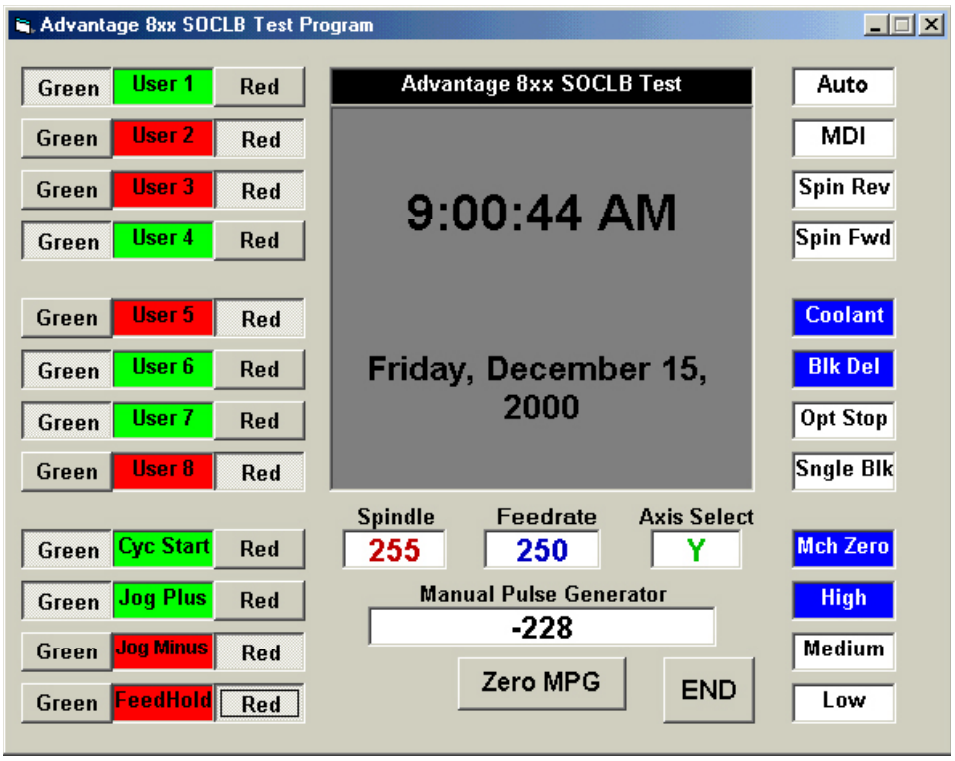
Some of the PLCs that can be found in the Examples sub-directory are listed below.

PLC or PMC Name	PLC Functionality
Brake.plc	Logic for controlling a brake that is attached to a servo motor.
Coolant.plc	Logic for different types of coolant control.
Collet.plc	Logic for drawbar control.
Error.plc	Logic for user assignable error messages.
Estop.plc	Logic for Emergency Stop condition handling.
EstopNew.plc	Logic for Emergency Stop condition with newer PC motherboards.
Gear.plc	Logic for spindle gear changing control.
Home.plc	Logic for homing axes on a machine that is using overtravel switches as home switches.
Initialize.plc	Logic for establishing machine I/O conditions during power up sequence.
Lube.plc	Logic for controlling automatic machine lubrication system. Excellent example of using "Timer On" & "Timer Off" logic.
Model.plc	Logic for integrating user customized PLC's and PMAC "Reset" state.
PartsCtr.plc	Logic for turning on outputs when the "Parts Counter" equals "Parts Required"
Tool.pmc	Motion program for "Carousel" type tool changers.
Turret.plc	Logic for automatic bi-directional lathe tool changer.
Watchdog.plc	Logic for orderly NC shutdown handling due to PMAC "Watchdog" failure

SOCLB810.EXE Test Program

Delta Tau has developed the "SOCLB810.EXE" diagnostic test program to assist the machine tool builder, maintenance personnel, and/or machine operator to test and verify the operational integrity of the SOCLB and the Advantage 8xx CNC machine tool front panel I/O.

The SOCLB810.EXE program is an easy-to-use diagnostic program that it is not dependant on having a PMAC, UMAC, or QMAC controller present to test the Advantage 8xx SOCLB.



Starting The SOCLB810.EXE Program

The SOCLB810.exe program is a Visual Basic program that has been qualified with Windows 98, Windows '98SE, Windows ME, and Windows 2000 operating systems. The SOCLB810 program consists of three files: SOCLB810.exe, SOCLB32.dll, and MSVBVM60.dll.

When you install the PMAC-NC32 *for Windows* program, the SOCLB810.EXE program will be installed automatically. To start the SOCLB810.exe program, double click on the SOCLB810.exe icon on either the Windows desktop, or select the file from the Windows "Start"/Programs/Delta Tau sub-directory. When the SOCLB810 application begins, the program will display the above shown user interface.

Operating The SOCLB810.EXE Program

Before using the SOCLB810.exe program, make sure the Emergency Stop pushbutton is pressed (active). This insures that no machine action will take place while testing the Advantage 810. The SOCLB810 program allows the operator or maintenance technician to test each feature of the Advantage 810.

The SOCLB810.exe program tests the 12 pushbuttons that have LEDs associated with them. They are: User 1 through User 8, Cycle Start, Jog Plus, Jog Minus, and Feed Hold pushbuttons. When you press any of these buttons on the Advantage 810, they alternately blink green & red on the Advantage 810 and the SOCLB810 program. When you release the pushbutton being tested, the button being tested LED will turn off on both the Advantage 810 and the SOCLB810 program.

The SOCLB810.exe program also tests the 12 pushbutton that do not have LEDs associated with them. These buttons are: Auto, MDI, Spindle Forward, Spindle Reverse, Coolant, Block Delete, Optional Stop, Single Block, Machine Zero, Speed Multiply High, Speed Multiply Medium, and Speed Multiply Low. When you press any of these buttons on the Advantage 810, the button background turns blue, and the button title turns white. When you release the pushbutton, the screen displays the white background and black text associated with that pushbutton.

The Spindle and Feedrate Override box displays a value from 0 (all the way off) to 255 (all the way on). The Axis Select box will display X, Y, Z, A, B, C, U, V, W, 1, 2, 3, 4, 5, 6, 7 IN THIS ORDER. If you do not read the Axis Select box in this order, then there is a wiring problem with the Axis Select rotary switch.

The Manual Pulse Generator box will display either a positive number (rotating CW) or negative number (rotating CCW) depending on which way you rotate the MPG. When you first start the SOCLB810 program, the value displayed in the Manual Pulse Generator box may be any value. Press the "Zero MPG" button on the SOCLB810 program to set the currently displayed value to 0. Rotate the MPG to verify that the proper amount of counts are being displayed. You should read 100 counts for every full revolution of the Manual Pulse Generator.

APPENDIX

ADV810.H File

The following table details the M-variable assignments and memory addresses for the Adv810.h file. Many of the macros in the Adv810.H file are "Constant Definitions." These constant definitions issue commands directly between the PMAC and the PMAC-NC32 *for Windows* program, so they do not have a variable assignment or address.

Macro Name	Default Value / Address	Assignment	Comment
JOG_X_PLUS	CMD"#1j+"		
JOG_Y_PLUS	CMD"#2j+"		
JOG_Z_PLUS	CMD"#3j+"		
JOG_C_PLUS	CMD"#5j+"		
JOG_A_PLUS	CMD"#6j+"		
JOG_X_MINUS	CMD"#1j-"		
JOG_Y_MINUS	CMD"#2j-"		
JOG_Z_MINUS	CMD"#3j-"		
JOG_C_MINUS	CMD"#5j-"		
JOG_A_MINUS	CMD"#6j-"		
JOG_STOP_ALL	CMD"#1j/ #2j/ 3j/"		
RUN_HOME_PROG	CMD"&1 B3 R"		
JOG_X_HOME	CMD"#1HM"		
JOG_Y_HOME	CMD"#2HM"		
JOG_Z_HOME	CMD"#3HM"		
JOG_C_HOME	CMD"#5HM"		
JOG_A_HOME	CMD"#6HM"		
JOG_X_INCR	CMD"#1j=*"		
JOG_Y_INCR	CMD"#2j=*"		
JOG_Z_INCR	CMD"#3j=*"		
JOG_C_INCR	CMD"#5j=*"		
JOG_A_INCR	CMD"#6j=*"		
JOG_X_SPEED_I	I122		
JOG_Y_SPEED_I	I222		
JOG_Z_SPEED_I	I322		
JOG_X_LOW	10		X axis low jog speed in counts per millisecond
JOG_Y_LOW	10		Y axis low jog speed in counts per millisecond
JOG_Z_LOW	10		Z Axis low jog speed in counts per millisecond
JOG_X_MED	50		X axis medium jog speed in counts per millisecond
JOG_Y_MED	50		Y axis medium jog speed in counts per millisecond

Macro Name	Default Value / Address	Assignment	Comment
JOG_Z_MED	50		Z axis medium jog speed in counts per millisecond
JOG_X_HIGH	100		X axis high jog speed in counts per millisecond
JOG_Y_HIGH	100		Y axis high jog speed in counts per millisecond
JOG_Z_HIGH	100		Z axis high jog speed in counts per millisecond
HOME_MODE	0		
HOME_X_MTR	$1		Mask indicating X axis to home
HOME_Y_MTR	$2		Mask indicating Y axis to home
HOME_Z_MTR	$4		Mask indicating Z axis to home
HOME_C_MTR	$10		Mask indicating C axis to home
HOME_A_MTR	$20		Mask indicating A axis to home
FOVRD_RANGE	100		Max feedrate override when using Pot ONLY
FOVRD_INCR	12.5		Feedrate Override increment % BCD ONLY
FOVRD_MIN	0		Minimum feedrate override percentage
MAX_RPD_OVR	100		Maximum feedrate override percentage
SOVRD_RANGE	60		Spindle speed override percent range, ANALOG ONLY
SOVRD_INCR	5		Spindle speed override increment % BCD ONLY
SOVRD_MIN	50		Minimum spindle speed override percentage
AXIS_X_MASK	$0		
AXIS_Y_MASK	$8		
AXIS_Z_MASK	$a		
AXIS_A_MASK	$2		
AXIS_B_MASK	$6		
AXIS_C_MASK	$e		
AXIS_U_MASK	$f		
AXIS_V_MASK	$7		
AXIS_W_MASK	$3		
DISPLAY_INCREMENT	5		
MTRHOME_ERR	$80000000		User error bit set if attempt to run program without homing
PB_HOME_M	Y:$6CFD0,3,1	M475	
PB_JOG_PLUS_M	Y:$6CFD0,6,1	M476	

Macro Name	Default Value / Address	Assignment	Comment
PB_JOG_MINUS_M	Y:$6CFD0,5,1	M477	
PB_CLNT_M	Y:$6CFD0,11,1	M478	
PB_AUTO_M	Y:$6CFD0,15,1	M479	
PB_MDI_M	Y:$6CFD0,14,1	M480	
PB_SPND_CW_M	Y:$6CFD0,12,1	M481	
PB_SPND_CCW_M	Y:$6CFD0,13,1	M482	
PB_SINGLE_BLOCK_M	Y:$6CFD0,8,1	M483	
PB_BLOCK_DELETE_M	Y:$6CFD0,10,1	M484	
PB_OPT_STOP_M	Y:$6CFD0,9,1	M485	
PB_CYCLE_START_M	Y:$6CFD0,7,1	M486	
PB_FEED_HOLD_M	Y:$6CFD0,4,1	M487	
HANDLE_COUNTUSB_M	DP:$6CFD3	M488	
SS_AXISD_M	X:$6CFD0,8,4	M489	
SS_SPMLTD_M	Y:$6CFD0,0,4	M490	
ADC0_M	Y:$6CFD4,0,8	M491	
ADC1_ADR	Y:$6CFD4,8,8	M492	
LT_CYCLE_START_M	X:$6CFD8,0,1	M493	
LT_FEED_HOLD_M	X:$6CFD8,7,1	M494	
CYCLE_START_FLAG		P475	
FEED_HOLD_FLAG		P476	
JOG_PLUS_FLAG		P477	
JOG_MINUS_FLAG		P478	
HOME_MODE_P		P479	
ADC0_P		P480	
ADC1_P		P481	
ADC2_P		P482	
ADC3_P		P483	
ADC4_P		P484	
LIMIT_FLAG		P485	
CALC_TMP		P486	
LAST_HANDLE_COUNT_P		P487	
SINGLE_BLOCK_FLAG		P488	
BLOCK_DEL_FLAG		P489	
OPT_STOP_FLAG		P490	
SS_SSOVRD_P		P491	
SS_FOVRDD_P		P492	
SPND_CCW_FLAG		P493	
SPND_CW_FLAG		P494	
HOMING_ACTIVE_FLAG		P495	
COOLANT_PB_FLAG		P498	
MONITOR_ON_OFF_DELAY		P499	

ADV810User.H File

The following table details the M-variable assignments and memory address assignments for the Adv810User.h file. This file allows the integrator to add specific application functionality using the eight user-customizable pushbuttons (with associated green and red indicating LEDs).

Macro Name	Default Value / Address	Assignment	Comment
PB_USER_1_M	X:$6CFD0,3,1	M541	
PB_USER_2_M	X:$6CFD0,2,1	M542	
PB_USER_3_M	X:$6CFD0,1,1	M543	
PB_USER_4_M	X:$6CFD0,0,1	M544	
PB_USER_5_M	X:$6CFD0,7,1	M545	
PB_USER_6_M	X:$6CFD0,6,1	M546	
PB_USER_7_M	X:$6CFD0,5,1	M547	
PB_USER_8_M	X:$6CFD0,4,1	M548	
LT_USERGREEN_1_M	Y:$6CFD8,0,1	M551	
LT_USERGREEN_2_M	Y:$6CFD8,1,1	M552	
LT_USERGREEN_3_M	Y:$6CFD8,2,1	M553	
LT_USERGREEN_4_M	Y:$6CFD8,3,1	M554	
LT_USERGREEN_5_M	Y:$6CFD8,8,1	M555	
LT_USERGREEN_6_M	Y:$6CFD8,9,1	M556	
LT_USERGREEN_7_M	Y:$6CFD8,10,1	M557	
LT_USERGREEN_8_M	Y:$6CFD8,11,1	M558	
LT_USERRED_1_M	Y:$6CFD8,4,1	M561	
LT_USERRED_2_M	Y:$6CFD8,5,1	M562	
LT_USERRED_3_M	Y:$6CFD8,6,1	M563	
LT_USERRED_4_M	Y:$6CFD8,7,1	M564	
LT_USERRED_5_M	Y:$6CFD8,12,1	M565	
LT_USERRED_6_M	Y:$6CFD8,13,1	M566	
LT_USERRED_7_M	Y:$6CFD8,14,1	M567	
LT_USERRED_8_M	Y:$6CFD8,15,1	M568	