USER MANUAL

# ADVANTAGE 600
# Operator Control Logic Board

Operator Control Logic Board

3Ax-602784-xUxx

March 2, 2005

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

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**Delta Tau Data Systems, Inc. Technical Support**
Phone: (818) 717-5656
Fax: (818) 998-7807
Email: support@deltatau.com
Website: http://www.deltatau.com

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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 directly exposed to hazardous or conductive materials and/or environments, we cannot guarantee their operation.

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# INTRODUCTION

The Advantage 600 Series controller systems represent the latest in Delta Tau's extensive research and development efforts in bringing high-performance, open architecture, PC based CNC systems to the machine tool industry.

The Advantage 600 Series CNC controllers were designed to simplify the integration of machine tools, provide extraordinary material processing performance, while simultaneously giving the systems integrator the flexibility of an open architecture system.

The systems integrator should use this manual in conjunction with the PMAC NC for Windows Integration manuals.

## The Advantage 600 Operator Control Panel

The rugged Advantage 600 control panel incorporates Delta Tau's OCLB (Operator Control Logic Board). The OCLB I/O logic interface board was specifically designed for use with the Advantage 600 CNC system and mounts directly behind the control panel inside the Advantage 600 operator's cabinet.

The Advantage 600 Control Panel/OCLB combination provide the following standard features:

| | |
|---|---|
| Machine On / Off | 1 NO. Contact, 1 NC Contact |
| Emergency Stop | 1 NO. Contact, 1 NC Contact |
| Single Block | SPST switch one input |
| Block Delete | SPST switch one input |
| Optional Stop | SPST switch one input |
| Coolant On / Auto / Off | SPDT switch two inputs |
| Speed Multiply (X1, X10, X100) | SPDT switch two inputs |
| Jog + | Make pushbutton one inputs |
| Jog - | Make pushbutton one inputs |
| Cycle Start | Make pushbutton one inputs |
| Feed Hold | Make pushbutton one inputs |
| Spindle Direction CW | Make pushbutton one inputs |
| Spindle Direction CCW | Make pushbutton one inputs |
| Spindle Override | 13 position 4 input BCD switch |
| Feedrate Override | 13 position 4 input BCD switch |
| Axis Select | 8 position 4 input BCD switch (X, Y, Z, A, B, C, U, V) |
| Mode Select Switch | 5 position 4 input BCD switch (MDI, Auto, Manual Continuous, Increment / Handle, Home) |
| Handwheel | 100 Pulses per Revolution Manual Pulse Generator |

The OCLB features an additional user configurable 24 inputs/24 outputs standard. The 48 lines of I/O can interface with commercial type Opto-22 module PB24 standard motherboards via the two 50-pin IDC headers provided. Users also have the option and are encouraged to purchase Delta Tau's 48 Opto I/O Expansion PCBA, see below.

The Advantage 600 control panel features a 100 PPR (Pulses Per Revolution) Manual Pulse Generator standard. The OCLB incorporates all the necessary hardware for not only the panel mounted handwheel, but the optional Delta Tau Remote Handwheel pendant as well.

The OCLB features four on-board status indicator LEDs which can be helpful for troubleshooting. They are:

| Label | Color | Comment |
|---|---|---|
| A+24V | Red | When on, indicates +24VDC is present at TB2 |
| WDO | Red | When on, indicates watch dog failure |
| A+5V | Yellow | When on, indicates A+5VDC is being supplied for the OPTO circuits |
| PMAC+5V | Green | When on, indicates +5 VDC present from PMAC |

## Advantage 600 24 Input/24 Output Opto I/O Expansion PCBA

(Part No. 602868-100)

This expansion card plugs directly into the OCLB and provides 48 lines of optically isolated I/O with convenient Phoenix style plug-in terminal connectors. This configuration is suited especially for customizing user I/O switches and buttons, but can be used for other I/O applications. The I/O expansion card is easily configurable for either sinking or sourcing inputs/outputs via jumper settings and socketed IC replacement. The I/O ICs are rated to 24V and 100mA. The I/O expansion card also provides the user with green/red status LEDs which inform the user whether the particular I/O point is sinking or sourcing.

## Advantage 600 Control Panel Analog Input Option Upgrade – Option 1

16 Inputs/24 Outputs/8 Analog Inputs (300-602784-OPT)

The OCLB – Option 1 on board A/D converter provides eight channels of 8-bit analog input. These inputs are ideally suited for incorporating Feedrate/Spindle override potentiometers, but can also be used for other miscellaneous analog input. When the Advantage 600 is ordered with the OCLB - Option 1, both the hardware and software required to integrate user supplied external feedrate/spindle override inputs is included. Note: When the OCLB is ordered with Option 1, the number of general-purpose inputs is reduced from 24 to 16.

## Advantage 600 Remote/Local Operation Accessory – Acc-35A

Differential Line Driver (3A1-602344-10X)

Installations of CNC systems requiring the PC to be more than ten feet from the Control Panel hardware require the use of PMAC's Accessory 35A (Acc-35A). The Acc-35A is a differential line driver which provides the required signal transmission strength for extended cable lengths between PMAC and the OCLB. Note: Acc-35B has been integrated into the Advantage 600 OCLB and does not need to be purchased separately.

## Advantage 600 Remote Handwheel Box – Acc-NC1

(3C2-000CNC-OPT)

Users wishing to incorporate a remote handwheel can purchase Acc-NC1 directly from Delta Tau. The Acc-NC1 includes a 100 PPR (Pulses Per Revolution) Manual Pulse Generator, axis select, feedrate override, E-stop button, and remote enable switch. The remote handwheel option plugs directly into port J6 on the OCLB and requires no additional configuration.

# OPERATOR CONTROL PANEL FUNCTIONS

**Cycle Start Pushbutton**
Whenever in Auto or MDI mode if the motors have been homed and the system is not currently running a program and the system is in-position, either a run or step command is issued to the PMAC. If the system has been placed into single step mode via the single step toggle input a step command is sent other wise a run command is sent to the PMAC.

**Cycle Start Lamp**
Whenever in Auto or MDI and the PMAC is in the process of a single step or running this lamp is illuminated. Even if feed override is at 0%, this lamp will be illuminated. If the system is not in Auto or MDI mode, this lamp will be off.

**Feed Hold Pushbutton**
Whenever the feedhold pushbutton is pressed, a feed hold is issued to the PMAC.

**Cycle Start Lamp**
Whenever in Auto or MDI and the PMAC is in not in the process of a single step or running this lamp is illuminated. If the system is not in Auto or MDI mode, this lamp will be off.

**Jog Plus and Jog Minus Pushbuttons**
When this pushbutton is pressed and the system is in continuous mode, the system will jog the currently selected axis at the currently selected speed until the pushbutton is released. If the system is in handle/incremental mode, the system will jog the selected axis the selected increment amount until the destination increment is reached. If the pushbutton is released before the desired increment is released the selected axis jog motion will halt. Hence, hold the push button in until the desired increment is reached. If in home mode, the system will home the selected axis when the push button is pressed.

**Spindle CCW and Spindle CW Pushbuttons**
When pressed the system will command the spindle to rotate at the last programmed spindle speed. The spindle is then stopped whenever either the CCW or CW spindle pushbutton is pressed.

**Feedrate Override BCD Switch**
The feedrate override switch overrides the current feedrate while in AUTO or MDI mode when running a program. Whenever in rapid mode (G0) it is not possible to override the system over 100%. In modes other than AUTO or MDI, this switch has no effect.

**Spindle Override BCD Switch**
The spindle override switch overrides the current programmed spindle speed.

**Axis Select BCD Switch**
Determines which axis will be jogged or homed by the Jog Plus and Jog Minus push buttons.

**Mode Select BCD Switch**
Places PMAC NC into the selected mode: Auto MDI, Manual continuous jog, Manual home jog or Manual incremental/handwheel jog.

**Single Block SPST Switch**
Place PMAC NC into Single Block Mode. When in this mode PMAC NC will perform at most one G-Code line per press of the cycle start push button.

**Block Delete SPST Switch**
Places PMAC NC into Block Delete Mode.

**Optional Stop SPST switch**
Places PMAC NC into Optional Stop Mode.

**Coolant SPDT switch**
Sets bits for use with the example PLC cool600.plc included with PMAC NC.

**Axis Speed Select SPDT switch**
Determines the increment for handwheel and incremental jogging and the speed for continuous jogging.

# ADVANTAGE 600 CONTROL PANEL SETUP

The following steps are necessary to set up your Advantage 600 system control panel and OCLB:

- JTHW multiplexer port address configuration
- Operator Control Logic Board E-point jumper configuration
- Connection of cables and +24VDC to the OCLB
- Software configuration

Detailed explanation of the OCLB functionality and stand-alone setup for users not using the Advantage 600 series controller systems will be discussed later in this document.

***Note:***

If purchasing a complete Advantage 600 NC system, some or the entire preliminary configuration will have been completed already.

## Step 1 - JTHW Addressing

PMAC communicates with the OCLB via it is J3 (JTHW) multiplexer port. If using the Delta Tau PMAC NC for Windows software, the OCLB must be addressed as the first multiplexed I/O board. This is done by configuring the dip switches for SW3 as follows:

| Board # | SW3-5 | SW3-4 | SW3-3 | SW3-2 | SW3-1 |
|---|---|---|---|---|---|
| 1 | ON | ON | ON | ON | ON |

## Step 2 – Operator Control Logic Board E-point Configuration

The OCLB has a total of 24 configurable E-point jumpers. The table below describes the function of each jumper and gives the default setting. A standard Advantage 600 CNC controller system will use the default settings. It is advisable for any integrator to verify that the E-points are configured properly before any new installation.

| Jumper | Configuration | Default |
|---|---|---|
| E1 | (Not installed) disables OCLB watchdog circuit when installed | Not installed |
| E2 | Installing disables on-board Acc-35B | Installed |
| E3* | Allows 5V logic on the board to be supplied from the 24v power supply | Installed |
| E4* | Allows the 24V at TB2 to power the rotary switches | Installed |
| E5* | Allows the ground at TB2 to power the rotary switches | Installed |
| E6* | Allow ground from +24Vdc to be shared with the OPTO-22 portion of board | Installed 1-2 |
| E7* | Allow ground from +24Vdc to be shared with rotary switches | Installed 1-2 |
| E8* | Allow ground from +24Vdc to be shared with lights | Installed 1-2 |
| E9A - E9H | When installed, allows you to have 24 inputs instead of 16 inputs (each extra input point used must be jumped, only install if option 1 is not present, otherwise, all jumpers to remain off. | Installed |
| E10* | Set at 1-2 if analog input option, is not present<br>Set at 2-3 if analog input option, is present | Optional<br>(Board specific) |
| E11* | Set at 1-2 if analog option 1 is not present<br>Set at 2-3 if analog option 1 is present | Optional<br>(Board specific) |
| E12* | Factory diagnostic jumpers, Never Change | Installed 1-2 |
| E13* | Factory diagnostic jumpers, Never Change | Installed 1-2 |
| E14 | Attach J3 D-sub shell to ground | Not installed |
| E15 | Attach P1 D-sub shell to ground | Not installed |
| E16 | Attach J2 D-sub shell to ground | Not installed |
| E17 | Attach J6 D-sub shell to ground | Not installed |
| * Indicates jumper must be installed for OCLB to operate | | |

## Step 3 – Connection of Cables to the OCLB

The minimum configuration of the Advantage 600 control panel requires four connections to the OCLB.

- J1A - To PMAC's J3 (JTHW) multiplexer port
- J2 - Connects to control panel DB-37 connector or custom user panel I/O
- TB4 - Connects to control panel manual pulse generator
- TB2 - User supplied +24VDC

Refer to cable schematic in this manual. Detailed descriptions of these connectors are provided at the end of this manual.

## Step 4 – Software Configuration

The Advantage 600 NC systems require several PLC and H (header files) files to operate. These files should be downloaded through the PMAC Executive Software to the PMAC. The PLC files contain the programmable logic control which reads and implements the functions of the user control panel I/O through the OCLB. The H files contain PMAC I/O memory addresses, PLC code variable definitions, and various other definitions which allow the control panel and the OCLB to communicate with the PMAC NC for Windows software.

### Configuring a PMAC NC Mill 32-bit Application:

From the directory C:\Program Files\Delta Tau\NC 2.xx\Mill\, download the file ADV600M.CFG to the PMAC. This configuration file will include all the necessary PLC and H files required by the OCLB and the PMAC NC for Windows software. If configuring a PMAC NC Mill 16-bit application, the file will be located in C:\Programf\Deltatau\Nc1.xx\Mill\.

### Configuring a PMAC NC Lathe 32-bit Application:

From the directory C:\Program Files\Delta Tau\NC 2.xx\Lathe\, download the file ADV600L.CFG to the PMAC. This configuration file will include all the necessary PLC and H files required by the OCLB and the PMAC NC for Windows software. If configuring a PMAC NC Lathe 16-bit application, the file will be located in C:\Programf\Deltatau\Nc1.xx\Lathe\.

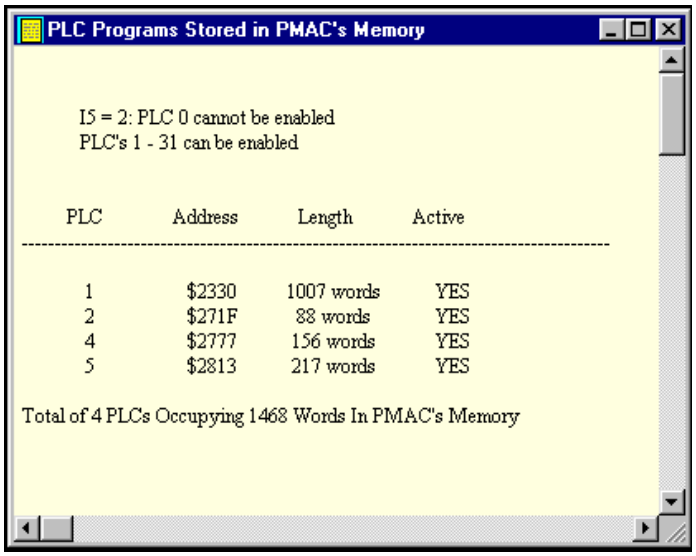
These configuration files will download the following files to PMAC automatically:

**ADV600M.PLC** or **ADV600L.PLC** – Allows use of the operator control panel.
**HANDLE.PLC** – Allows use of the manual pulse generator
**ADV600.H** – Header file with M-variable declarations to support the OCLB.
**ADDRESS.H** – Header file containing definitions used by PMAC and host.
**OEM.H** – Header file definitions used by PMAC.
**OEMM.H** – Header file definitions used by PMAC.

If intending to use the general-purpose 48 lines of I/O or an Acc-34 family I/O board, the file **IO600.H** will need to be downloaded as well.

Once these files have been downloaded, set PMAC I-variable *I5=2* and issue a save command to insure your configuration will be retained through a power down/up. Check the PLC status by selecting the **PLC Program Information** button from the Status menu in the PMAC Executive.

If the software configuration was successful, a window with the following information displays:




Before the PMAC NC for Windows software can be started, complete the setup with some application specific details.

If configuring a PMAC NC 32-bit application, open the Motion Control PMAC NC Setup applet located in the PMAC NC start menu programs. Follow the directions in the PMAC NC manual for details.

If configuring a PMAC NC 16-bit application, find the file MILL.CNC or LATHE.CNC file in the C:\Programf\Deltatau\Nc1.xx\Mill\ or C:\Programf\Deltatau\Nc1.xx\ Lathe\ and modify in a text editor as explained in the PMAC NC manual.

# ADVANTAGE 600 CONTROL PANEL ANALOG INPUT OPTION – 1 SETUP

The A/D converter provides eight channels of 8-bit analog conversion. The input voltages can be of the range 0 – 5V and can be converted to 8-bit unsigned values. This converter is to be used for miscellaneous analog inputs (i.e. Potentiometers) that may be used in PMAC plc code. Under no circumstances should these be used as position feedback. When using these options the available number of general-purpose inputs on the OCLB board is reduced from 24 to 16.

## Setting Up Option – 1 to read External Spindle and Feedrate Potentiometers

For users of PMAC NC there is supplied code in ADV600x.PLC and the include file ADV600.H that allows using the A/D converter without having to write any code. Code for AIN1, AIN2 and AIN3 is already in the PLC. To enable those sections of code, open the file ADV600.H and search for the define statement for USEADC. By default, the definition of this macro is 0, Option – 1 not enabled. Change this value to 1 to enable reading of AIN1, AIN2 and AIN3.

For example in Adv600.h change:

```
#define USEADC    0    to    #define USEADC  1
```

The converted values of AIN1, AIN2 and AIN3 will be in the P-Variables defined as ADC0_P, ADC1_P and ADC2_P in the file Adv600.h

```
#define ADC0_P              P480
#define ADC1_P              P481
#define ADC2_P              P482
```

To use the pre-written code of Adv600.plc for feedrate override, find the define statement USEADC_FEEDPOT. Again change the definition from 0 to 1. The Adv600.plc will use AIN1 for feedrate override.

For example in Adv600.h change:

```
#define USEADC_FEEDPOT 0    to  #define USEADC_FEEDPOT 1
```

In addition, Adv600.h contains a macro definition for FOVRD_RANGE which determines what feedrate override value the system will take when the AIN1 is at 5V.

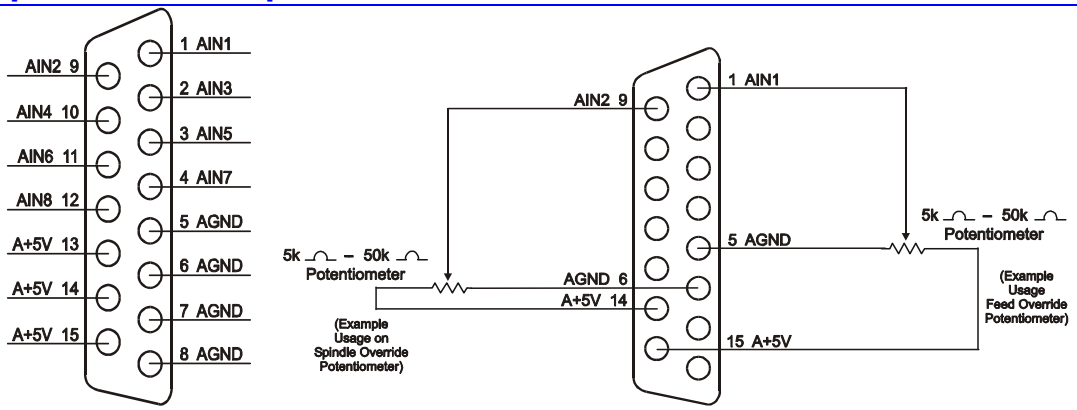
To use the pre-written code of Adv600.plc for spindle override find the define statement USEADC_SPNDPOT. Again change the definition from 0 to 1. The Adv600.plc will use AIN2 for spindle override.

For example in Adv600.h change:

```
#define USEADC_SPNDPOT 0    to  #define USEADC_SPNDPOT 1
```

In addition, Adv600.h contains a macro definition for SOVRD_RANGE which determines what spindle override range the system will have. The macro definition of SOVRD_MIN determines the minimum value the system will have for spindle override when AIN2 reads 0 volts.

## Example Feedrate/Spindle Override Connection Schematic




Analog input #2 (or #1) used as feedrate override implemented with a five to fifty thousand ohm potentiometer. Read zero to five volts at AIN2, pin 9 (or AIN1, pin 1) is scaled to minimum/maximum rotation of the knob.

## Setting up Option – 1 for Reading Custom Analog Inputs

The procedure for writing code to read the analog inputs from the Option – 1 accessory requires several steps. First, select which channel to read the analog information from while simultaneously enabling the conversion for that channel. The second step is to actually read the information from the appropriate channel on the OCLB. The final step is to clear the A/D enable and address bits.

### Step 1

The output bits 24-26 on Port B of the OCLB determine which channel will be converted. A value between 0-7 determines which of the eight analog inputs is being read. The output bit 27 enables the conversion on the A/D converter.

### Step 2

The second step is to read the converted digital information from the appropriate channel. The digital value representing the analog voltage is located at input bits 15-23 of Port C.

### Step 3

The final step is to clear the A/D enable and address bits by setting the output bits 24-27 on Port B all to 0.

**PLC Example:**

```
// INPUT DEFINITIONS
// Define an M-Variable pointing to Port C
#define
Acc34_1C          M491
M491->TWS:3
// Define a M-Variable of DP type to be used as an image of Port C
#define IN_1C_M           M492
M492->DP:$1003
// Define a M-Variable that points to the 16th - 23rd bits of the image of Port C
#define ADCCONV_M           M494
M494->X:$1003,0,8
// OUTPUT DEFINITIONS
// Define a M-Variable pointing to Port B
#define Acc34_1C          M291
M291->TWS:6
// Define a M-Variable of DP type to be used as an image of Port B
#define OUT_1_M           M250
```

```
M250->DP:$1003
// Define a M-Variable that points to the 24th - 27th  bits of the output image
#define ADCSELENA_M       M497
M497->X:$DFE8,8,4
// Mask to turn on last bit of ADCSELENA_M
#define ENA_ADC                        8
#define ADC0_P              P480
#define ADC1_P              P481
#define ADC2_P              P482
```

**Example from ADV600M.PLC:**

```
  ADCSELENA_M = ENA_ADC | 0   // set bits to select AIN0 and enable a conversion
  Acc34_1B = OUT_1_M          // Write image which was altered above to port B
  IN_1C_M = Acc34_1C          // Read port C into image word
  ADC0_P = ADCCONV_M          // Read conversion value from the image word
  ADCSELENA_M = 0             // clear analog channel select bits and
                              // turn off the enable conversion bit
  Acc34_1B = OUT_1_M          // Write to port B
  ADCSELENA_M = ENA_ADC | 1   // Read AIN1
  Acc34_1B = OUT_1_M
  IN_1C_M = Acc34_1C
  ADC1_P = ADCCONV_M
  ADCSELENA_M = 0
  Acc34_1B = OUT_1_M
  ADCSELENA_M = ENA_ADC | 2   // Read AIN2
  Acc34_1B = OUT_1_M
  IN_1C_M = Acc34_1C
  ADC2_P = ADCCONV_M
  Acc34_1B = OUT_1_M
  ADCSELENA_M = 0
```

# GENERAL PURPOSE 48 OPTO I/O CONFIGURATION

The OCLB provides 48 lines of general purpose I/O via connectors J4 and J5. The inputs and outputs on these connectors are TTL level, Opto-22 PB24 standard. J4 is designed such that it contains 8 outputs and 16 inputs. J5 is designed such that it contains 16 outputs and 8 inputs. Combined the OCLB provides 24 inputs and 24 outputs.

## Using Pre-Defined Advantage 600 I/O Variables

Users of the Advantage 600 CNC system can utilize the pre-written code included in the ADV600M.PLC and IO600.H files. All necessary plc functionality and m-variable definitions are included in these files and no further code is necessary. The user can immediately use either the M-variables themselves, or take advantage of the macro definitions assigned to the m-variables in custom written code. It is recommended that the system integrator utilize the macro definition names rather than the m-variable definitions for organizational purposes.

To enable an output all that is necessary is to set the appropriate m-variable to 1.

**Example:**

```
M900 = 1     or     Acc34OUT1_00 = 1
```

Similarly to disable an output:

```
M900 = 0     or     Acc34OUT1_00 = 0
```

The pre-defined Advantage 600 24 inputs and 24 outputs are listed below:

```
Input 1    Acc34IN1_00  or  M800    Output 1   Acc34OUT1_00  or  M900
Input 2    Acc34IN1_01  or  M801    Output 2   Acc34OUT1_01  or  M901
Input 3    Acc34IN1_02  or  M802    Output 3   Acc34OUT1_02  or  M902
Input 4    Acc34IN1_03  or  M803    Output 4   Acc34OUT1_03  or  M903
Input 5    Acc34IN1_04  or  M804    Output 5   Acc34OUT1_04  or  M904
Input 6    Acc34IN1_05  or  M805    Output 6   Acc34OUT1_05  or  M905
Input 7    Acc34IN1_06  or  M806    Output 7   Acc34OUT1_06  or  M906
Input 8    Acc34IN1_07  or  M807    Output 8   Acc34OUT1_07  or  M907
Input 9    Acc34IN1_08  or  M808    Output 9   Acc34OUT1_08  or  M908
Input 10   Acc34IN1_09  or  M809    Output 10  Acc34OUT1_09  or  M909
Input 11   Acc34IN1_10  or  M810    Output 11  Acc34OUT1_10  or  M910
Input 12   Acc34IN1_11  or  M811    Output 12  Acc34OUT1_11  or  M911
Input 13   Acc34IN1_12  or  M812    Output 13  Acc34OUT1_12  or  M912
Input 14   Acc34IN1_13  or  M813    Output 14  Acc34OUT1_13  or  M913
Input 15   Acc34IN1_14  or  M814    Output 15  Acc34OUT1_14  or  M914
Input 16   Acc34IN1_15  or  M815    Output 16  Acc34OUT1_15  or  M915
Input 17   Acc34IN1_16  or  M816    Output 17  Acc34OUT1_16  or  M916
Input 18   Acc34IN1_17  or  M817    Output 18  Acc34OUT1_17  or  M917
Input 19   Acc34IN1_18  or  M818    Output 19  Acc34OUT1_18  or  M918
Input 20   Acc34IN1_19  or  M819    Output 20  Acc34OUT1_19  or  M919
Input 21   Acc34IN1_20  or  M820    Output 21  Acc34OUT1_20  or  M920
Input 22   Acc34IN1_21  or  M821    Output 22  Acc34OUT1_21  or  M921
Input 23   Acc34IN1_22  or  M822    Output 23  Acc34OUT1_22  or  M922
Input 24   Acc34IN1_23  or  M823    Output 24  Acc34OUT1_23  or  M923
```

## User Written PLC Code

To read the general-purpose inputs only a few definitions are necessary. First, an M-variable must be pointed to the appropriate thumbwheel multiplex port address space using PMAC's thumbwheel serial multiplex address pointers. For example an M-variable may be pointed to TWS:3 provided the address is configured as board #1 via SW3 so that the general purpose inputs on Port C may be read.

```
#define Acc34_1C          M491
M491->TWS:3
```

After making the above M-variable address definition, one should be able to query the M491 to detect the current state of the inputs. M-variables that point to PMAC's thumbwheel multiplexed port cannot be queried via motion programs or a PLC 0. In a foreground PLC, it is recommended that the M-variable defined to the thumbwheel port be assigned to an image word.

For example, after making the following definition:

```
#define IN_1C_M           M492
M492->DP:$1003
```

In a PLC, the following assignment should be made.

```
IN_1C_M = Acc34_1C
```

Now additional M-variables can be pointed to the image address (i.e. DP:$1003) that can read an individual input. For example:

```
M800->Y:$1003,0,1       allows reading of input zero
M801->Y:$1003,1,1       allows reading of input one
.
M815->Y:$1003,15,1      allows reading of input 15
M816->X:$1003,0,1       allows reading of input 16
M817->X:$1003,1,1       allows reading of input 17
.
M823->X:$1003,7,1       allows reading of input 23
```

Writing to the general purpose I/O is similar to the reading procedure above. First, an M-variable must be pointed to the appropriate thumbwheel multiplex port address space using PMAC's thumbwheel serial multiplex address pointers. For example, an M-variable may be pointed to TWS:6 provided the address is configured as board #1 via SW3 so that the general purpose outputs on Port B may be written. Below are excerpts of definitions and PLC code that allow users to write to port B using image words.

Required definitions are:

```
#define Acc34_1B  M291 // Acc-34 #1 Port B definition in PMAC NC's oemm.h
#define OUT_1_M   M250   // Created in address.h
M250->DP:$DFE8
Acc34_1B = OUT_1_M      // ADV600M.PLC code to place data from image word on
Port B
```

Example image address definitions:

```
M900->Y:$ DFE8,0,1      allows writing of output 0
M901->Y:$ DFE8,1,1      allows writing of output 1
.
M915->Y:$ DFE8,15,1     allows writing of output 15
M916->X:$ DFE8,0,1      allows writing of output 16
M917->X:$ DFE8,1,1      allows writing of output 17
.
M923->X:$ DFE8,7,1      allows writing of output 23
```

The pre-written ADV600M.PLC writes to image words in this fashion. Moreover, the header file IO600.h defines the M-variables that point to image words appropriate for the general-purpose inputs and outputs of this board.

Inputs 24 through 31 on the board are dedicated to the board's encoder counter and manual pulse generator circuits. Therefore, they cannot be used for general-purpose inputs.

Outputs 24 - 31 also exist internally on the board. Outputs 24 through 27 are dedicated for option 1, 28 and 29 are dedicated for the encoder counter section. Output 30 is dedicated to the boards cycle start light and output 31 for the boards feed hold light. Hence, outputs 24 - 31 cannot be used for general-purpose outputs.

# J4/J5 CONNECTORS - GENERAL PURPOSE INPUT/ OUTPUT

## J4 - (JIOA)

| Pin | Schematic Label | IO600.h Macro Definition | Thumbwheel Port | Memory Register Address | Input/Output Function |
|---|---|---|---|---|---|
| 1 | OUT23 | Acc34OUT1_23_ADR | Port B | X:$DFE8,7,1 | OCLB Output 23 |
| 2 | AGND | | | | Analog Ground |
| 3 | OUT22 | Acc34OUT1_22_ADR | Port B | X:$DFE8,6,1 | OCLB Output 21 |
| 4 | AGND | | | | Analog Ground |
| 5 | OUT21 | Acc34OUT1_21_ADR | Port B | X:$DFE8,5,1 | OCLB Output 21 |
| 6 | AGND | | | | Analog Ground |
| 7 | OUT20 | Acc34OUT1_20_ADR | Port B | X:$DFE8,4,1 | OCLB Output 20 |
| 8 | AGND | | | | Analog Ground |
| 9 | OUT19 | Acc34OUT1_19_ADR | Port B | X:$DFE8,3,1 | OCLB Output 19 |
| 10 | AGND | | | | Analog Ground |
| 11 | OUT18 | Acc34OUT1_18_ADR | Port B | X:$DFE8,2,1 | OCLB Output 18 |
| 12 | AGND | | | | Analog Ground |
| 13 | OUT17 | Acc34OUT1_17_ADR | Port B | X:$DFE8,1,1 | OCLB Output 17 |
| 14 | AGND | | | | Analog Ground |
| 15 | OUT16 | Acc34OUT1_16_ADR | Port B | X:$DFE8,0,1 | OCLB Output 16 |
| 16 | AGND | | | | Analog Ground |
| 17 | IN47 | Acc34IN1_15_ADR | Port C | Y:$1003,15,1 | OCLB Input 15 |
| 18 | AGND | | | | Analog Ground |
| 19 | IN46 | Acc34IN1_14_ADR | Port C | Y:$1003,14,1 | OCLB Input 14 |
| 20 | AGND | | | | Analog Ground |
| 21 | IN45 | Acc34IN1_13_ADR | Port C | Y:$1003,13,1 | OCLB Input 13 |
| 22 | AGND | | | | Analog Ground |
| 23 | IN44 | Acc34IN1_12_ADR | Port C | Y:$1003,12,1 | OCLB Input 12 |
| 24 | AGND | | | | Analog Ground |
| 25 | IN43 | Acc34IN1_11_ADR | Port C | Y:$1003,11,1 | OCLB Input 11 |
| 26 | AGND | | | | Analog Ground |
| 27 | IN42 | Acc34IN1_10_ADR | Port C | Y:$1003,10,1 | OCLB Input 10 |
| 28 | AGND | | | | Analog Ground |
| 29 | IN41 | Acc34IN1_09_ADR | Port C | Y:$1003,9,1 | OCLB Input 9 |
| 30 | AGND | | | | Analog Ground |
| 31 | IN40 | Acc34IN1_08_ADR | Port C | Y:$1003,8,1 | OCLB Input 8 |
| 32 | AGND | | | | Analog Ground |
| 33 | IN39 | Acc34IN1_07_ADR | Port C | Y:$1003,7,1 | OCLB Input 7 |
| 34 | AGND | | | | Analog Ground |
| 35 | IN38 | Acc34IN1_06_ADR | Port C | Y:$1003,6,1 | OCLB Input 6 |
| 36 | AGND | | | | Analog Ground |
| 37 | IN37 | Acc34IN1_05_ADR | Port C | Y:$1003,5,1 | OCLB Input 5 |
| 38 | AGND | | | | Analog Ground |
| 39 | IN36 | Acc34IN1_04_ADR | Port C | Y:$1003,4,1 | OCLB Input 4 |
| 40 | AGND | | | | Analog Ground |
| 41 | IN35 | Acc34IN1_03_ADR | Port C | Y:$1003,3,1 | OCLB Input 3 |
| 42 | AGND | | | | Analog Ground |
| 43 | IN34 | Acc34IN1_02_ADR | Port C | Y:$1003,2,1 | OCLB Input 2 |
| 44 | AGND | | | | Analog Ground |
| 45 | IN33 | Acc34IN1_01_ADR | Port C | Y:$1003,1,1 | OCLB Input 1 |
| 46 | AGND | | | | Analog Ground |
| 47 | IN32 | Acc34IN1_00_ADR | Port C | Y:$1003,0,1 | OCLB Input 0 |
| 48 | AGND | | | | Analog Ground |
| 49 | A+5V | | | | Analog +5V |
| 50 | AGND | | | | Analog Ground |

## J5 - (JIOB)

| Pin | Schematic Label | IO600.h Macro Definition | Thumbwheel Port | Memory Register Address | Input/Output Function |
|---|---|---|---|---|---|
| 1 | IN55 | Acc34IN1_23_ADR | Port C | X:$1003,7,1 | OCLB Input 23* |
| 2 | AGND | | | | Analog Ground |
| 3 | IN54 | Acc34IN1_22_ADR | Port C | X:$1003,6,1 | OCLB Input 22* |
| 4 | AGND | | | | Analog Ground |
| 5 | IN53 | Acc34IN1_21_ADR | Port C | X:$1003,5,1 | OCLB Input 21* |
| 6 | AGND | | | | Analog Ground |
| 7 | IN52 | Acc34IN1_20_ADR | Port C | X:$1003,4,1 | OCLB Input 20* |
| 8 | AGND | | | | Analog Ground |
| 9 | IN51 | Acc34IN1_19_ADR | Port C | X:$1003,3,1 | OCLB Input 19* |
| 10 | AGND | | | | Analog Ground |
| 11 | IN50 | Acc34IN1_18_ADR | Port C | X:$1003,2,1 | OCLB Input 18* |
| 12 | AGND | | | | Analog Ground |
| 13 | IN49 | Acc34IN1_17_ADR | Port C | X:$1003,1,1 | OCLB Input 17* |
| 14 | AGND | | | | Analog Ground |
| 15 | IN48 | Acc34IN1_16_ADR | Port C | X:$1003,0,1 | OCLB Input 16* |
| 16 | AGND | | | | Analog Ground |
| 17 | OUT15 | Acc34OUT1_15_ADR | Port B | Y:$DFE8,15,1 | OCLB Output 15 |
| 18 | AGND | | | | Analog Ground |
| 19 | OUT14 | Acc34OUT1_14_ADR | Port B | Y:$DFE8,14,1 | OCLB Output 14 |
| 20 | AGND | | | | Analog Ground |
| 21 | OUT13 | Acc34OUT1_13_ADR | Port B | Y:$DFE8,13,1 | OCLB Output 13 |
| 22 | AGND | | | | Analog Ground |
| 23 | OUT12 | Acc34OUT1_12_ADR | Port B | Y:$DFE8,12,1 | OCLB Output 12 |
| 24 | AGND | | | | Analog Ground |
| 25 | OUT11 | Acc34OUT1_11_ADR | Port B | Y:$DFE8,11,1 | OCLB Output 11 |
| 26 | AGND | | | | Analog Ground |
| 27 | OUT10 | Acc34OUT1_10_ADR | Port B | Y:$DFE8,10,1 | OCLB Output 10 |
| 28 | AGND | | | | Analog Ground |
| 29 | OUT9 | Acc34OUT1_09_ADR | Port B | Y:$DFE8,9,1 | OCLB Output 9 |
| 30 | AGND | | | | Analog Ground |
| 31 | OUT8 | Acc34OUT1_08_ADR | Port B | Y:$DFE8,8,1 | OCLB Output 8 |
| 32 | AGND | | | | Analog Ground |
| 33 | OUT7 | Acc34OUT1_07_ADR | Port B | Y:$DFE8,7,1 | OCLB Output 7 |
| 34 | AGND | | | | Analog Ground |
| 35 | OUT6 | Acc34OUT1_06_ADR | Port B | Y:$DFE8,6,1 | OCLB Output 6 |
| 36 | AGND | | | | Analog Ground |
| 37 | OUT5 | Acc34OUT1_05_ADR | Port B | Y:$DFE8,5,1 | OCLB Output 5 |
| 38 | AGND | | | | Analog Ground |
| 39 | OUT4 | Acc34OUT1_04_ADR | Port B | Y:$DFE8,4,1 | OCLB Output 4 |
| 40 | AGND | | | | Analog Ground |
| 41 | OUT3 | Acc34OUT1_03_ADR | Port B | Y:$DFE8,3,1 | OCLB Output 3 |
| 42 | AGND | | | | Analog Ground |
| 43 | OUT2 | Acc34OUT1_02_ADR | Port B | Y:$DFE8,2,1 | OCLB Output 2 |
| 44 | AGND | | | | Analog Ground |
| 45 | OUT1 | Acc34OUT1_01_ADR | Port B | Y:$DFE8,1,1 | OCLB Output 1 |
| 46 | AGND | | | | Analog Ground |
| 47 | OUT0 | Acc34OUT1_00_ADR | Port B | Y:$DFE8,0,1 | OCLB Output 0 |
| 48 | AGND | | | | Analog Ground |
| 49 | A+5V | | | | Analog +5 volts |
| 50 | AGND | | | | Analog Ground |
| * When the board is populated with the analog option and jumpers E9A - E9H are removed Port C inputs 16-23 are not available for general-purpose inputs | | | | | |

# USING THE 48 OPTO I/O EXPANSION PCBA

This expansion card plugs directly into the OCLB and provides 48 lines of optically isolated I/O with convenient Phoenix style plug-in terminal connectors. This configuration is especially suited for customizing user I/O switches and buttons, but can be used for other I/O applications.

The expansion card plugs directly into the OCLB via connectors J4 and J5. See page 32 for layout. The user then may wire I/O directly to the expansion card via the Phoenix style plug-in terminal connectors.

The I/O expansion card can be configured for either sinking or sourcing inputs/outputs in groups of eight. The configuration of the inputs requires only changing a jumper location. The outputs require jumper configuration and the appropriate sinking/sourcing IC. For sinking (open-collector), use ULN 2803A, for sourcing (open-emitter) use UDN 2981A. The ICs have socketed receptacles for easy replacement. The I/O ICs are rated to 24V and 100mA. In addition, the I/O expansion card provides the green/red status LEDs which indicate whether the particular I/O point is sinking or sourcing.

Each ten pin terminal block TB1-TB3, and TB5-TB7, will accept eight lines of either input or output. Pins 9 and 10 at each terminal require GND and +5V respectively to power the Opto-IC circuitry.

| TB-1 | | | TB-2 | | | TB-3 | |
|---|---|---|---|---|---|---|---|
| **Pin** | **Description** | | **Pin** | **Description** | | **Pin** | **Description** |
| 1 | Input 1 | | 1 | Input 9 | | 1 | Input 17 |
| 2 | Input 2 | | 2 | Input 10 | | 2 | Input 18 |
| 3 | Input 3 | | 3 | Input 11 | | 3 | Input 19 |
| 4 | Input 4 | | 4 | Input 12 | | 4 | Input 20 |
| 5 | Input 5 | | 5 | Input 13 | | 5 | Input 21 |
| 6 | Input 6 | | 6 | Input 14 | | 6 | Input 22 |
| 7 | Input 7 | | 7 | Input 15 | | 7 | Input 23 |
| 8 | Input 8 | | 8 | Input 16 | | 8 | Input 24 |
| 9 | GND | | 9 | GND | | 9 | GND |
| 10 | 12 - 24V | | 10 | 12 - 24V | | 10 | 12 - 24V |
| **TB-5** | | | **TB-6** | | | **TB-7** | |
| **Pin** | **Description** | | **Pin** | **Description** | | **Pin** | **Description** |
| 1 | Output 1 | | 1 | Output 9 | | 1 | Output 17 |
| 2 | Output 2 | | 2 | Output 10 | | 2 | Output 18 |
| 3 | Output 3 | | 3 | Output 11 | | 3 | Output 19 |
| 4 | Output 4 | | 4 | Output 12 | | 4 | Output 20 |
| 5 | Output 5 | | 5 | Output 13 | | 5 | Output 21 |
| 6 | Output 6 | | 6 | Output 14 | | 6 | Output 22 |
| 7 | Output 7 | | 7 | Output 15 | | 7 | Output 23 |
| 8 | Output 8 | | 8 | Output 16 | | 8 | Output 24 |
| 9 | GND | | 9 | GND | | 9 | GND |
| 10 | 12 - 24V | | 10 | 12 - 24V | | 10 | 12 - 24V |

***Note:***

Users of the Advantage 600 system may read or write to the particular I/O point using the Macro definitions as defined in the General Purpose 48 Opto I/O Configuration section.

## 48 Opto I/O Jumper Settings

| Input | Jumper | Sinking Configuration | Sourcing Configuration |
|---|---|---|---|

| | | | |
|---|---|---|---|
| TB1 | E1 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| | E2 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| TB2 | E3 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| | E4 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| TB3 | E5 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| | E6 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| **Output** | **Jumper** | **Sinking Configuration** | **Sourcing Configuration** |
| TB5 | E9 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| | E10 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| TB6 | E11 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| | E12 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| TB7 | E13 | Jump pins 1 to 2 | Jump pins 2 to 3 |
| | E14 | Jump pins 1 to 2 | Jump pins 2 to 3 |

# JTHW ADDRESSING

The following applies to all Acc-34xxx family of boards.

PMAC communicates with this board through the thumbwheel port. The technique used to access data from this board is PMAC multiplexed I/O (TWS). The integrator should be thoroughly familiar with PMAC multiplexed I/O techniques as described in the PMAC users manual.

Multiplexed I/O is used to access all the I/O on this board. Board addresses are configured at SW3. The following table lists the switch settings for valid addresses. The Port A TWS, Port B TWS and Port C TWS columns give the TWS m-variable definition values for the appropriate port.

| Board # | Port A TWS (Inputs 0 - 31) | Port B TWS (Outputs 0 -31) | Port C TWS (Inputs 32-63) | SW3-5 | SW3-4 | SW3-3 | SW3-2 | SW3-1 |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 6 | 3 | ON | ON | ON | ON | ON |
| 2 | 9 | 14 | 11 | ON | ON | ON | ON | OFF |
| 3 | 17 | 22 | 19 | ON | ON | ON | OFF | ON |
| 4 | 25 | 30 | 27 | ON | ON | ON | OFF | OFF |
| 5 | 33 | 38 | 35 | ON | ON | OFF | ON | ON |
| 6 | 41 | 46 | 43 | ON | ON | OFF | ON | OFF |
| 7 | 49 | 54 | 51 | ON | ON | OFF | OFF | ON |
| 8 | 57 | 62 | 59 | ON | ON | OFF | OFF | OFF |
| 9 | 65 | 70 | 67 | ON | OFF | ON | ON | ON |
| 10 | 73 | 78 | 75 | ON | OFF | ON | ON | OFF |
| 11 | 81 | 86 | 83 | ON | OFF | ON | OFF | ON |
| 12 | 89 | 94 | 91 | ON | OFF | ON | OFF | OFF |
| 13 | 97 | 102 | 99 | ON | OFF | OFF | ON | ON |
| 14 | 105 | 110 | 107 | ON | OFF | OFF | ON | OFF |
| 15 | 113 | 118 | 115 | ON | OFF | OFF | OFF | ON |
| 16 | 121 | 126 | 123 | ON | OFF | OFF | OFF | OFF |
| 17 | 129 | 134 | 131 | OFF | ON | ON | ON | ON |
| 18 | 137 | 142 | 139 | OFF | ON | ON | ON | OFF |
| 19 | 145 | 150 | 147 | OFF | ON | ON | OFF | ON |
| 20 | 153 | 158 | 155 | OFF | ON | ON | OFF | OFF |
| 21 | 161 | 166 | 163 | OFF | ON | OFF | ON | ON |
| 22 | 169 | 174 | 171 | OFF | ON | OFF | ON | OFF |
| 23 | 177 | 182 | 179 | OFF | ON | OFF | OFF | ON |
| 24 | 185 | 190 | 187 | OFF | ON | OFF | OFF | OFF |
| 25 | 193 | 198 | 195 | OFF | OFF | ON | ON | ON |
| 26 | 201 | 206 | 203 | OFF | OFF | ON | ON | OFF |
| 27 | 209 | 214 | 211 | OFF | OFF | ON | OFF | ON |
| 28 | 217 | 222 | 219 | OFF | OFF | ON | OFF | OFF |
| 29 | 225 | 230 | 227 | OFF | OFF | OFF | ON | ON |
| 30 | 233 | 238 | 235 | OFF | OFF | OFF | ON | OFF |
| 31 | 241 | 246 | 243 | OFF | OFF | OFF | OFF | ON |
| 32 | 249 | 254 | 251 | OFF | OFF | OFF | OFF | OFF |

# USING THE ACC-35A WITH ADV600 (REMOTE/LOCAL OPERATION)

P1 is a DB37 male connector for interfacing to the onboard Accessory 35B.

| Pin | Label | Pin | Label |
|---|---|---|---|
| 1 | BSEL0+ | 20 | BSEL0- |
| 2 | BDAT0+ | 21 | BDAT0- |
| 3 | BSEL1+ | 22 | BSEL1- |
| 4 | BDAT1+ | 23 | BDAT1- |
| 5 | BSEL2+ | 24 | BSEL2- |
| 6 | BDAT2+ | 25 | BDAT2- |
| 7 | BSEL3+ | 26 | BSEL3- |
| 8 | BDAT3+ | 27 | BDAT3- |
| 9 | BSEL4+ | 28 | BSEL4- |
| 10 | BDAT4+ | 29 | BDAT4- |
| 11 | BSEL5+ | 30 | BSEL5- |
| 12 | BDAT5+ | 31 | BDAT5- |
| 13 | BSEL6+ | 32 | BSEL6- |
| 14 | BDAT6+ | 33 | BDAT6- |
| 15 | BSEL7+ | 34 | BSEL7- |
| 16 | BDAT7+ | 35 | BDAT7- |
| 17 | GND | 36 | GND |
| 18 | S+5v | 37 | S+5v |
| 19 | GND | | |

Installations of CNC systems that require the PC to be more than ten feet from the Control Panel hardware require the use of PMAC's Acc-35A. The Acc-35A counterpart, Acc-35B, is internal to the OCLB. Acc-35A provides differential signal transmission for the longer cable paths between PMAC and the Control Panel board. This is shown in the System Cable diagram at the end of this section. Acc-35A is the local (to PMAC) JTHW buffer board. This board should be attached to PMAC's JTHW connector via the supplied 26-pin flat cable. As mentioned before, the Control Panel has the remote JTHW buffer circuits. It is attached to the Acc-35A with the supplied cable (DB-37p to DB-37s).

## Acc-35A Connectors

Refer to the Acc-35A layout diagram for the location of the connectors on the board. This can be found in the supplied product documentation for Acc-35A/B. J1 (26-pin Header) provides the link between PMAC's J3 (JTHW) and Acc-35A. Using the supplied flat cable, PMAC's J3 should be connected here. P1 (DB-37s) is through Acc-35A and is connected to the remote buffer. For cable paths greater than 15 feet, the differential address and data lines should be run as twisted pairs and the cable should be shielded. With the E1 jumper removed, the +5V power supply going to the remote end (Control Panel) is brought out through TB1, a 2-pin terminal block, and not through the JTHW cable.

***Note:***

Whenever the distance between an Acc-35A and the Control Panel is long (greater than 10 feet), it is necessary to use TB1 for the power supply with the E1 jumper removed.

## Specific Addressing Techniques

The Acc-35A has two dip switches SW1 and SW2. There are also two corresponding switches on the Control Panel, SW1 and SW2 respectively. These switches are used to disable the read response of remote devices on PMAC's JTHW multiplex memory space. PMAC NC for Windows maintains the convention of dividing the address space into two segments: PMAC Local and PMAC Remote. Local addresses are in the range of 128 to 255 ($80 to $FF). Remote addresses are in the range of 0 to 127 ($0 to $7F). To achieve this all four switches are set the same:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Open | Open | Open | Closed | Open |

## Generic Addressing Techniques

On an Acc-35A board, the active range must include all boards connected to PMAC through this Acc-35A. The active range must not include any other board connected directly to the JTHW port, whether another Acc-35A (and its active range), an Acc-34x, or an NC control panel.

On an Acc-35B or board with built-in Acc-35B functionality, the active range must include all boards connected to PMAC through this Acc-35B and its matching Acc-35A. The active range must not overlap with the active range of any other Acc-35B or board with Acc-35B functionality connected to the same Acc-35A.

The numeric range in the table entry specifies the JTHW thumbwheel multiplexer port address range for which the card is enabled for the specified SW1 and SW2 settings. The 5-digit binary numbers for the SW1 and SW2 settings, represent from left to right, SWn-5 to SWn-1 (most significant to least significant). A 0 means Closed, and a 1 means Open, on the DIP switch.

The SW1 setting specifies the highest address that can be enabled on this card; multiply the SW1 number by 8 and add 7. The SW2 setting specifies the number of cards that are to be enabled – the number of cards is the SW2 number plus 1 (if the SW2 number is 2^n - 1, as for all settings in this table).

An xxx entry in the table signifies that there is no multiplexer port address for which the card will be enabled.

## SW2 Setting (=Number of Boards Minus 1)

| SW1 Setting | 00000 (1 board) | 00001 (2 boards) | 00011 (4 boards) | 00111 (8 boards) | 01111 (16 boards) | 11111 (32 boards) |
|---|---|---|---|---|---|---|
| 00000 | 0-7 | xxx | xxx | xxx | xxx | xxx |
| 00001 | 8-15 | 0-15 | xxx | xxx | xxx | xxx |
| 00010 | 16-23 | xxx | xxx | xxx | xxx | xxx |
| 00011 | 24-31 | 16-31 | 0-31 | xxx | xxx | xxx |
| 00100 | 32-39 | xxx | xxx | xxx | xxx | xxx |
| 00101 | 40-47 | 32-47 | xxx | xxx | xxx | xxx |
| 00110 | 48-55 | xxx | xxx | xxx | xxx | xxx |
| 00111 | 56-63 | 48-63 | 32-63 | 0-63 | xxx | xxx |
| 01000 | 64-71 | xxx | xxx | xxx | xxx | xxx |
| 01001 | 72-79 | 64-79 | xxx | xxx | xxx | xxx |
| 01010 | 80-87 | xxx | xxx | xxx | xxx | xxx |
| 01011 | 88-95 | 80-95 | 64-95 | xxx | xxx | xxx |
| 01100 | 96-103 | xxx | xxx | xxx | xxx | xxx |
| 01101 | 104-111 | 96-111 | xxx | xxx | xxx | xxx |
| 01110 | 112-119 | xxx | xxx | xxx | xxx | xxx |
| 01111 | 120-127 | 112-127 | 96-127 | 64-127 | 0-127 | xxx |
| ... | | | | | | |
| 01111 | 248-255 | 240-255 | 224-255 | 192-255 | 128-255 | 0-255 |

**Notes:**

1. An NC control panel accessory occupies 16 addresses on the multiplexer port. It counts as two boards in these calculations.
2. Other settings are valid, but produce non-continuous ranges of addresses for which the card is enabled.
3. Any setting in which SW1-n is 0 (Closed) and SW2-n is 1 (Open), for any n (1-5), produces a condition in which all addresses are disabled.
4. Older multiplexer port accessories, without parity -- Acc-34, 34A, 34B and the original NC control panels -- should not be set to any port address 128 or above;

## Control Panel Connectors

Refer to the layout diagram of the Control Panel at the end of this section for the location of connectors on the board. P1 (DB-37s) connects the remote buffer on the Control Panel (cable coming from the Acc-35A). Cables made must use the pinout provided by the product documentation for Acc-35A/B. TB1 is a 2-pin terminal block which is used to bring in the +5V supply for the logic circuits on the Control Panel, if not supplied through the cable, and should be no less than 20 AWG. E2 on the Control Panel is removed to configure for remote operation.

# OCLB CONNECTORS

## TB1 - TB3 - Power Connectors

| Terminal | Function | Power Requirements | Function |
|---|---|---|---|
| TB1 | Built In Acc 35B external power supply | 5V regulated<br>Pin 1 - Ground | Supply only if using the on board Acc-35B and do not have it powered by PMAC. In this case, the associated Acc 35A must have E1 removed. If the associated Acc 35A has E1 installed, do not supply power here. |
| TB2 | Input supply to the 5V regulator and the machine rotary switch power supply | 15 – 24V unregulated.<br>Pin 1,3 - Ground | External 15-24V for the 5V regulator to power the machine I/O OPTO logic circuits. Power here may also power the rotary switches provided E4 and E5 are installed |
| TB3 | Output from the machine logic 5V regulator | 5V regulated<br>Pin 1 Ground | +5V input (not needed except for special case) |

## TB4 - Handwheel (Manual Pulse Generator Connector)

TB4 is for interfacing the manual pulse generator, or handwheel encoder input

| Pin | Label |
|---|---|
| 1 | HWCHA+ |
| 2 | HWCHA- |
| 3 | HWCHB+ |
| 4 | HWCHB- |
| 5 | AGND |
| 6 | A+5v |
| 7 | AGND |
| 8 | A+5v |

## TB5 - E-Stop Input

| Pin | Label | Function | Description |
|---|---|---|---|
| 1 | ESTOP1 | Output | Provides E-Stop 1 output from J6 |
| 2 | ESTOP2 | Output | Provides E-Stop 2 output from J6 |

## JTHW - Thumbwheel Connector

**J1A & J1B** are 26 pin male connectors for ribbon cable to daisy chain to PMAC thumbwheel port or other Delta Tau I/O boards.

| Pin | Symbol | Function | Description |
|---|---|---|---|
| 1 | GND | Common | PMAC Common |
| 2 | GND | Common | PMAC Common |
| 3 | DAT0 | Output | Data Bit 0 |
| 4 | SEL0 | Input | Address Line 0 |
| 5 | DAT1 | Output | Data Bit 1 |
| 6 | SEL 1 | Input | Address Line1 |
| 7 | DAT2 | Output | Data Bit 2 |
| 8 | SEL2 | Input | Address Line 2 |
| 9 | DAT3 | Output | Data Bit 3 |
| 10 | SEL3 | Input | Address Line 3 |
| 11 | DAT4 | Output | Data Bit 4 |
| 12 | SEL 4 | Input | Address Line 4 |
| 13 | DAT5 | Output | Data Bit 5 |
| 14 | SEL5 | Input | Address Line 5 |
| 15 | DAT6 | Output | Data Bit 5 |
| 16 | SEL6 | Input | Address Line 6 |
| 17 | DAT7 | Output | Data Bit 6 |
| 18 | SEL7 | Input | Data Bit 7 |
| 19 | N.C. | | |
| 20 | GND | Common | PMAC Common |
| 21 | BFLD | | |
| 22 | GND | Common | PMAC Common |
| 23 | IPLD | | |
| 24 | GND | Common | PMAC Common |
| 25 | +5V | Input | +5V DC SUPPLY |
| 26 | INIT | | |

## Operator Panel Input and Output

All the inputs on J2 (the DB37 female connector) are read through Port A of this board using an M-variable defined to PMAC's thumbwheel serial multiplexed address space. The panel inputs were designed specifically to be used with the PMAC NC program. The board may be used in non PMAC NC applications, however it is then up to the user to program all of the functions on the panel. PMAC NC comes with a PLC ADV600.PLC designed to implement all of the functions on J2.

## J2 - (JPAN)

| Pin No. | Schematic Label | Adv600.h Macro Definition | Thumbwheel Port | Memory Register Address | Input/Output Function |
|---|---|---|---|---|---|
| 1 | MODSEL0- | SS_MODED_ADR | Port A | Y:$DFE0,0,4,U | Bit 0 - Mode select BCD switch |
| 2 | MODSEL2- | SS_MODED_ADR | Port A | Y:$DFE0,0,4,U | Bit 2 - Mode select BCD switch |
| 3 | JOG+/ | PB_JOG_PLUS_ADR | Port A | Y:$DFE0,4,1 | Bit 4 - Jog plus momentary push button |
| 4 | COOLNT1- | SS_CLNT_ADR | Port A | Y:$DFE0,4,4 | Bit 7 - Coolant SPDT switch 2nd input |
| 5 | SSO_VR0- | SS_SSOVRD_ADR | Port A | Y:$DEF0,8,4,U | Bit 8 - Spindle override BCD switch |
| 6 | SSO_VR2- | SS_SSOVRD_ADR | Port A | Y:$DEF0,8,4,U | Bit 10 - Spindle override BCD switch |
| 7 | FRO_VR0- | SS_FOVRDD_ADR | Port A | Y:$DEF0,12,4,U | Bit 12 - Feedrate override BCD switch |
| 8 | FRO_VR2- | SS_FOVRDD_ADR | Port A | Y:$DEF0,12,4,U | Bit 14 - Feedrate override BCD switch |
| 9 | SPDIR0- | PB_SPND_CCW_ADR | Port A | X:$DEF0,0,1 | Bit 0 - Spindle CCW momentary push button |
| 10 | SNGBLK- | SS_SINGLE_BLOCK_ADR | Port A | X:$DEF0,2,1 | Bit 2 - Single Block SPST switch input |
| 11 | CYCSTR- | PB_CYCLE_START_ADR | Port A | X:$DEF0,4,1 | Bit 4 - Cycle start momentary push button |
| 12 | FEEDHD- | PB_FEED_HOLD_ADR | Port A | X:$DEF0,5,1 | Bit 5 - Feed hold momentary push button |
| 13 | OPTSTOP- | SS_OPT_STOP_ADR | Port A | X:$DEF0,6,1 | Bit 6 - Optional Stop SPST switch input |
| 14 | INT_AS1- | SS_AXISD_ADR | Port A | X:$DEF0,8,4,U | Bit 9 - Axis select BCD switch |
| 15 | INT_AS3- | SS_AXISD_ADR | Port A | X:$DEF0,8,4,U | Bit 11 - Axis select BCD switch |
| 16 | INT_SM1- | SS_SPMLTD_ADR | Port A | X:$DEF0,12,4,U | Bit 13 - Jog speed and increment select DTSP switch 2nd input |
| 17 | ESTOP_IN- | SS_SPMLTD_ADR | Port A | X:$DEF0,12,4,U | Bit 15 - Emergency Stop Input |
| 18 | OGND | | | | AGND for A+15V to +24V |
| 19 | O+V | | | | A+15V to +24V |
| 20 | MODSEL1- | SS_MODED_ADR | Port A | Y:$DFE0,0,4,U | Bit 1 - Mode select BCD switch |
| 21 | MODSEL3- | SS_MODED_ADR | Port A | Y:$DFE0,0,4,U | Bit 3 - Mode select BCD switch |
| 22 | JOG-/ | PB_JOG_MINUS_ADR | Port A | Y:$DFE0,5,1 | Bit 5 - Jog minus momentary push button |
| 23 | COOLNT1- | SS_CLNT_ADR | Port A | Y:$DFE0,4,4 | Bit 6 - Coolant SPDT switch 1st input |
| 24 | SSO_VR1- | SS_SSOVRD_ADR | Port A | Y:$DEF0,8,4,U | Bit 9 - Spindle override BCD switch |
| 25 | SSO_VR3- | SS_SSOVRD_ADR | Port A | Y:$DEF0,8,4,U | Bit 11 - Spindle override BCD switch |
| 26 | FRO_VR1- | SS_FOVRDD_ADR | Port A | Y:$DEF0,12,4,U | Bit 13 - Feedrate override BCD switch |

| | | | | | |
|---|---|---|---|---|---|
| 27 | FRO_VR3- | SS_FOVRDD_ADR | Port A | Y:$DEF0,12,4,U | Bit 15 - Feedrate override BCD switch |
| 28 | SPDIR1- | PB_SPND_CW_ADR | Port A | X:$DEF0,1,1 | Bit 1 - Spindle CW momentary push button |
| 29 | BLKDEL- | SS_BLOCK_DELETE_ADR | Port A | X:$DEF0,3,1 | Bit 3 - Block Delete SPST switch input |
| 30 | CS_LIGHT- | LT_CYCLE_START_ADR | Port B | X:$DFE8,14,1 | Bit 14 - Cycle start light |
| 31 | FH_LIGHT- | LT_FEED_HOLD_ADR | Port B | X:$DFE8,15,1 | Bit 15 - Feed hold light |
| 32 | INT_AS0- | SS_AXISD_ADR | Port A | X:$DEF0,8,4,U | Bit 8 - Axis select BCD switch |
| 33 | INT_AS2- | SS_AXISD_ADR | Port A | X:$DEF0,8,4,U | Bit 10 - Axis select BCD switch |
| 34 | INT_SM0- | SS_SPMLTD_ADR | Port A | X:$DEF0,12,4,U | Bit 12 - Jog speed and increment select SPDT switch 1st input |
| 35 | ONOFF_IN- | SS_SPMLTD_ADR | Port A | X:$DEF0,12,4,U | Bit 14 - PC Power on/off logic |
| 36 | OGND | | | | AGND for A+15V to +24V |
| 37 | O+V | | | | A+15V to +24V |

## J3 - (JANA)

J3 is a 15-pin female D-sub connector. Below is a table indicating the pin definitions.

| Pin | Label | Function | Description |
|---|---|---|---|
| 1 | AIN1 | Input | Option 1 - Analog Input 1 |
| 2 | AIN3 | Input | Option 1 - Analog Input 3 |
| 3 | AIN5 | Input | Option 1 - Analog Input 5 |
| 4 | AIN7 | Input | Option 1 - Analog Input 7 |
| 5 | AGND | Common | |
| 6 | AGND | Common | |
| 7 | AGND | Common | |
| 8 | AGND | Common | |
| 9 | AIN2 | Input | Option 1 - Analog Input 2 |
| 10 | AIN4 | Input | Option 1 - Analog Input 4 |
| 11 | AIN6 | Input | Option 1 - Analog Input 6 |
| 12 | AIN8 | Input | Option 1 - Analog Input 8 |
| 13 | A+5V | Output | +5V Output From OCLB |
| 14 | A+5V | Output | +5V Output From OCLB |
| 15 | A+5V | Output | +5V Output From OCLB |

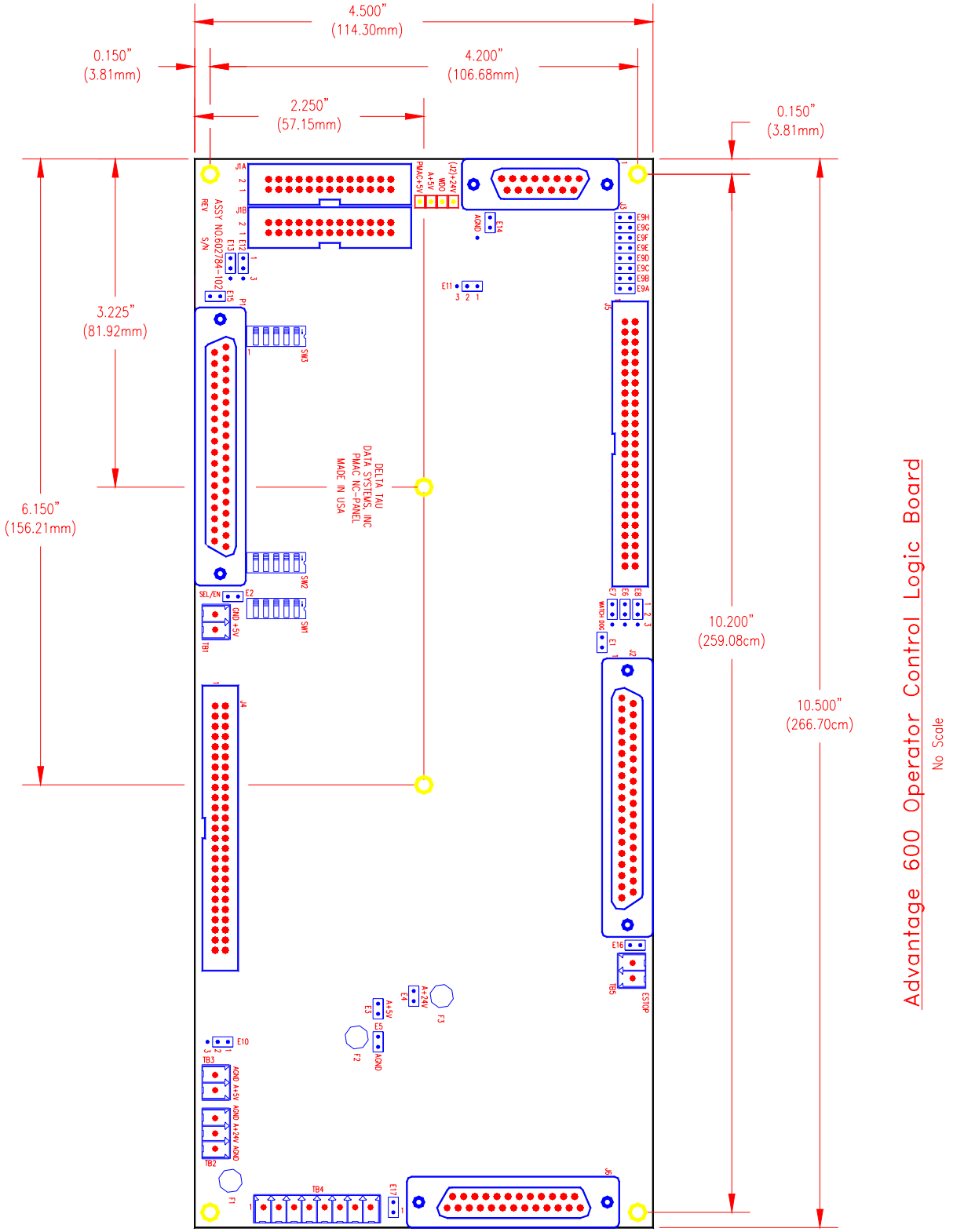
## J6 - Remote Handwheel Box

J6 is DB-25 female style connector to interface to Delta Tau's Remote Handwheel box.

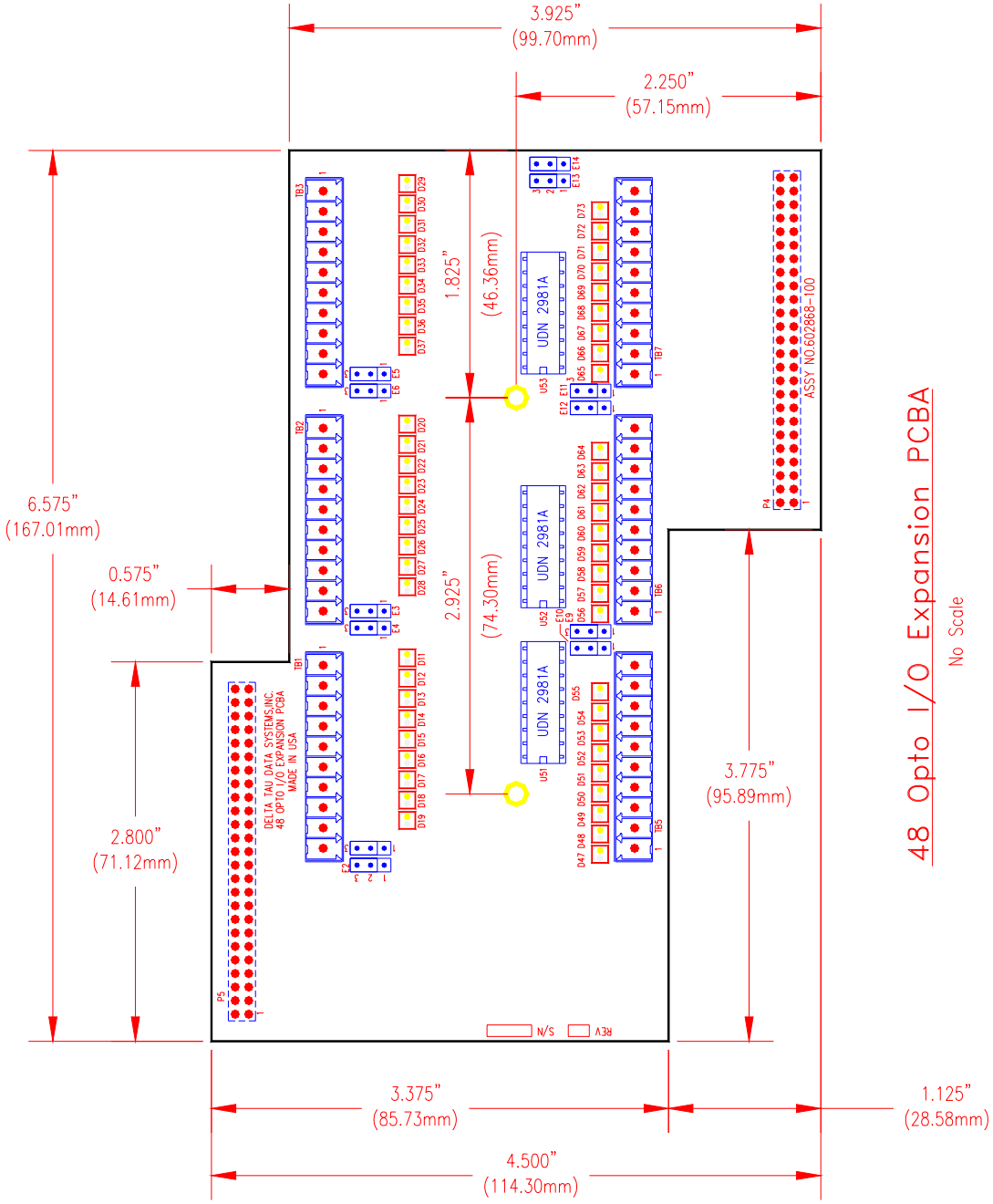
| Pin | Label | Function |
|---|---|---|
| 1 | HWCHA+ | Manual Pulse Generator A input |
| 2 | HWCHB+ | Manual Pulse Generator B input |
| 3 | AGND | Analog common |
| 4 | AGND | Analog common |
| 5 | ENCSEL- | Enable remote handwheel box |
| 6 | AS1- | Axis select BCD input bit 1 |
| 7 | AS3- | Axis select BCD input bit 3 |
| 8 | SM1- | Jog speed and increment multiply BCD input bit 1 |
| 9 | SM3- | Jog speed and increment multiply BCD input bit 3 |
| 10 | SW_COM | BCD common input |
| 11 | N.C. | Not used |
| 12 | N.C. | Not used |
| 13 | ESTOP2 | Contact 2 for e-stop switch |
| 14 | HWCHA- | Manual Pulse Generator A/ input |
| 15 | HWCHB- | Manual Pulse Generator B/ input |
| 16 | A+5V | Analog 5 volts |
| 17 | A+5V | Analog 5 volts |
| 18 | AS0- | Axis select BCD input bit 0 |
| 19 | AS2- | Axis select BCD input bit 2 |
| 20 | SM0- | Jog speed and increment multiply BCD input bit 0 |
| 21 | SM2- | Jog speed and increment multiply BCD input bit 2 |
| 22 | E_STOP- | Remote box active detection |
| 23 | N.C | Not used |
| 24 | N.C. | Not used |
| 25 | ESTOP1 | Contact 2 for e-stop switch |

# BOARD DIMENSIONS AND DIAGRAMS

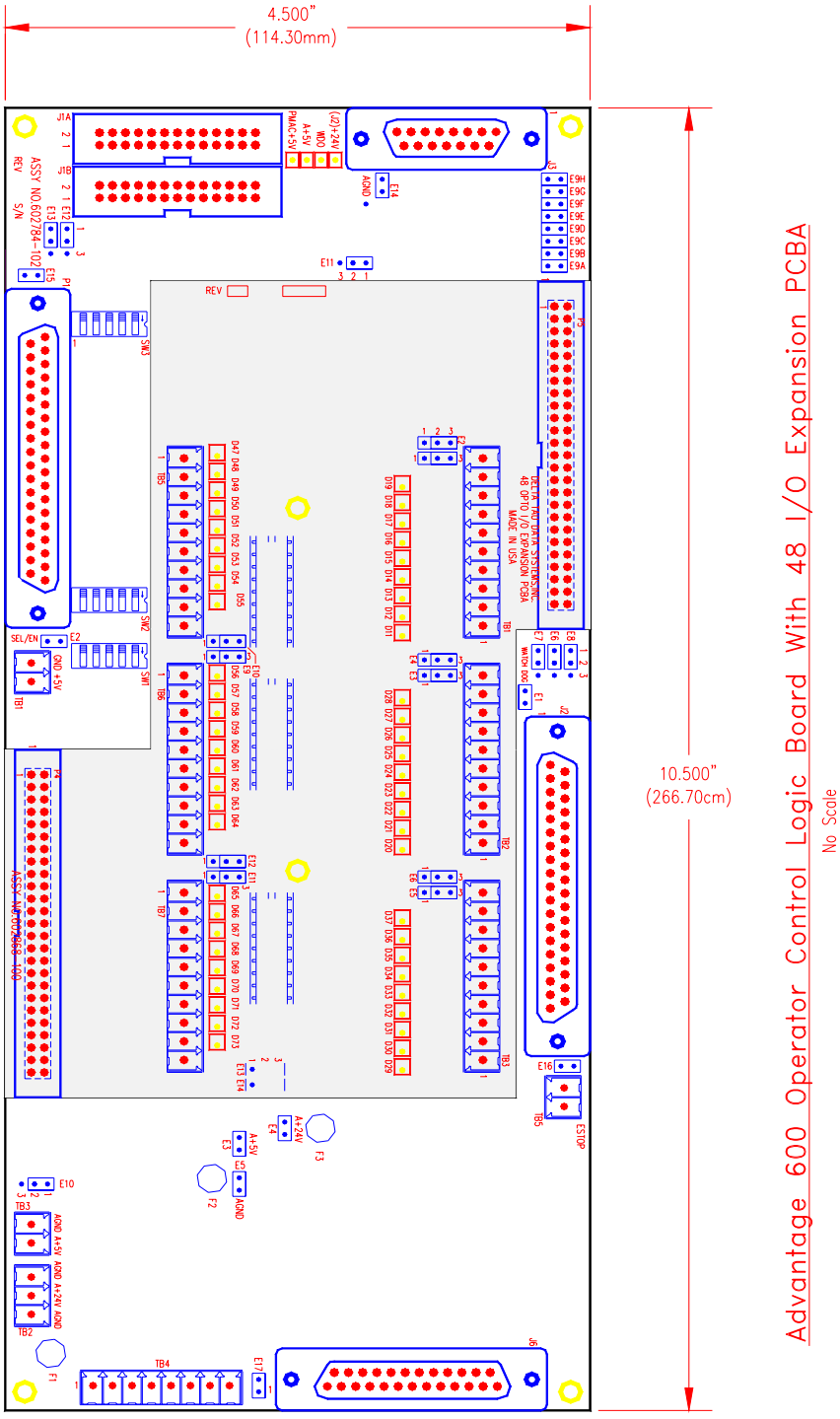
## Advantage 600 Operator Control Logic Board



# 48 Opto I/O Expansion PCBA



# Advantage 600 Operator Control Logic Board with 48 Opto I/O Expansion PCBA



# Operator Control Logic Board Wiring Diagram