



**DELTA TAU**  
Data Systems, Inc.

*NEW IDEAS IN MOTION...*

## *USER MANUAL*

# ADVANTAGE 600/700 OPERATOR CONTROL LOGIC BOARD

*P/N 300-602784-10x*

*Manual P/N 300-602784-363*

*September 1999*

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## **INTRODUCTION**

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The Advantage 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 Series CNC controllers simplify the integration of machine tools and provide extraordinary material processing performance, while 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.

### **Operator Control Panel**

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The rugged Advantage 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 CNC system, and mounts directly behind the control panel inside the Advantage operator's cabinet.

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

<b>Feature</b>	<b>Description</b>
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 +	Normally open pushbutton one input
Jog -	Normally open pushbutton one input
Cycle Start	Normally open pushbutton one input
Feed Hold	Normally open pushbutton one input
Spindle Direction CW	Normally open pushbutton one input
Spindle Direction CCW	Normally open pushbutton one input
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**, as described below.

The Advantage 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 also the optional Delta Tau **Remote Handwheel** pendant.

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

## **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 especially suited 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 LED's which inform the user whether the particular I/O point is sinking or sourcing.

## **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 8 channels of 8-bit analog input. These inputs are ideally suited for incorporating Feedrate/Spindle override potentiometers, but can also be used for other analog input. When the Advantage is ordered with the OCLB - Option 1, both the hardware and software required to integrate user-supplied external feedrate/spindle override inputs is included.

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*Note*

When the OCLB is ordered with Option 1, the number of user configurable inputs is reduced from 24 to 16.

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## **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.

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*Note*

ACC-35B has been integrated into the Advantage OCLB and does not need to be purchased separately.

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## **Remote Handwheel Box – ACC-NC1**

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### **(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**

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### **Cycle Start Pushbutton**

Either a run or step command is issued to the PMAC, provided the pushbutton is in Auto or MDI mode, the motors have been homed, the system is not currently running a program, and the system is in-position. If the system has been placed into single-step mode via the single-step toggle input, a step command is sent; otherwise, a run command is sent to the PMAC.

### **Cycle Start Lamp**

This lamp will be illuminated even if feed override is at 0%, whenever in Auto or MDI mode and PMAC-NC is in the process of a single step or running. If the system is not in Auto or MDI mode, this lamp will be off.

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#### *Note*

The lamp will be illuminated while a program is running, even if the feedrate override is at 0%.

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### **Feed Hold Pushbutton**

A feed hold is issued to the PMAC whenever the feedhold pushbutton is pressed.

### **Cycle Start Lamp**

If the system is not in Auto or MDI mode, this lamp will be off.

### **Jog Plus & 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. If the pushbutton is released before the desired increment is reached, the selected axis jog motion will not halt. If in home mode, the system will home the selected axis when the pushbutton is pressed. The operator need not hold the button during the whole homing cycle.

### **Spindle CCW & Spindle CW Pushbuttons**

When either pushbutton is pressed, the system commands 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**

This switch determines which axis is jogged or homed by the Jog Plus and Jog Minus pushbuttons.

### **Mode Select BCD switch**

This switch places PMAC-NC into the selected mode: Auto MDI, Manual continuous jog, Manual home jog or Manual incremental/handwheel jog.

**Single Block switch**

This switch places PMAC-NC into single-block mode. When in this mode PMAC NC will execute one G-Code line per press of the cycle start pushbutton.

**Block Delete SPST switch**

This switch places PMAC-NC into block delete mode. When this switch is set on, all G code lines with the “T” character will be skipped.

**Optional Stop switch**

This switch places PMAC-NC into optional stop mode. If this switch is set on and the program contains a “MOI,” the program will stop at the “MOI.”

**Coolant switch**

This switch sets bits for use with the example PLC cool600.plc included with PMAC - NC. When the switch is in the spring return position of AUTO, the coolant is switched on and off by the program. When the switch is in the momentary position of OFF, then the coolant will be switched off if it is already on. When the switch is in the momentary position of ON, then the coolant will turn on if it is not already on.

**Axis Speed Select switch**

This switch determines the increment for handwheel and incremental jogging and the speed for continuous jogging. When the switch is in the full up position, the incremental move distance is the longest. When the switch is in the middle position, the continuous jog speed is medium and the incremental move distance is between the largest and smallest distances. When the switch is in the full down position, the continuous jog speed is the slowest and the incremental jog distance is the shortest.

## **CONTROL PANEL SETUP**

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

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

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

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### *Note*

If you are purchasing a complete Advantage NC system, some or all of the preliminary configuration will have been completed for you.

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### **Step 1 - JTHW Addressing**

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PMAC communicates with the OCLB via its J3 (JTHW) multiplexer port. If you are 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**

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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 CNC controller system uses the default settings. It is advisable for any integrator to verify that the E-points are configured properly before any new installation.

<b>E-Point</b>	<b>Physical Layout</b>	<b>Configuration</b>	<b>Default</b>
E1	1    2	Disables OCLB watchdog circuit when installed	Not installed
E2	1 2	Installing disables on-board ACC. 35B Leave in when connecting directly to the (ITHW) multiplex port. Remove when using an ACC-35A	Installed
E3*	1    2	Allows 5v logic on the board to be supplied from the 24v power supply	Installed
E4*	1    2	Allows the 24v at TB2 to power the rotary switches	Installed
E5*	1    2	Allows the ground at TB2 to power the rotary switches	Installed
E6*	1    2 3	Allow ground from +24vdc to be shared with the OPTO-22 portion of board	Installed 1-2
E7*	1    2 3	Allow ground from +24vdc to be shared with rotary switches	Installed 1-2
E8*	1    2 3	Allow ground from +24vdc to be shared with lights	Installed 1-2
E9A - E9H	1 2	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 <u>not present</u> , otherwise, all jumpers to remain off.	Installed
E10*	1 2 3	Set at 1-2 if analog input option, is <u>not</u> present Set at 2-3 if analog input option, is present	Installed
E11*	1 2 3	Set at 1-2 if analog option 1 is <u>not</u> present Set at 2-3 if analog option 1 is present	Installed
E12*	1    2 3	Factory diagnostic jumpers, NEVER CHANGE	Installed 1-2
E13*	1    2 3	Factory diagnostic jumpers, NEVER CHANGE	Installed 1-2
E14	1    2	Attach J3 D-sub shell to ground	Not installed
E15	1 2	Attach P1 D-sub shell to ground	Not installed
E16	1 2	Attach J2 D-sub shell to ground	Not installed
E17	1    2	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**

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

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

Detailed descriptions of these connectors are provided at the end of this manual.

## **STEP 4 – Software Configuration**

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The Advantage 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 facilitate communication between the control panel or the OCLB with the *PMAC-NC for Windows* software.

### **If you are 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 you are configuring a *PMAC-NC Mill* 16-bit application, the file will be located in *C:\Programf\Deltatau\Nc1.xx\Mill\*.

### **If you are 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 you are configuring a *PMAC-NC Lathe* 16-bit application, the file will be located in *C:\Programf\Deltatau\Nc1.xx\Lathe\*.

These configuration files automatically download the following files to PMAC:

**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.

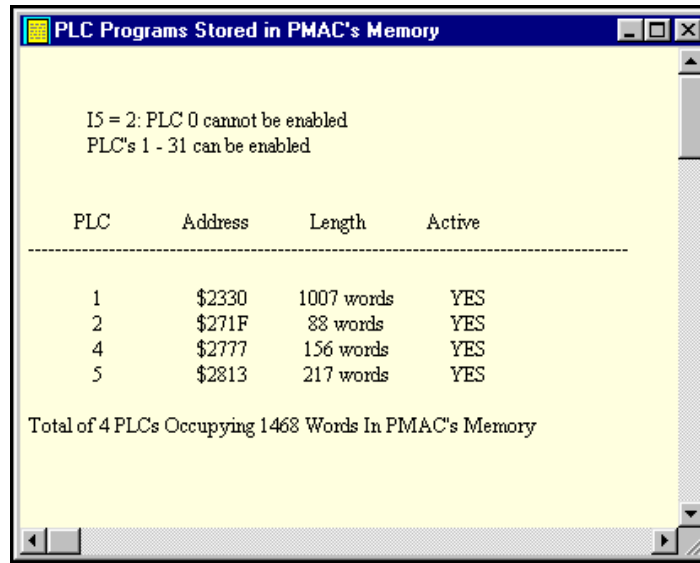
**OEM.H** – Header file definitions used by PMAC.

**OEMM.H** – Header file definitions used by PMAC.

If you intend 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 ensure your configuration will be retained through a power down/up. Check the PLC status by opening the *PLC Program Information* button from the *Status* pull-down menu in the *PMAC Executive*.

If your software configuration was successful you should see a screen with the following information:



Before you can actually start the *PMAC-NC for Windows* software, you will need to complete the setup with some application-specific details.

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

## CONTROL PANEL ANALOG INPUT

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### OPTION – 1 SETUP

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The A/D converter provides 8 channels of 8-bit analog conversion. The input voltages can be of the range 0 - 5 volts 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 Override Potentiometers

For users of PMAC-NC there is supplied code in *ADV600x.PLC* and the included file *ADV600.H* that allows you to begin using the A/D converter without having to write any code. Code for analog inputs 1 through 3 (AIN1, AIN2 and AIN3) is already in the PLC. To enable those sections of code just 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*. 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 allows you to determine what feedrate override value your system will take when the AIN1 is at 5 volts.

To use the pre-written code of *Adv600.plc* for spindle override, find the define statement *USEADC\_SPNDPOT*. Change the definition from 0 to 1. The *Adv600.plc* will use AIN2 for spindle override.

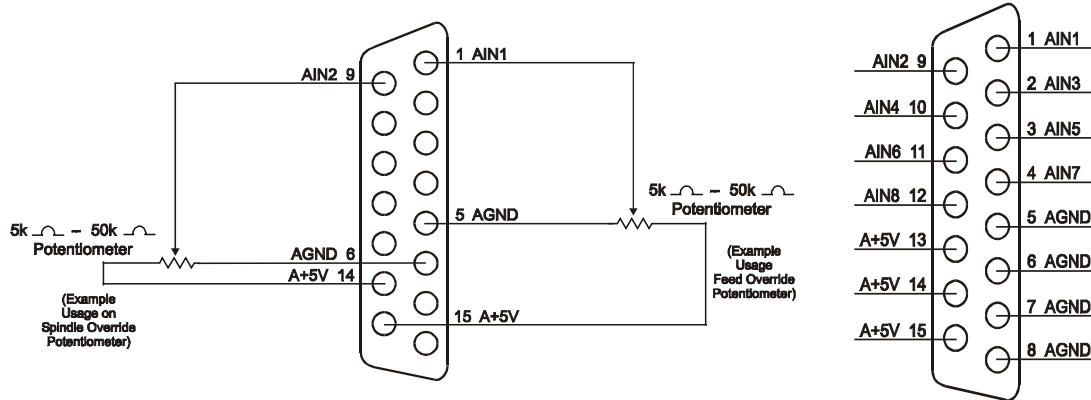
For example in *Adv600.h* change:

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

In addition, *Adv600.h* contains a macro definition for *SOVRD\_RANGE* which allows you to determine what spindle override range your system will have. The macro definition of *SOVRD\_MIN* determines the minimum value your 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 5- to 50,000-ohm potentiometer. When connected as illustrated below, pin 9 (AIN2) will see 0 to 5 volts. The



software then scales this voltage to be proportional to the minimum/maximum rotation of the knob. Pin 1 (AIN1) is treated in the same manner.

### 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, the user must 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 8 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.

User 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    // storage for analog input, AIN1
#define ADC1_P           P481    // storage for analog input, AIN2
#define ADC2_P           P482    // storage for analog input, AIN3
```

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
ADCSELENA_M = 0
ACC34_1B = OUT_1_M
```



## GENERAL PURPOSE 48 OPTO I/O CONFIGURATION

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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 contains 8 outputs and 16 inputs. J5 contains 16 outputs and 8 inputs. Combined, the OCLB provides 24 inputs and 24 outputs.

### Using Pre-Defined I/O Variables

---

User's of the Advantage 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, 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 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

Only a few definitions are necessary to read the general purpose inputs. 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 instance, 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 instance

```
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
```

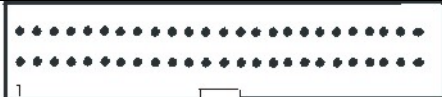
The pre-written ADV600M.PLC writes to image words in this fashion. Moreover, the header file IO600.h defines the M-variables that point to image words appropriate for the general-purpose inputs and outputs of this board.


Inputs 24 through 31 on the board are dedicated to the board's encoder counter and manual pulse generator circuits, and are not available for general-purpose inputs.

Outputs 24 - 31 also exist internally on the board, but are not available for general-purpose outputs. Outputs 24 through 27 are dedicated to option 1; 28 and 29 are dedicated to the encoder counter section. Output 30 is dedicated to the board's cycle start light, and output 31 to the board's feed hold light.

## **J4/J5 CONNECTORS - GENERAL PURPOSE I/O**

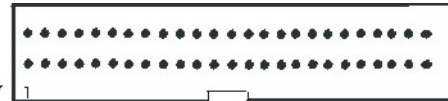
<b>J4 - (JIOA) 50-Pin Connector</b>			 Top View		
<b>Pin</b>	<b>Schematic Label</b>	<b>IO600.h Macro Definition</b>	<b>Thumbwheel Port</b>	<b>Memory Register Address</b>	<b>Input/Output Function</b>
1	OUT23	ACC34OUT1_23_ADR	Port B	X:\$DFE8,7,1	OCLB Output 23
2	AGND				Analog Ground
3	OUT22	ACC34OUT1_22_ADR	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

<b>J4 - (JIOA) 50-Pin Connector (Continued)</b>				 Top View	
Pin	Schematic Label	IO600.h Macro Definition	Thumbwheel Port	Memory Register Address	Input/Output Function
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 +5 volts
50	AGND				Analog Ground

<b>J5 - (JIOB) 50-Pin Connector</b>				 Top View	
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

**J5 - (JIOB) 50-Pin Connector  
(Continued)**

Top View



Pin	Schematic Label	IO600.h Macro Definition	Thumbwheel Port	Memory Register Address	Input/Output Function
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

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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. 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) - ULN 2803A, For sourcing (open-emitter) – UDN 2981A. The IC's have socketed receptacles for easy replacement. The I/O IC's are rated to 24V and 100mA. The I/O expansion card also provides the user with green/red status LED's which inform the user whether the particular I/O point is sinking or sourcing.

Each ten pin terminal block TB1-TB3, and TB5-TB7, will accept 8 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	
Pin	Description
1	Input 1
2	Input 2
3	Input 3
4	Input 4
5	Input 5
6	Input 6
7	Input 7
8	Input 8
9	GND
10	12 - 24V

TB-2	
Pin	Description
1	Input 9
2	Input 10
3	Input 11
4	Input 12
5	Input 13
6	Input 14
7	Input 15
8	Input 16
9	GND
10	12 - 24V

TB-3	
Pin	Description
1	Input 17
2	Input 18
3	Input 19
4	Input 20
5	Input 21
6	Input 22
7	Input 23
8	Input 24
9	GND
10	12 - 24V

TB-5	
Pin	Description
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Output 7
8	Output 8
9	GND
10	12 - 24V

TB-6	
Pin	Description
1	Output 9
2	Output 10
3	Output 11
4	Output 12
5	Output 13
6	Output 14
7	Output 15
8	Output 16
9	GND
10	12 - 24V

TB-7	
Pin	Description
1	Output 17
2	Output 18
3	Output 19
4	Output 20
5	Output 21
6	Output 22
7	Output 23
8	Output 24
9	GND
10	12 - 24V

**Note:**

User's of the Advantage 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

**Note:**

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

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 Accessory 35A (ACC-35A). The ACC-35A counterpart, Accessory 35B (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 a DB-37 male to DB-37 female cable.

### ACC-35A Connectors

Please refer to the layout diagram of ACC-35A 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) provides the link through which ACC-35A 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 +5 volt 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**. Two corresponding switches on the Control Panel, **SW1** and **SW2** respectively, 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, SW1 and SW2 on the Control Panel and on ACC-35A are all set the same:

1	2	3	4	5
open	open	open	closed	open

## **Generic Addressing Techniques**

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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, SW<sub>n-5</sub> to SW<sub>n-1</sub> (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
...						
11111	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


Please 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 +5 V 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.




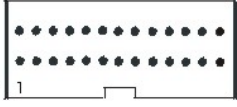


## OCLEB CONNECTORS

<b>TB1 - TB3 - Power Connectors</b>		TB1, TB2 Top View 	TB3, Top View 
<b>Terminal</b>	<b>Function</b>	<b>Power Requirements</b>	<b>Function</b>
TB1	Built In ACC 35B external power supply	5 Volts regulated	
Pin 1 - Ground	Supply only if using the on board ACC 35B and it is not to be 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.		TB1, TB2
TB2	Input supply to the 5 Volt regulator and the machine rotary switch power supply	15 - 24 Volts unregulated. Pin 1,3 - Ground	External 15-24v for the 5-Volt 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	5 Volts regulated	
Pin 1 Ground	+5 volt input (not needed except for special case)		

<p><b>TB4 - Handwheel (Manual Pulse Generator Connector)</b></p>	 <p>Top View</p>
<p><b>Pin</b></p>	<p><b>Label</b></p>
<p>1</p>	<p>HWCHA+</p>
<p>2</p>	<p>HWCHA-</p>
<p>3</p>	<p>HWCHB+</p>
<p>4</p>	<p>HWCHB-</p>
<p>5</p>	<p>AGND</p>
<p>6</p>	<p>A+5v</p>
<p>7</p>	<p>AGND</p>
<p>8</p>	<p>A+5v</p>
<p>TB4 is for interfacing the manual pulse generator, or handwheel encoder input</p>	

<p><b>TB5 - E-Stop Input</b></p>			 <p>Top View</p>
<p><b>Pin</b></p>	<p><b>Label</b></p>	<p><b>Function</b></p>	<p><b>Description</b></p>
<p>1</p>	<p>ESTOP1</p>	<p>Output</p>	<p>Provides E-Stop 1 output from J6</p>
<p>2</p>	<p>ESTOP2</p>	<p>Output</p>	<p>Provides E-Stop 2 output from J6</p>

<b>JTHW - Thumbwheel Connector</b>		 Top View	
<b>Pin</b>	<b>Symbol</b>	<b>Function</b>	<b>Description</b>
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 Line 1
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		

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

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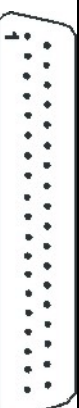
## **Operator Panel Input and Output**

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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 to be used with the PMAC-NC program. The board may be used in non-PMAC-NC applications, but then programming all the panel functions is the user's responsibility. PMAC NC comes with a PLC ADV600.PLC designed to implement all of the functions on J2.

**J2 - (JAPAN)**

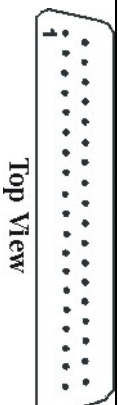
**(37-Pin Connector)**



Top View

Pin No.	Schematic Label	Adv600.h Macro Definition	Thumbwheel Port	Memory Register Address	Input/Output Function
1	MODESEL0-	SS MODED_ADR	Port A	Y:\$DFE0,0,4,U	Bit 0 - Mode select BCD switch
2	MODESEL2-	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:\$DFE0,8,4,U	Bit 8 - Spindle override BCD switch
6	SSO VR2-	SS SSOVRD_ADR	Port A	Y:\$DFE0,8,4,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 ASI-	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 SPM1TD_ADR	Port A	X:\$DEF0,12,4,U	Bit 13 - Jog speed and increment select DTSP switch 2nd input
17	ESTOP IN-	SS SPM1TD_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	MODESEL1-	SS MODED_ADR	Port A	Y:\$DFE0,0,4,U	Bit 1 - Mode select BCD switch
21	MODESEL3-	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:\$DFE0,8,4,U	Bit 9 - Spindle override BCD switch
25	SSO VR3-	SS SSOVRD_ADR	Port A	Y:\$DFE0,8,4,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

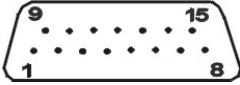
**J2 - (JAPAN)**



Top View

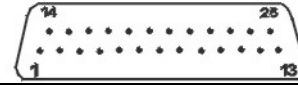
**(37-Pin Connector) (Continued)**

Pin No.	Schematic Label	Adv600.h Macro Definition	Thumbwheel Port	Memory Register Address	Input/Output Function
31	FH_LIGHT-	LT_FEED_HOLD_ADR	Port B	X:\$DDEF8,15,1	Bit 15 - Feed hold light
32	INT_AS0-	SS_AXISD_ADR	Port A	X:\$DDEF0,8,4,U	Bit 8 - Axis select BCD switch
33	INT_AS2-	SS_AXISD_ADR	Port A	X:\$DDEF0,8,4,U	Bit 10 - Axis select BCD switch
34	INT_SM0-	SS_SPM_LTD_ADR	Port A	X:\$DDEF0,12,4,U	Bit 12 - Jog speed and increment select SPDT switch 1st input
35	ONOFF_IN-	SS_SPM_LTD_ADR	Port A	X:\$DDEF0,12,4,U	Bit 14 - PC Power on/off logic
36	OGND				AGND for A+15V to +24V
37	O+V				A+15V to +24V

<p><b>J3 - (JANA) 15-pin female D-sub connector.</b></p>		<p>Top View </p>	
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

Top View



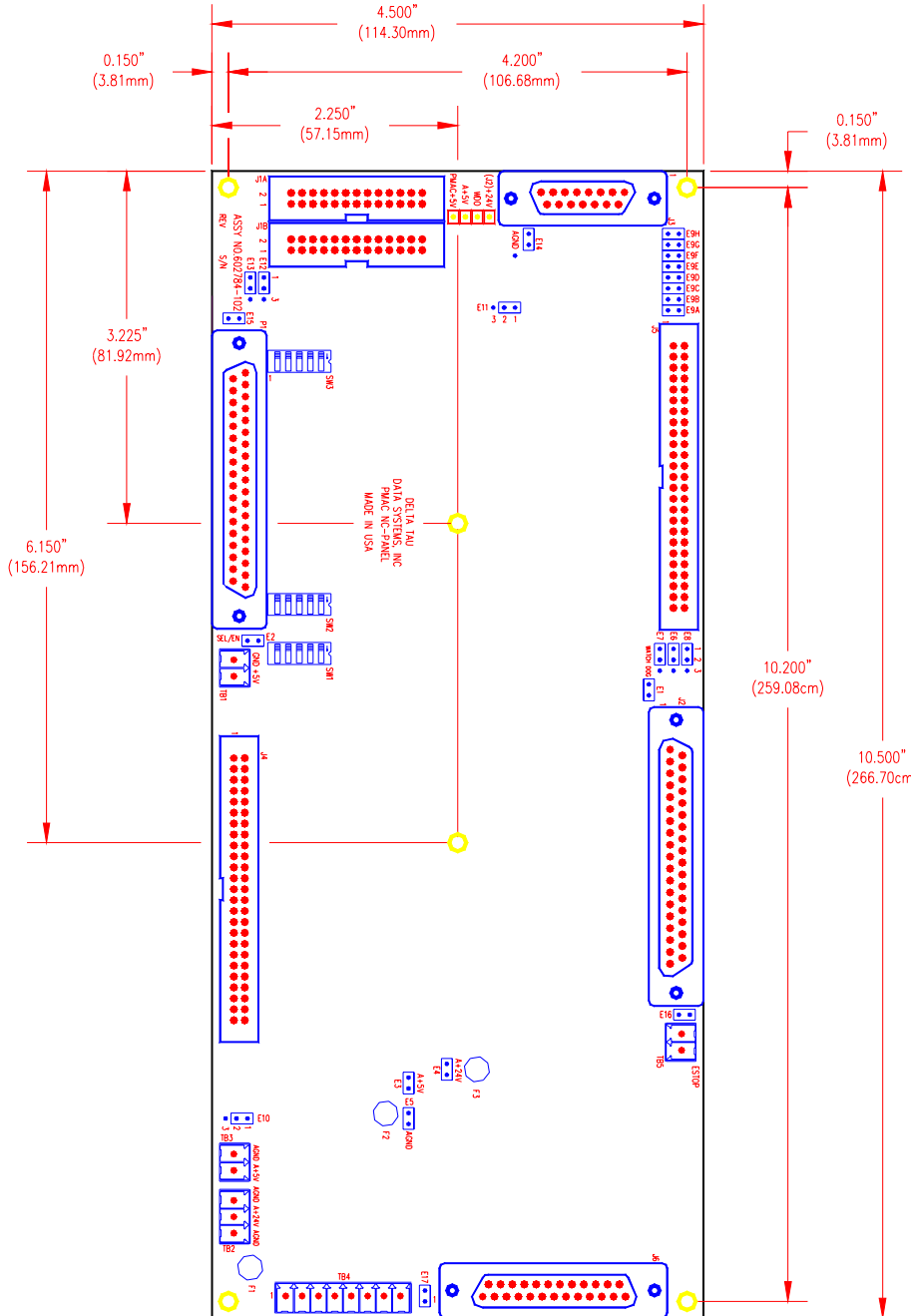
Pin	Label	Function
1	HWCHA+	Manual Pulse Generator A input
2	HWCHB+	Manual Pulse Generator B input
3	AGND	Analog common
4	AGND	Analog common
5	ENCSEL-	Enable remote handwheel box
6	AS1-	Axis select BCD input bit 1
7	AS3-	Axis select BCD input bit 3
8	SM1-	Jog speed and increment multiply BCD input bit 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

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



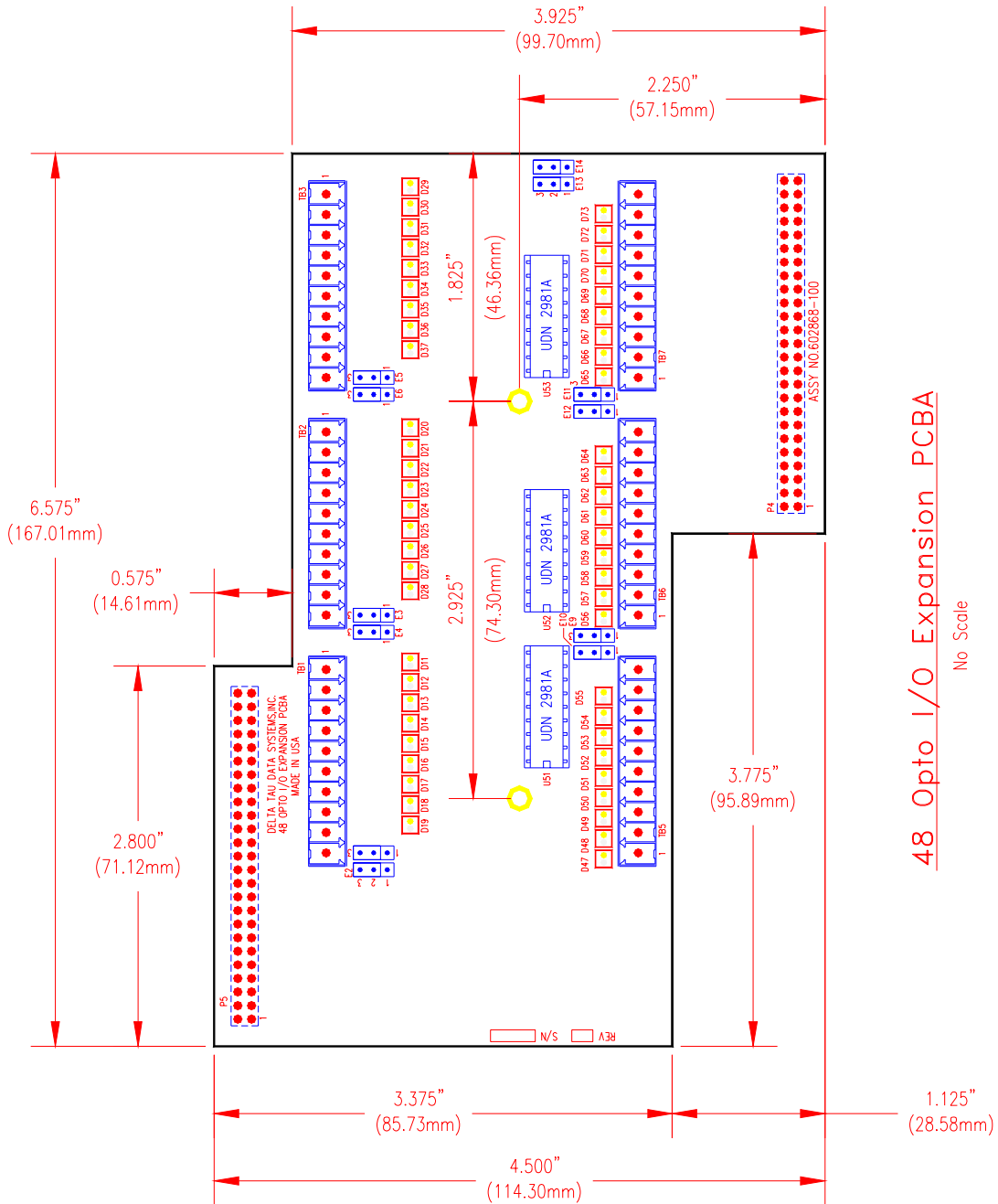
## BOARD DIMENSIONS AND DIAGRAMS

### Advantage 600 Operator Control Logic Board



Advantage 600 Operator Control Logic Board  
No. Scale

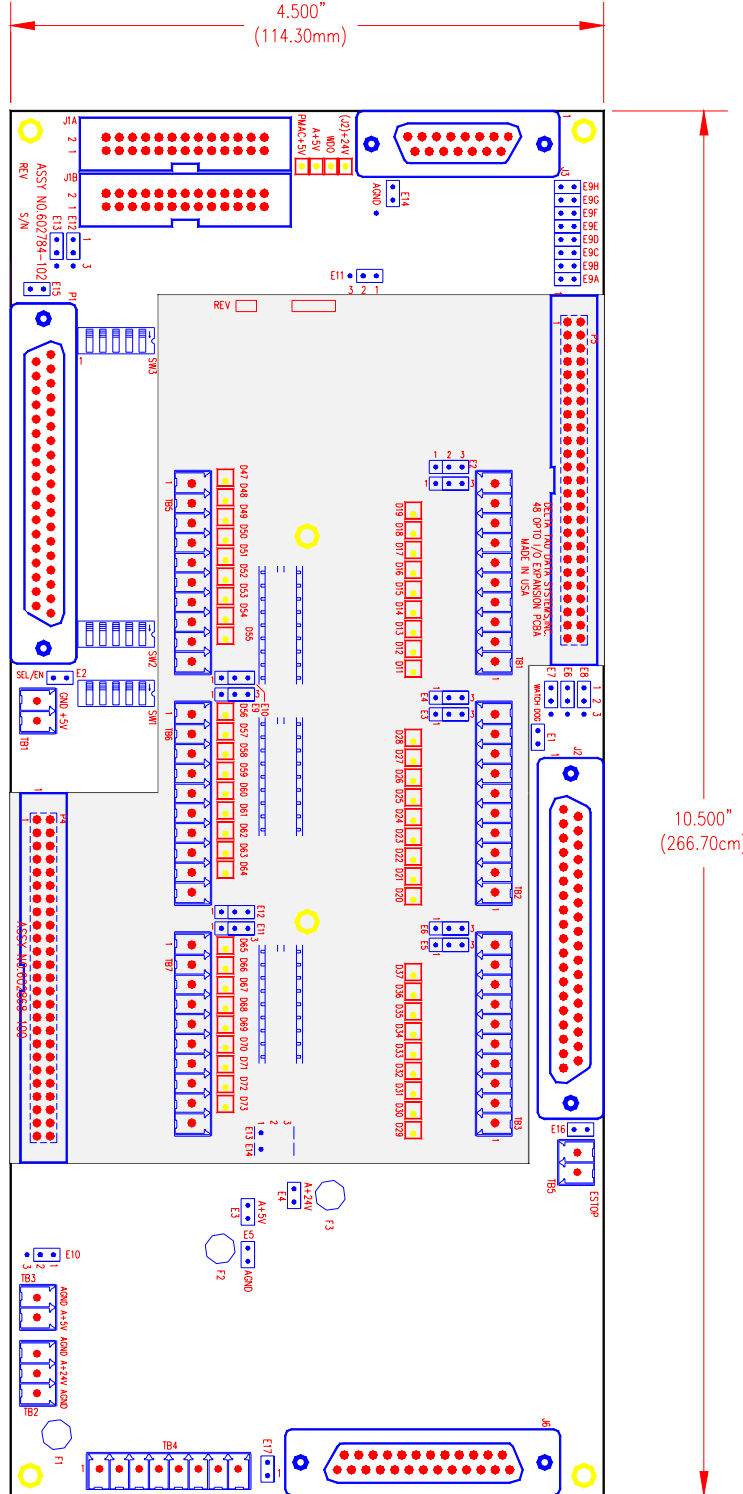
# 48 Opto I/O Expansion PCBA



48 Opto I/O Expansion PCBA

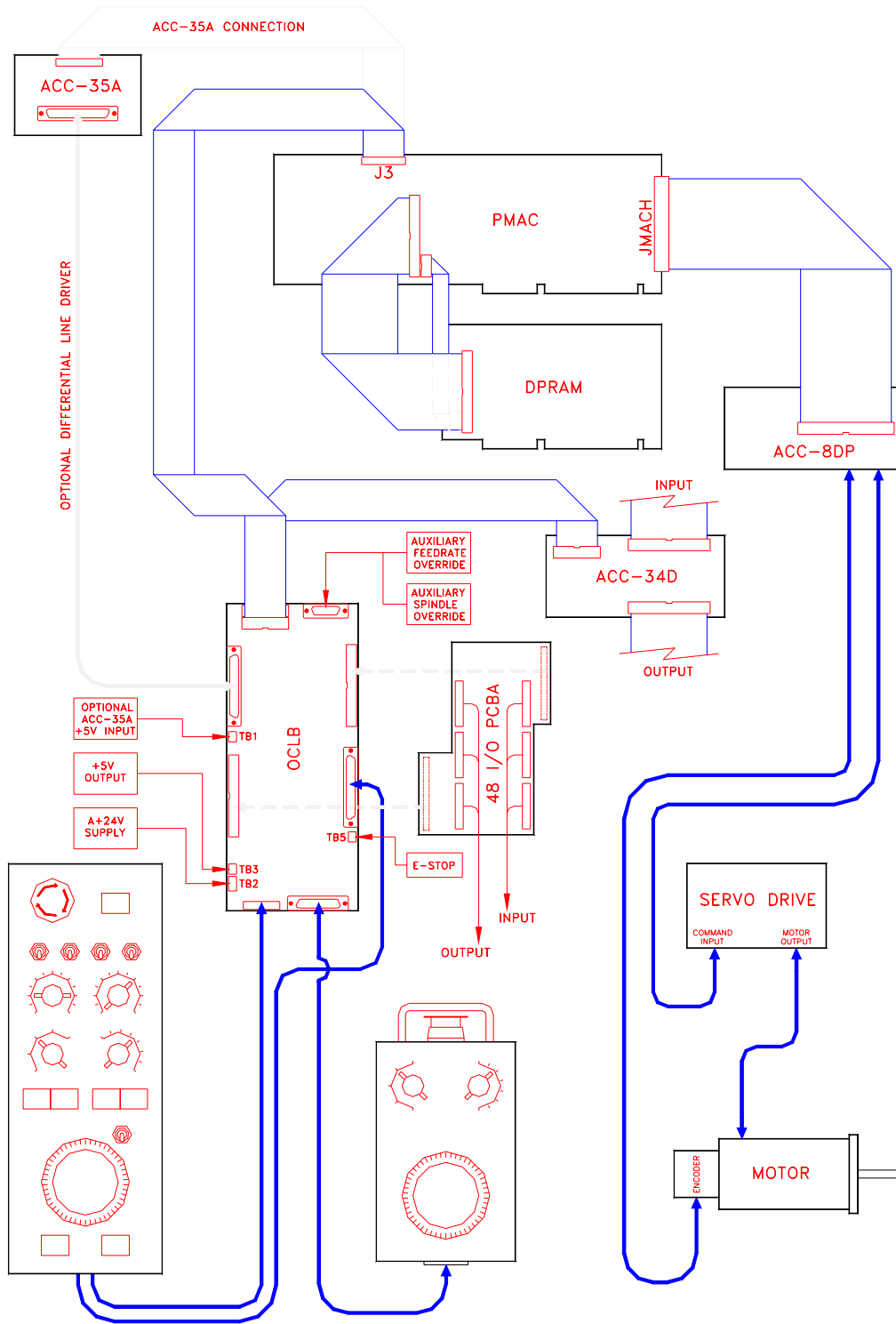
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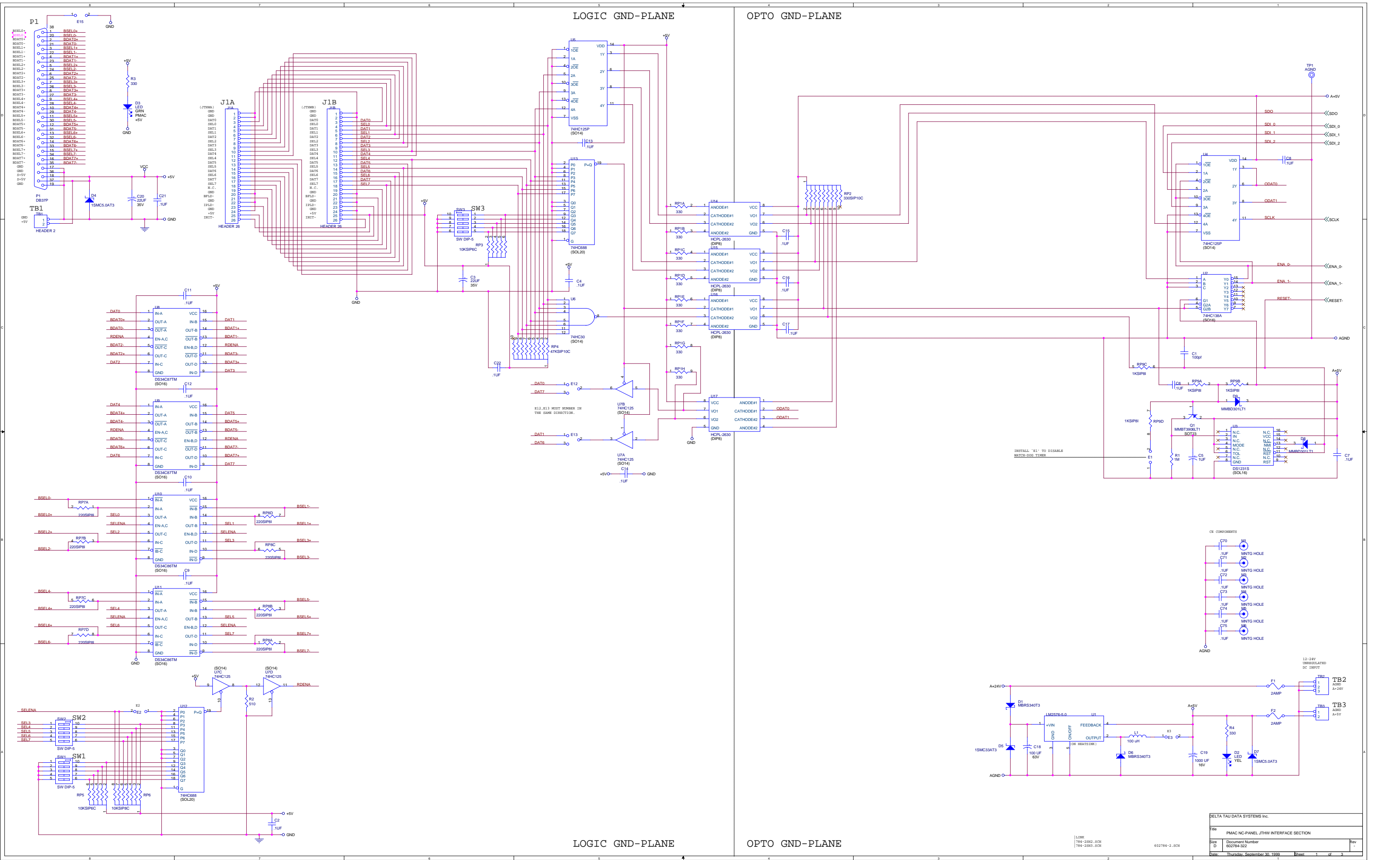
# Advantage 600 Operator Control Logic Board with 48 Opto I/O Expansion PCBA



Advantage 600 Operator Control Logic Board With 48 I/O Expansion PCBA  
No Scale

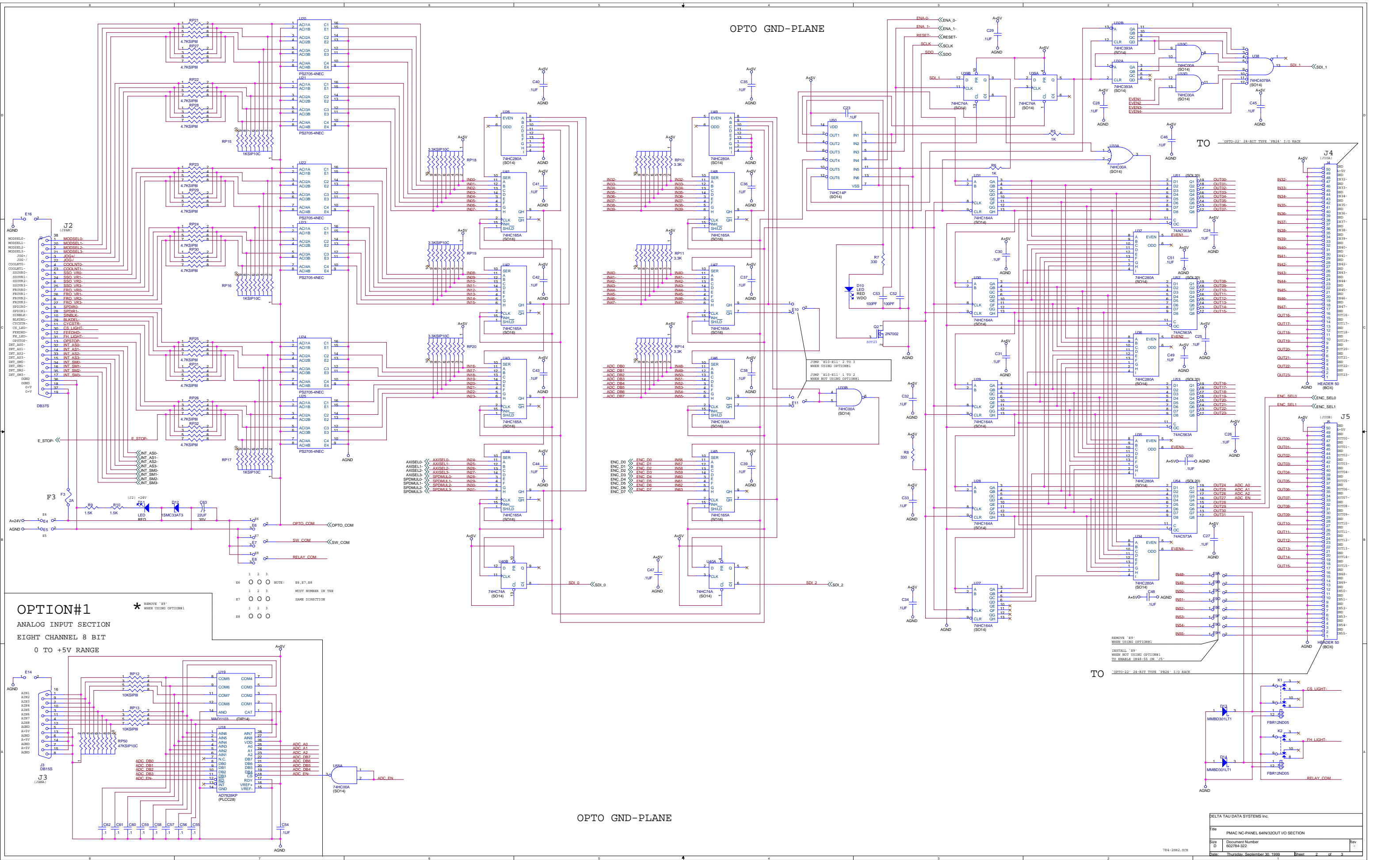
# Operator Control Logic Board Wiring Diagram



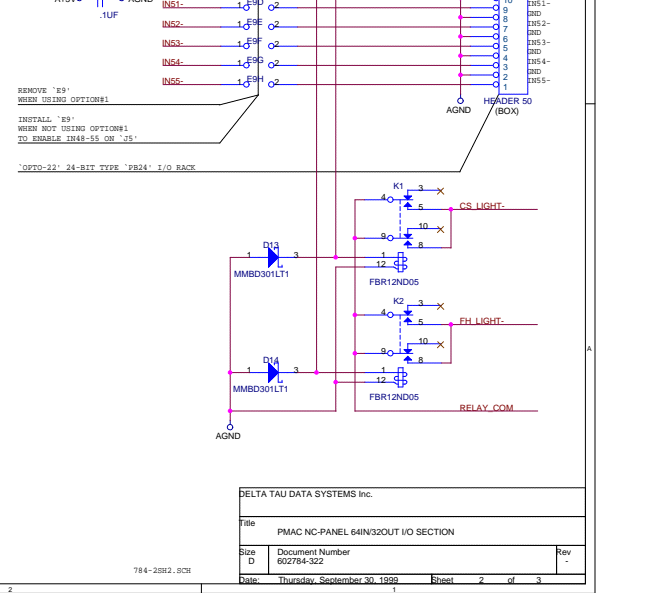
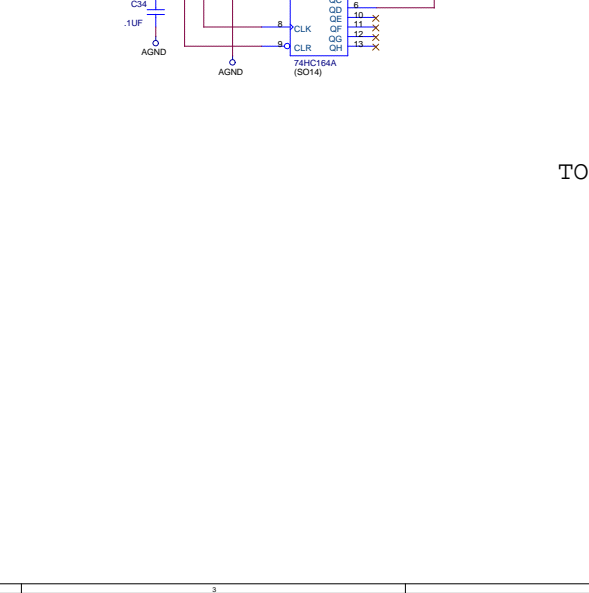
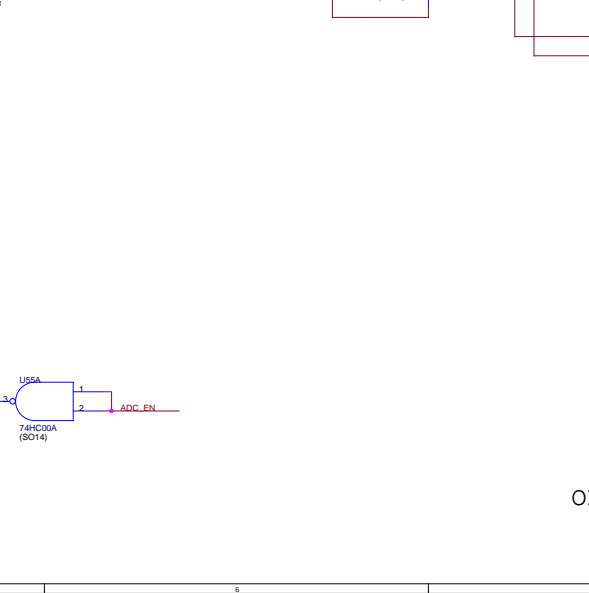
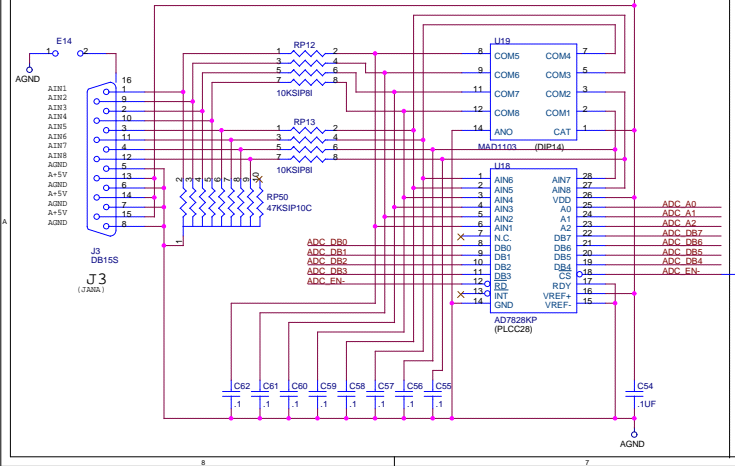


LOGIC GND-PLANE

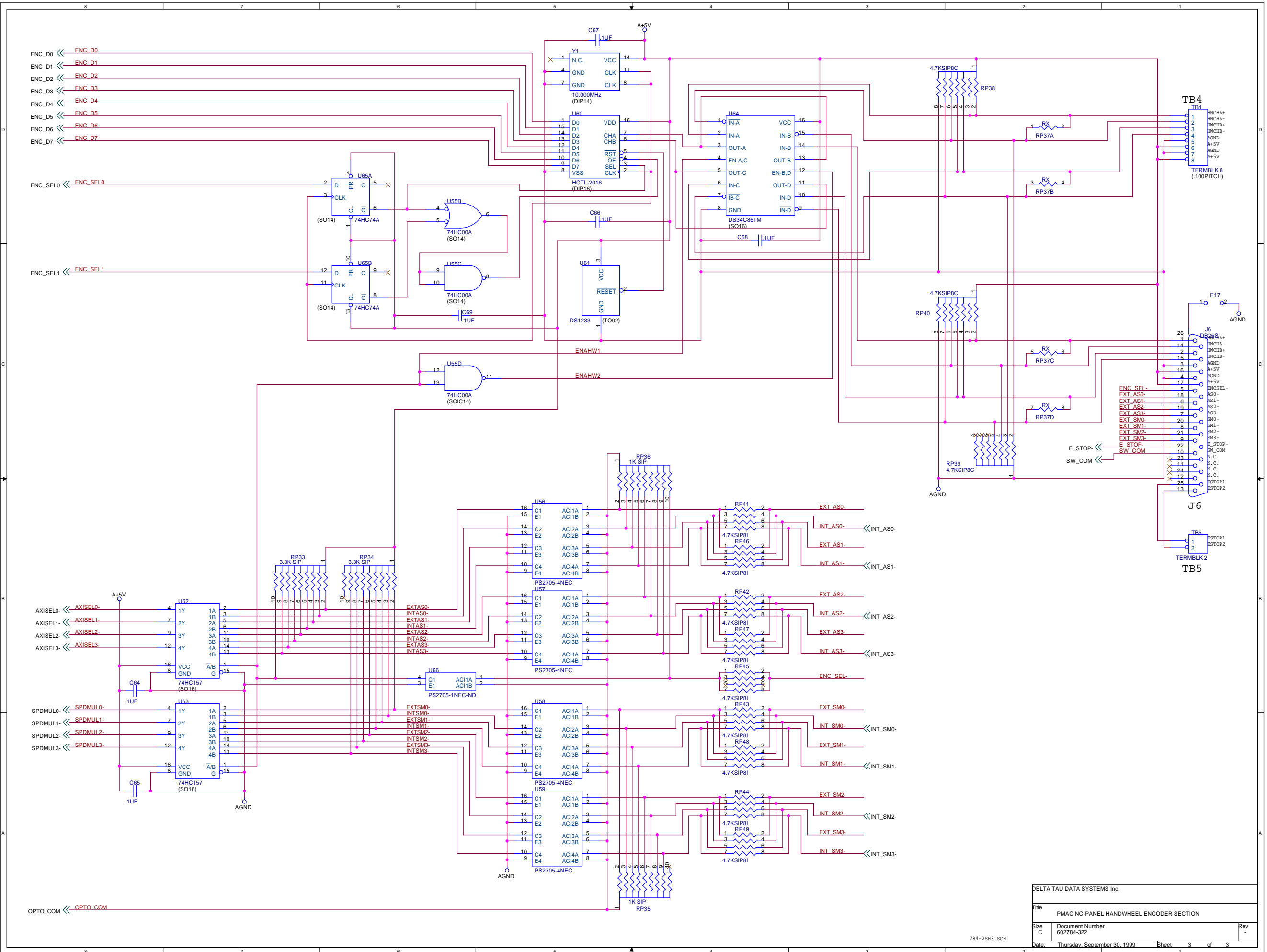
OPTO GND-PLANE



**OPTION#1**  
 ANALOG INPUT SECTION  
 EIGHT CHANNEL 8 BIT  
 0 TO +5V RANGE



OPTO GND-PLANE



DELTA TAU DATA SYSTEMS Inc.			
Title PMAC NC-PANEL HANDWHEEL ENCODER SECTION			
Size C	Document Number 602784-322	Rev -	
Date: Thursday, September 30, 1999	Sheet 3	of 3	