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1^ USER MANUAL

Accessory 65TH

Modbus/TCP-IP UR Protected/OPTO
(Sourcing 24in/24out)

3Ax-603830-xUxx

Sept. 15, 2005



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

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INTRODUCTION



The ACC-65ETH is a boxed accessory with 24 isolated self-protected digital inputs and 24 isolated self-protected digital outputs. The inputs and outputs are controlled through an Ethernet connector. The inputs are either sinking or sourcing (by user wiring) at 12V to 24V levels. The outputs are sourcing, each at up to 24VDC with 600mA continuous and 1.2A peak for up to 2 seconds. An optional set of analog inputs, analog outputs and relay contacts can be installed to control, for example, one or two inverter drives through the Ethernet Modbus/TCP-IP link.

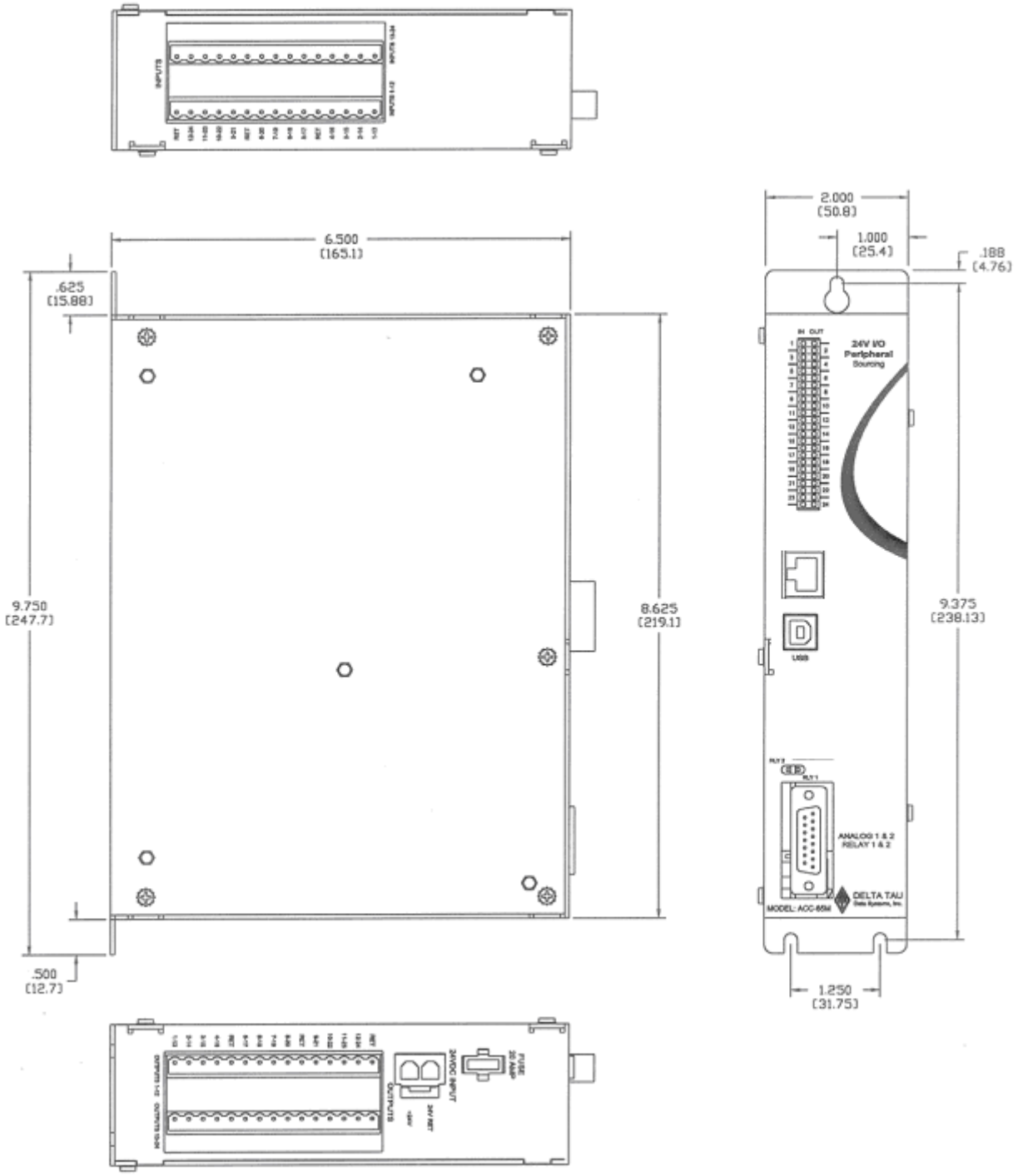
This accessory works with a PMAC or Turbo PMAC equipped with 100 Base T Ethernet system that has Modbus option installed. In addition, this product conforms to the Modbus specification other devices such as HMI, etc.

Options

- OPT-1 (301-603830-OPT): This option includes:
  - Two relay contact outputs
  - Two 12-bit DAC outputs with 0 - ±10 V voltage range
  - Two 12-bit ADC inputs with 0- ±10 V voltage range

HARDWARE REFERENCE SUMMARY

Product Layout



Connectors and Indicators

Inputs and Outputs LED Indicators

Each of the 24 input and 24 output lines has an associated LED that displays its state, either active or inactive, in the front panel of the unit.

Status LED Indicators

+24V: When lit, this LED indicates that 24V is applied to the unit.

Fuse: When lit, this LED indicates that the internal fuse protecting the external 24V is properly functional.

PWR: When lit, this LED indicates that proper power is applied to the logic circuits

Relay Status LED Indicators

RLY1: When lit, this LED indicates that relay # 1 is activated.

RLY2: When lit, this LED indicates that relay # 1 is activated.

USB Connector

This connector is used to perform some software diagnostic procedures, or to download the operational firmware.

24V Input Connector

Power is applied to the unit through this connector. The power requirements are 25A @ 24VDC

Ethernet Connector

Utilizes a Modbus/TCP-IP protocol to read from and write to all I/O.

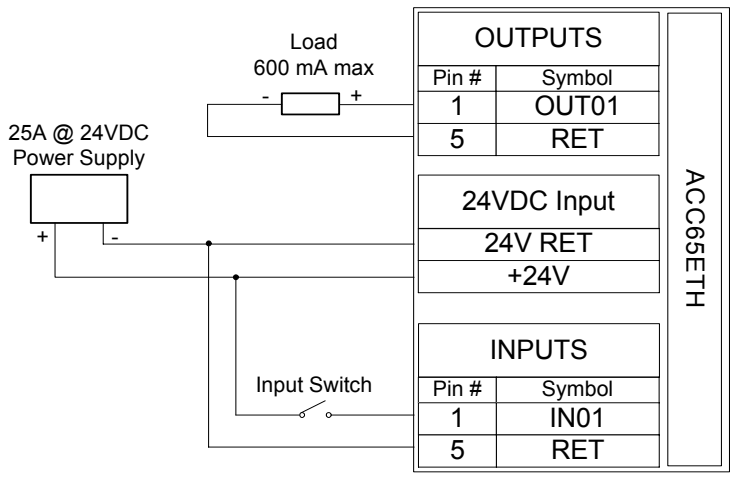
DB-15 Option-1 Connector

When OPT-1 is ordered this connector provides the lines for two relay contact outputs, two 12-bit DAC outputs with 0-20 V voltage range and two 12-bit ADC inputs with 0-20 V voltage range.

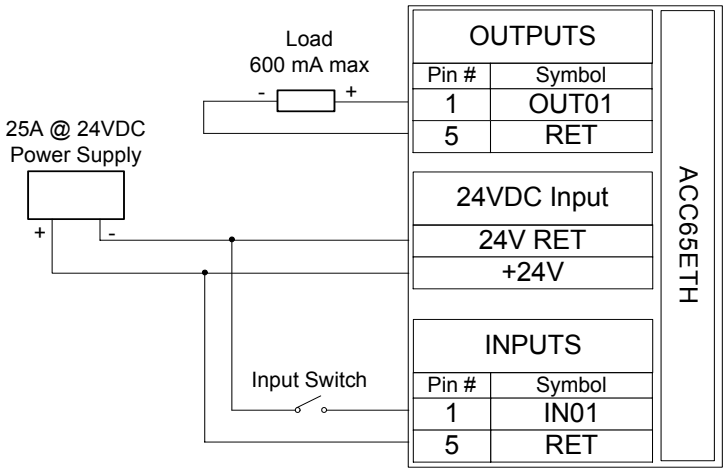
Inputs and Outputs Terminal Blocks

The digital inputs are connected through a 30-pin terminal block on the top panel of the unit, and the digital outputs are connected through a 30-pin terminal block on the bottom panel of the unit.

Connections Example: Sourcing Inputs and Sourcing Outputs



Connections Example: Sinking Inputs and Sourcing Outputs



JUMPERS DESCRIPTION

E1: USB/Ethernet Micro Controller Firmware reload enable

Jumper Type	Description	Default
2-Pin	**Micro Controller Firmware reload enable –** Factory default position is ON, and it should remain ON. If the firmware was corrupted due to a previous firmware download, the card firmware may be reloaded by powering on the card with the jumper off, installing the jumper without powering off, then downloading firmware with out powering off. Under normal circumstances, this jumper should be on even when upgrading firmware.	Jumpered

CONNECTORS DESCRIPTION

USB Universal Serial Bus Port

Pin #	Symbol	Function
1	VCC	N.C.
2	D-	DATA-
3	D+	DATA+
4	GND	GND
5	SHELL	SHIELD
6	SHELL	SHIELD

This connector is only used to change the operational firmware. In addition, if the IP address is forgotten, the EEPROM containing the IP address and configuration data can be programmed using the USB connector.

24VDC Input

Symbol	Function
24V RET	GND
+24V	+24V

This connector is used to power the unit with a 25A @ 24VDC power supply.

Ethernet Copper Connectors



Front View

Pin #	Symbol	Description
1	TX +	Transmit Output
2	TX -	Transmit Output
3	Unused	
4	Unused	
5	Unused	
6	Unused	
7	RX +	Receive Input
8	RX -	Receive Input
Amber LED	Activity	Blinking indicates transmit/receive activity
Green LED	Link	Solid Green indicates a valid connection

The cable used for the Ethernet wired connections is CAT5. When wired to a hub/switch, a straight-through 8 conductor cable can be used. When wired directly to a UMAC, a crossover cable must be used.

A solid green LED indicates a valid Ethernet hardware connection exists. A blinking amber LED indicates Ethernet traffic is present on the wire.

Inputs Connector: 30-pin Terminal Block

PIN #	SYMBOL	FUNCTION
1	IN01	INPUT 1
2	IN02	INPUT 2
3	IN03	INPUT 3
4	IN04	INPUT 4
5	RET	RETURN FOR INPUTS 1-8
6	IN05	INPUT 5
7	IN06	INPUT 6
8	IN07	INPUT 7
9	IN08	INPUT 8
10	RET	RETURN FOR INPUTS 1-8
11	IN09	INPUT 9
12	IN10	INPUT 10
13	IN11	INPUT 11
14	IN12	INPUT 12
15	RET	RETURN FOR INPUTS 9-16
16	IN13	INPUT 13
17	IN14	INPUT 14
18	IN15	INPUT 15
19	IN16	INPUT 16
20	RET	RETURN FOR INPUTS 9-16
21	IN17	INPUT 17
22	IN18	INPUT 18
23	IN19	INPUT 19
24	IN20	INPUT 20
25	RET	RETURN FOR INPUTS 17-24
26	IN21	INPUT 21
27	IN22	INPUT 22
28	IN23	INPUT 23
29	IN24	INPUT 24
30	RET	RETURN FOR INPUTS 17-24

The inputs are sinking or sourcing by user wiring. For sinking inputs, connect the +24V side of the power supply to the corresponding return line. For sourcing inputs, connect the GND side of the power supply to the corresponding return line. See the **Connections Example** diagrams on pages 4-5 of this manual for details.

Outputs Connector: 30-pin Terminal Block

Pin #	Symbol	Function
1	OUT01	OUTPUT 1
2	OUT02	OUTPUT 2
3	OUT03	OUTPUT 3
4	OUT04	OUTPUT 4
5	RET	RETURN FOR OUTPUTS 1-8
6	OUT05	OUTPUT 5
7	OUT06	OUTPUT 6
8	OUT07	OUTPUT 7
9	OUT08	OUTPUT 8
10	RET	RETURN FOR OUTPUTS 1-8
11	OUT09	OUTPUT 9
12	OUT10	OUTPUT 10
13	OUT11	OUTPUT 11
14	OUT12	OUTPUT 12
15	RET	OUTPUTS RETURN
16	OUT13	OUTPUT 13
17	OUT14	OUTPUT 14
18	OUT15	OUTPUT 15
19	OUT16	OUTPUT 16
20	RET	OUTPUTS RETURN
21	OUT17	OUTPUT 17
22	OUT18	OUTPUT 18
23	OUT19	OUTPUT 19
24	OUT20	OUTPUT 20
25	RET	OUTPUTS RETURN
26	OUT21	OUTPUT 21
27	OUT22	OUTPUT 22
28	OUT23	OUTPUT 23
29	OUT24	OUTPUT 24
30	RET	OUTPUTS RETURN

The outputs are always sourcing type. Pins 5, 10, 15, 20, 25 and 30 are internally connected. See the **Connections Example** diagrams on pages 4-5 of this manual for details.

OPT-1: DB-15 Connector

Pin #	Symbol	Function
1	GND	COMMON GROUND
2	ADC1+	ANALOG INPUT 1+
3	ADC2+	ANALOG INPUT 2+
4	DAC1+	ANALOG OUTPUT 1+
5	DAC2+	ANALOG OUTPUT 2+
6	RLY -NC-1	NORMALLY CLOSE RELAY 1
7	RLY -COM-2	COMMON RELAY 2
8	RLY -NO-2	NORMALLY OPEN RELAY 2
9	ADC1-	ANALOG INPUT 1-
10	ADC2-	ANALOG INPUT 2-
11	DAC1-	ANALOG OUTPUT 1-
12	DAC2-	ANALOG OUTPUT 2-
13	RLY -COM-1	COMMON RELAY 1
14	RLY -NO-1	NORMALLY OPEN RELAY 1
15	RLY -NC-2	NORMALLY CLOSE RELAY 2

When OPT-1 is ordered this connector provides the lines for 2 relay contact outputs: 2 x 12-bit DAC outputs with 0-±10 V voltage range, and 2 x 12-bit ADC inputs with 0-±10 V voltage range.

SOFTWARE DESIGN & SETUP

ACC65-ETH Modbus Server Description

Supported Modbus Function Codes (FC's):

FC	COMMAND DESCRIPTION
3	READ MULTIPLE REGISTERS X 4 WORDS
16	WRITE MULTIPLE REGISTERS X 4 WORDS
1	READ COILS X 24 COILS
2	READ INPUT DISCRETES X 24 DISCRETES
4	READ INPUT REGISTERS X 4 WORDS
5	WRITE ONE COIL
6	WRITE A SINGLE REGISTER
15	WRITE MULTIPLE COILS X 24 COILS
23	READ & WRITE MULTIPLE REGISTERS X 4 WORDS

ACC-65ETH I/O Modbus Memory Map

HARDWARE I/O	MODBUS WORD REFERENCE #	MODBUS INPUT DISCRETE AND COIL REVERENCE #
DIGITAL INPUTS 16 - 1	0	INPUT DISCRETES 15 - 0
DIGITAL INPUTS 24 - 17 (INPUT 25 = 24VOK)	1	INPUT DISCRETES 23 - 16 (INPUT 24 = 24VOK, 26 - 32 ARE ZERO)
ANALOG INPUT 1 (12 BIT ADC)	2 (LOWER 12 BITS ARE DATA, UPPER 4 BITS STATUS)	NA
ANALOG INPUT 2 (12 BIT ADC)	3 (LOWER 12 BITS ARE DATA, UPPER 4 BITS STATUS)	NA
DIGITAL OUTPUTS 16 - 1	4	INPUT/OUTPUT COILS 15 - 0
DIGITAL OUTPUTS 24 - 17 (OUTPUT 25 = RELAY1 ON, OUTPUT 26 = RELAY2 ON AND REMAINING BITS 27-32 ARE NOT USED)	5	INPUT/OUTPUT COILS 23 - 16 (COIL 24 = RELAY1 ON, COIL 25 = RELAY2 ON AND REMAINING COILS 26-31 ARE NOT USED)
ANALOG OUTPUT 1 (12 BIT DAC)	6 (UPPER 12 BITS ARE NOT USED)	NA
ANALOG OUTPUT 2 (12 BIT DAC)	7 (UPPER 12 BITS ARE NOT	NA

	USED)	

Suggested PMAC ACC-65ETH I/O Memory Map

PMAC ADDRESS (I67 +)	PMAC MODBUS REGISTER REF. #	PMAC MODBUS DISCRETE/COIL REF. #	ACC-65E MODBUS REGISTER (DISCRETE - COIL) REF. #	PMAC X: MEMORY PARAMETER	PMAC Y: MEMORY PARAMETER
$90	32/33	512 - 535	0/1 (0-23)	DIGITAL INPUTS 15 – 0	24VOK & DIGITAL INPUTS 23 – 16
$91	34/35		2/3	ADC INPUT 1	ADC INPUT 2
$92	36/37	576 - 599	4/5 (0-23)	DIGITAL OUTPUTS 15 – 0	RLY1, RLY2 & DIGITAL OUTPUTS 23 – 16
$93	38/39		6/7	DAC OUTPUT 1	DAC OUTPUT 2

Suggested PMAC Modbus Client Command List for above Memory Map

MODBUS FUNCTION CODE	MODBUS REFERENCE #	PMAC REFERENCE #	MODBUS COUNT
23 READ/WRITE – WRITE	4	36	4
23 READ/WRITE – READ	0	32	4

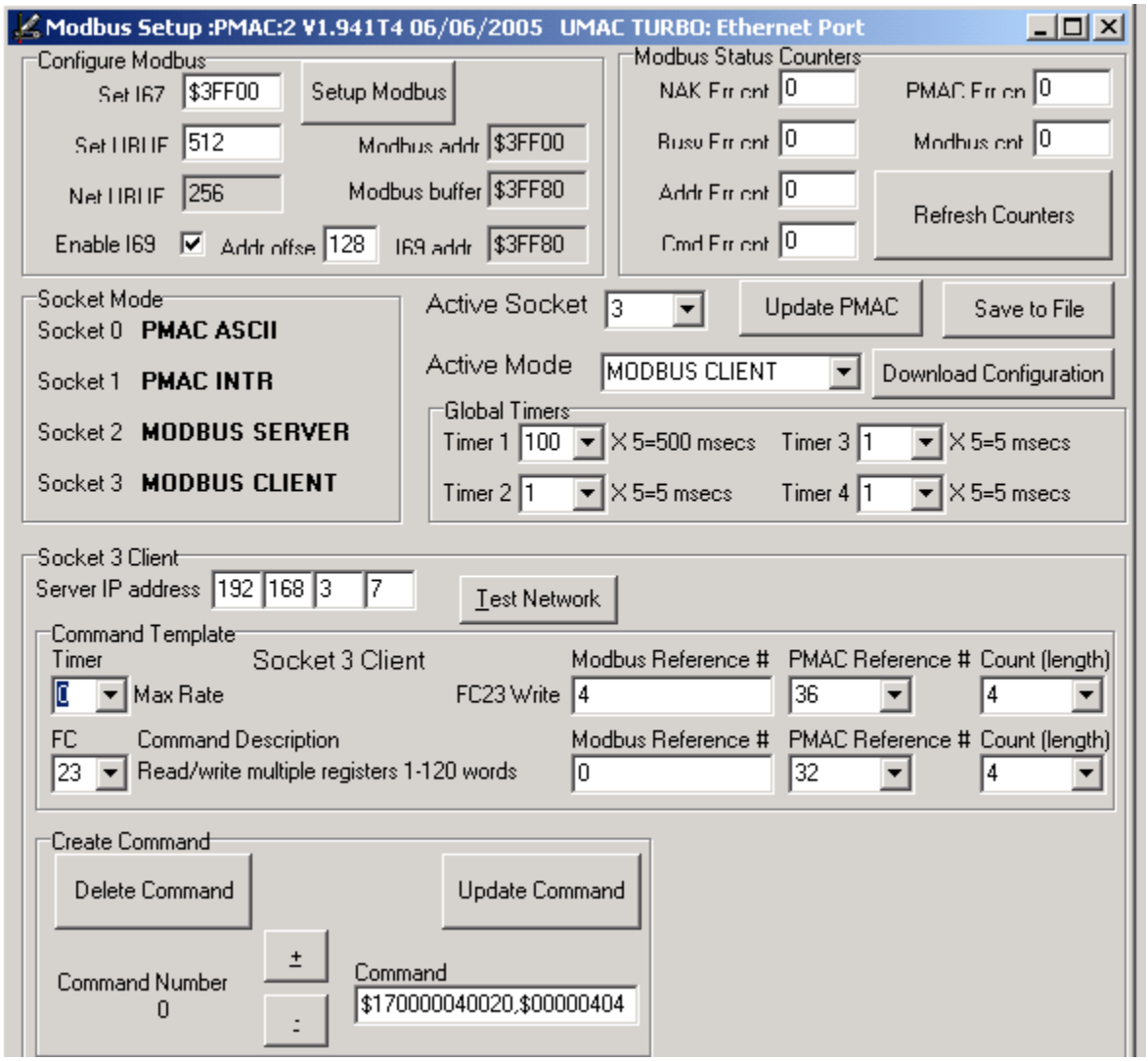
This will process all the Inputs and Outputs in one Modbus command. This Modbus Client command is required to transfer all the I/O data to/from the PMAC and the ACC-65ETH I/O board via Modbus/TCP-IP.

Using PeWinPro2 for Setting up Modbus

Note

The start of the PMAC Modbus Memory (I67) is in the upper 256 x 48 bit words of a PMAC USER Buffer. This will vary given the PMAC but will remain fixed for a given PMAC type and memory. The PMAC Modbus Server/Client buffer is in the upper 128 x 48 bit words, thus always at I67 + $80. Our suggested memory mapping for the ACC-65ETH is at I67 + $90 leaving the $80 - $8F for another PMAC Modbus feature used by I69. I69 allows the developer to directly control the PMAC without PLCs.

Select the PMAC that will be the Modbus/TCP-IP Client (the Master). Then select the **Configure->Modbus Setup** window. You should see a screen similar to the following after configuring your PMAC for Modbus communication.



- First select **Setup Modbus**. You may get another value for your Modbus address.
- **Enable I69** and set **Addr. Offs = 128** if you are going to use that feature.
- Setup one of **Sockets 1-3** as a **Client**.
- If you are using the recommended memory map, set up the above recommended **Client Command.**
- Set the **Server IP Address = 192.6.94.50** or your **ACC-65ETH IP address.**
- Select **Test Network** you should have a success if your ACC-65ETH is connected to your network. This button will test (Ping) and connect (Route) your ACC-65ETH IP address on your network.
- Select the **Update PMAC** button and the PMAC should now be communicating with your ACC-65ETH.
- Select the **Active Socket** that is a **Client** and then select **Refresh Counters**. The **Modbus cnt** should be counting if you are communicating with the **ACC-65ETH**.
- If not use **PeWinPro2** to test (Ping and Routing) your Ethernet network with the **ACC-65ETH**.

Using ACC-65ETH Discrete Inputs and Outputs

Example: Using the suggested ACC65-ETH memory map and an I67 = $3FF00, the I/O memory would be at $3FF90 - $3FF93. For the discrete I/O the user could use a DP (32 bit) type M-variable or a variation of the 1-16 bit types. For a 32 bit M-variable, one must remember that the first 16 bit of the I/O would be in the upper 32 bits.

```
M300->X:$3FF92,0,16          ; Discrete Outputs 1 - 16 (LSbit = Output 1)
M301->Y:$3FF92,0,8           ; Discrete Outputs 17 - 24

M400->X:$3FF90,0,16          ; Discrete Inputs 1 - 16 (LSbit = Input 1)
M401->Y:$3FF90,0,8           ; Discrete Inputs 17 - 24
```

Using the ACC-65ETH ADC Inputs & DAC Outputs

Example: Using the suggested ACC65-ETH memory map and an I67 = $3FF00, the I/O memory would be at $3FF90 - $3FF93. For the analog I/O the user must use the 12 bit M-variable type

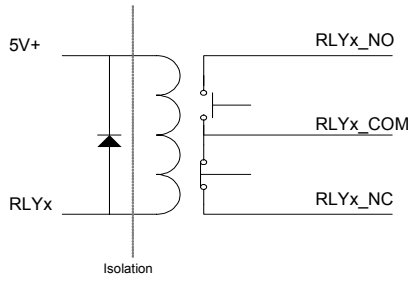
```
M320->X:$3FF93,0,12          ;DAC Output 1
M321->Y:$3FF93,0,12          ;DAC Output 2

M420->X:$3FF91,0,12          ;ADC Input 1
M421->Y:$3FF91,0,12          ;ADC Input 2
```

Using the ACC-65ETH Relay Contact Outputs

There are two relays (RLY1 and RLY2) each with a Normally Open (NO) and a Normally Closed (NC) relay contact. For an I67 = $3FF00 and the suggested PMAC memory map, the following M-variables will allow you to control these relays. See the Opt-1: DB-15 Connector for the hardware connection.

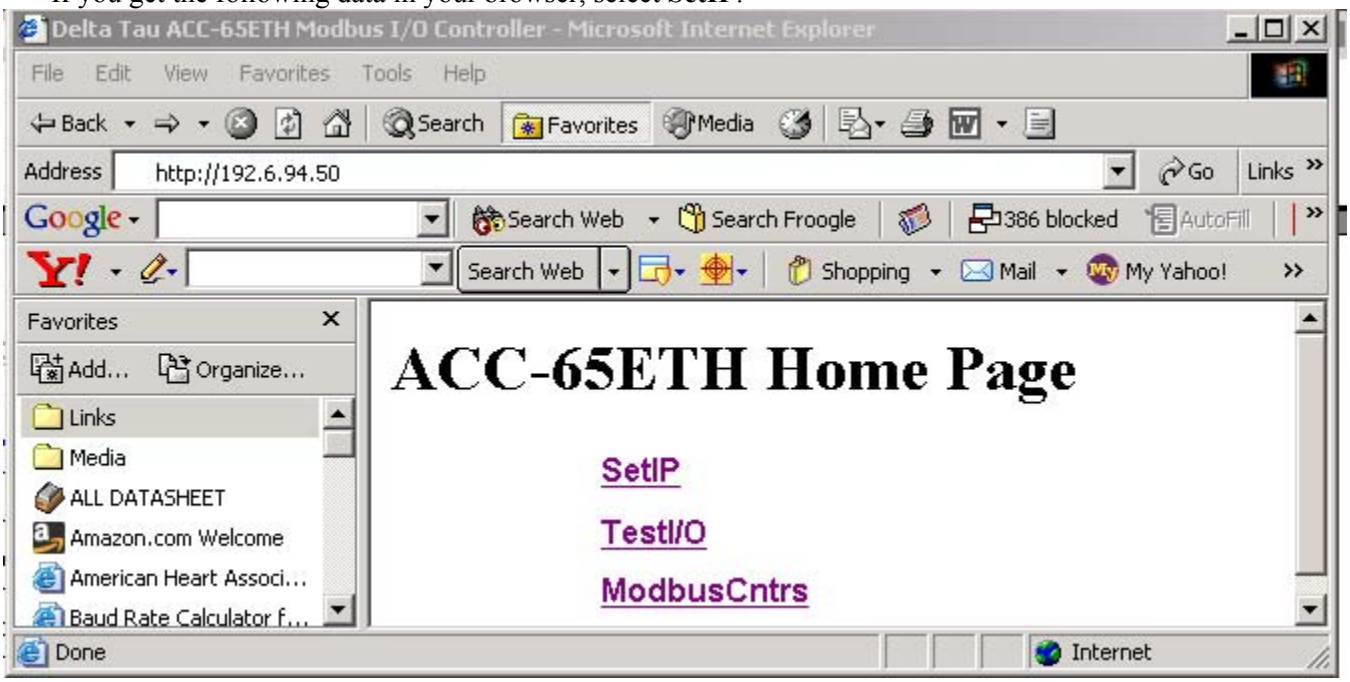
```
M310->Y:$3FF92,8      ; RLY1 Enable (1 = ON)
M311->Y:$3FF92,9      ; RLY2 Enable (1 = ON)
```



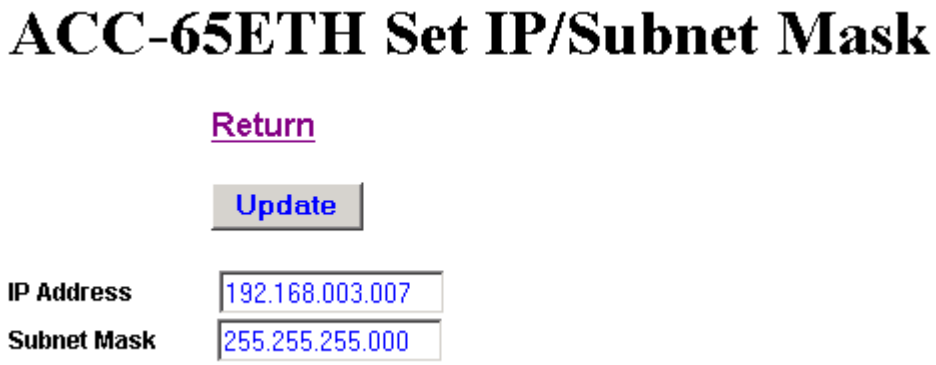
Setting up your IP Address for the ACC-65ETH Card

To update the IP address of the ACC-65ETH, do the following:

- Load your Web browser and type in the Address: http://192.6.94.50 (the default) or its current IP address.
- If you get "This page cannot be displayed" go to PewinPro2 for help in testing your Ethernet connection and setting up your Routing address table.
- If you get the following data in your browser, select **SetIP**.



- You should get the following screen.

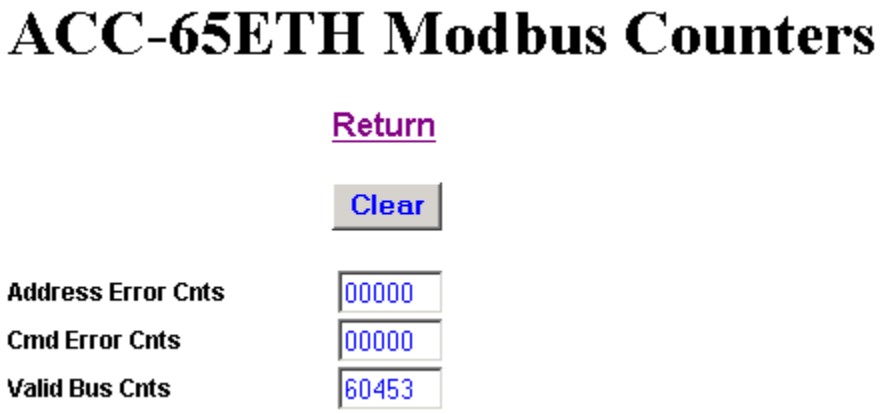


- Change the current IP and or Subnet Mask addresses and then select the **Update** button.
- You must recycle power to the ACC-65ETH card for the new addressing to take effect.
- Don't forget your new IP address because otherwise you will not be able to connect to the card over Ethernet. If you do, you must use the USB firmware downloader to determine or set your IP address.

Viewing your Modbus Status Counters

To view the Modbus Counters do the following:

- Selecting **ModbusCntrs** should show the following data:

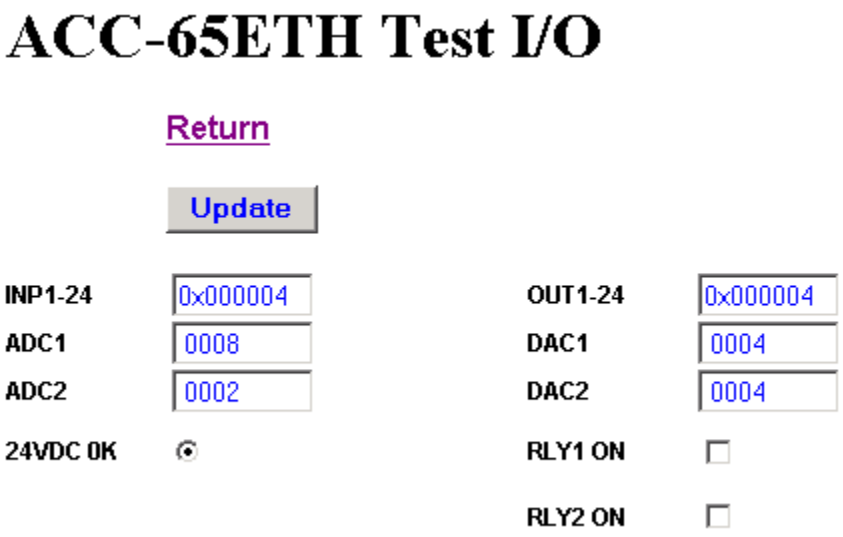


- Select the browser **Refresh** button to update the counters.
- Select the **Clear** button to clear the counters.

Testing the ACC-65ETH I/O

To test the I/O independently of Modbus do the following:

- Selecting **TestIO** should show the following data:



- Selecting the browser's **Refresh** button allows you to observe the last outputs and current inputs. This is useful and allowed during Modbus communication. So as to not overload the processor, allow at least one to two seconds between refreshing the displayed I/O.
- Enter the desired outputs on the right side of the page and then select the **Update** button. The outputs and inputs will be updated at the card and in the display registers.
- Select the browser's **Refresh** button or the Web Server **Update** button to output your selections and update the inputs.

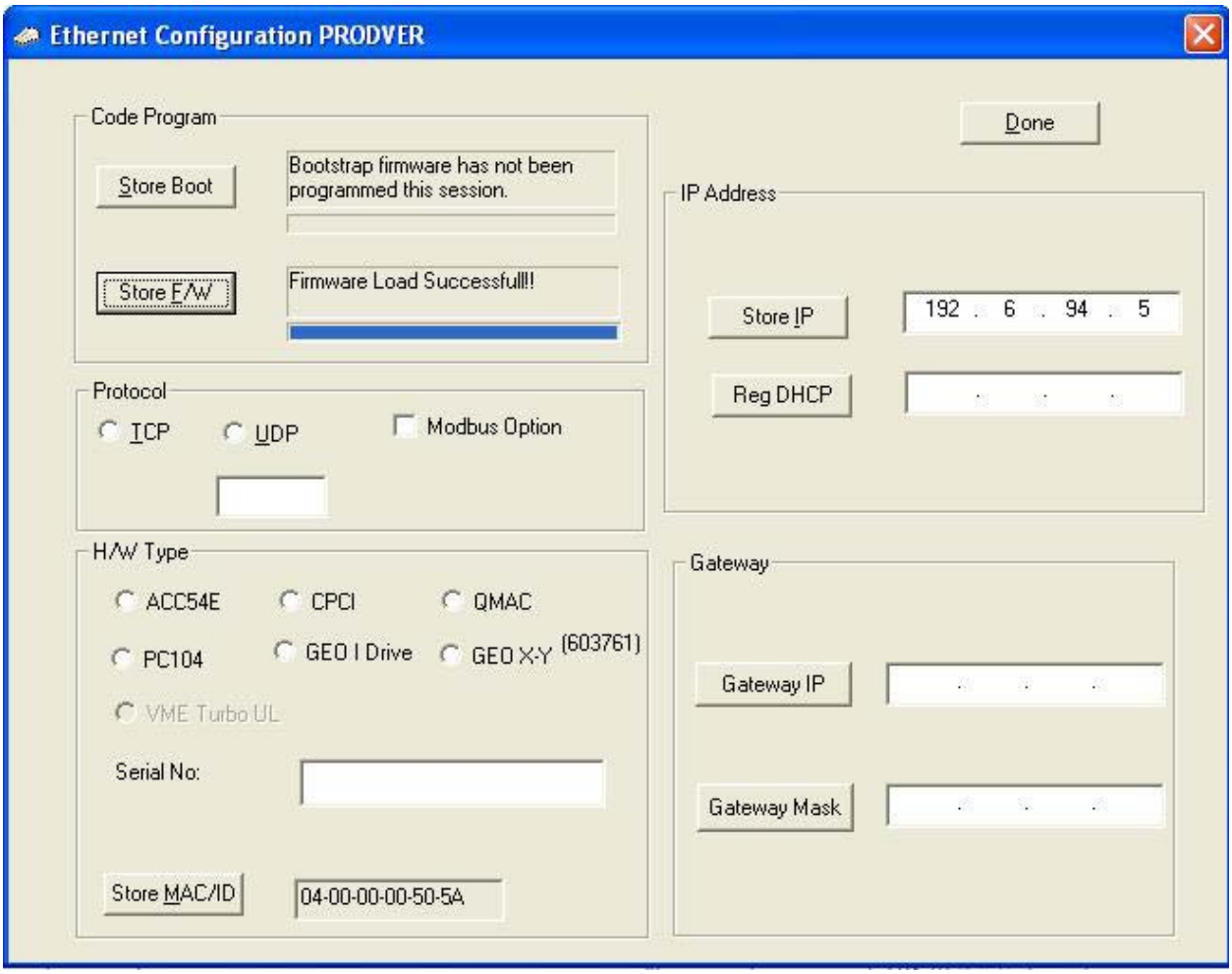
Firmware Updates

The latest firmware is loaded at the factory be shipping. Downloading new firmware to the ACC-65ETH IO Device should only be done if you are instructed by Delta Tau support to do so. To download new firmware, obtain the following items:

- USB Cable
- USBEthConfigure Software included with the Pewin32Pro2 Suite
- New firmware file for example ACC65ETH100.iic

To download the software to the ACC-65ETH, do the following:

1. Place the USB cable to the J2 USB connection on the ACC-65ETH and place the other end to the USB port on the PC.
2. Power up the ACC-65ETH and then launch USBEthConfigure.exe. Choose the firmware file (for example ACC65ETH100.iic) and then press the **Store F/W** button.
3. After the message appears indicating that the firmware download is complete click the **Done** button.



Note

If needed, this is another avenue to determine or set your IP address.

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