



# TDAS PRO Rack User's Manual



July 2016

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## DTS Support

TDAS systems are designed to be reliable and simple to operate. Should you need assistance, DTS has support engineers worldwide with extensive product knowledge and crash test experience to help via telephone, e-mail or on-site visits.

The best way to contact a DTS support engineer is to submit a request through the DTS Help Center web portal ([support.dtsweb.com](http://support.dtsweb.com)). You must be registered ([support.dtsweb.com/registration](http://support.dtsweb.com/registration)) to submit a request (<https://support.dtsweb.com/hc/en-us/requests/new>). Registration also enables access to additional self-help resources and non-public support information.

This manual supports all TDAS PRO 4- and 8-module Racks with 19-pin COM connectors including:

- 12000-00030: TDAS PRO 4-module Rack (std cap battery) (retired)
- 12000-00031: TDAS PRO 4-module Rack (ext'd cap battery)
- 12000-00032: TDAS PRO 4-module Rack (ext'd battery + remote power option)
- 12000-00040: TDAS PRO 8-module Rack (std cap battery) (retired)
- 12000-00041: TDAS PRO 8-module Rack (ext'd cap battery)
- 12000-00042: TDAS PRO 8-module Rack (ext'd battery + remote power option)

This manual does not support TDAS PRO racks with 14-pin COM connectors. Please contact Support for assistance.

# Introducing the TDAS PRO Rack

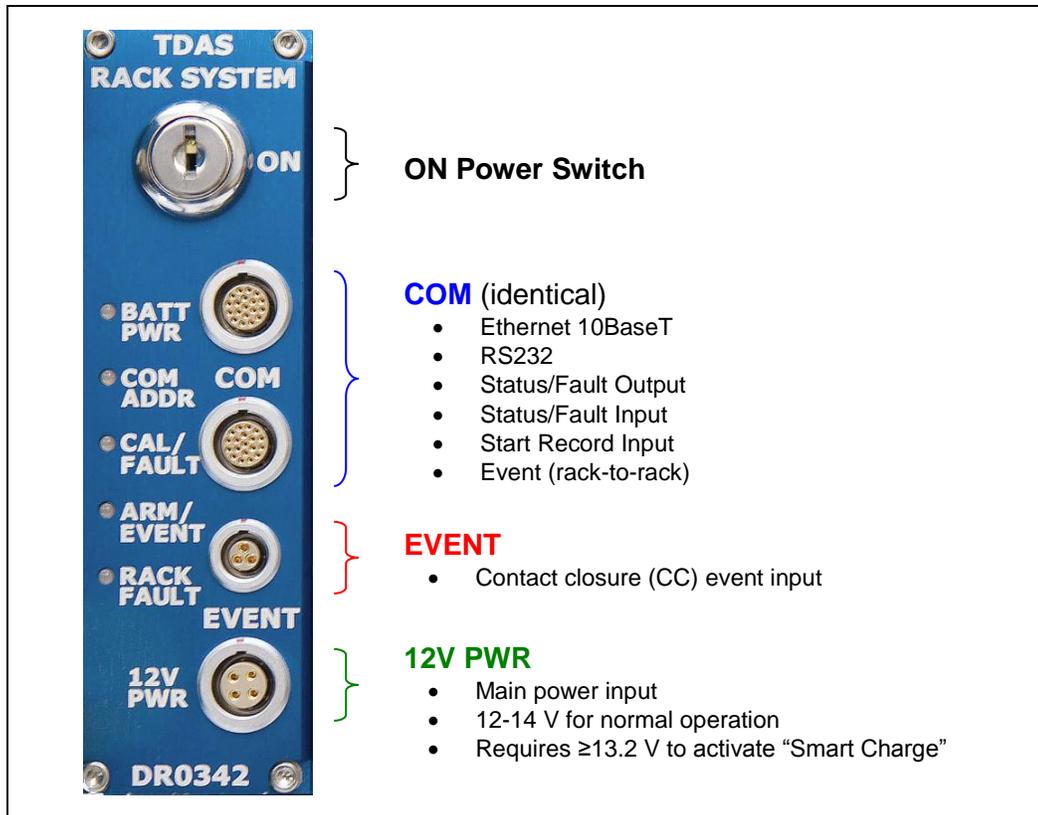
TDAS PRO racks are available in 4- and 8-module capacities. Power, communication and event signals are easily accessible via the control panel. Racks may be interconnected in any combination to create higher channel-count systems. TDAS PRO racks are compatible with all TDAS PRO modules, including Sensor Input (SIM), Timed Output (TOM) and Digital Input (DIM) modules.

- Shock hardened for 100 g dynamic testing environments.
- Ethernet 10BaseT communications compatible with SLICE PRO and other TDAS equipment via the COM connectors.
- Internal battery for safe operation even with loss of primary power.
- “Smart Charge” circuit helps ensure that the battery receives the proper charge.
- LED indicators for power and battery status, communications, arm and event signals.
- Power input is protected against reverse current, over-current, and transient over-voltage conditions.
- RS232 communication driver with ESD protection.
- Key switch prevents inadvertent turn off.
- Integral mounting flanges.

This manual discusses the features and options available with the TDAS PRO rack. Connector information and pin assignments can be found in Appendix A. Mechanical specifications are included in Appendix B. Please see your packing list for your hardware's specifications.

## Control Panel

The two COM connectors are functionally identical and allow access to all communication features and signal lines. The 12V PWR connector supports primary system input power. The ON key switch will power up or power down the system. Information on the LED indicators begins on page 6. Connector information and pin assignments can be found in Appendix A.



TDAS PRO Rack Control Panel

### Using the ON Key Switch



A key switch is used for on/off control. Total time from ON initiation to system ready is ~10 seconds. Multiple units in a chain may be started in any order, however be sure to wait at least 10 seconds between each rack to avoid communication conflicts. When the power LED on the modules are blinking green, you may start the software.

To restart a rack, turn off the key and wait ~30 seconds (10 seconds after all module LEDs go completely dark) before turning it on again. An incomplete power-down/power-up cycle can result in errors, so be certain to follow proper procedures.

### Using the Remote Power Feature (optional)



Some TDAS PRO racks are configured so they may be powered on and off remotely via the EVENT connector. This has the same effect as using the ON power switch. A normally open momentary switch should be used for this purpose. The system will power up and remain on as long as the signal is applied and will power down when the signal is absent for at least 3 seconds.

This feature will override the key switch; if the rack is turned on remotely, it must also be turned off remotely. To use this feature, see Appendix A for pin assignments.

## Using the COM Connectors

Ethernet communications, event input, start record input, and status signals are supported via the COM connectors. These connectors are functionally identical and are compatible with all TDAS and SLICE PRO COM connectors.

Communications are supported via an Ethernet REC cable (P/N 10700-0015x) using either COM port. TDAS PRO, TDAS G5 and SLICE PRO equipment can be daisy-chained via the COM connector using an RDC cable (P/N 10700-0014x) and following the interconnect protocol:

1. The Ethernet cable (P/N 10700-0015x) is connected to the first unit using either COM port.
2. The RDC cable (**M**ASTER) is connected to the first unit using the open COM port.
3. The RDC cable (**S**LAVE) from step 2 is connected to the second unit using either COM port.

Steps 2 and 3 are repeated for additional units. Each unit in the middle of the chain must contain one MASTER and one SLAVE connection. Up to 7 TDAS PRO, TDAS G5 or SLICE PRO systems can be connected in this manner.



Multiple interconnected TDAS systems should be powered up at least 10 seconds apart to avoid communication conflicts. (They may be powered up in any order.) When all units are ready, you can start the software.

## Using the EVENT Input



TDAS PRO racks include a dedicated input connector that supports an isolated, ESD protected, contact-closure event input. (The event input is also available through the 19-pin COM connectors.) This input provides a way to use a closure switch in harsh or noisy environments, without negatively affecting the data acquisition system. By using an RVB cable (P/N 10700-0018x), a hardware event can be used as a trigger. A software trigger can also be used—please see your software manual for information on how to set a software level trigger. (If your unit supports the remote power feature, the event input function does not change.)

The event input may be used in either of two ways.

- In Circular Buffer mode, this input triggers data collection and marks zero time (T=0).
- In Recorder mode, this input is used to mark T=0 only.

<p>Simple Contact Closure</p> 	<p>Self-powered No polarity requirement 1000 V isolation</p>
---	--

### WARNING:

**Do not apply external voltages to the EVENT input—this could result in damage to the unit. A simple FET switch can be used to convert a voltage input to an appropriate contact closure. Please contact DTS if you need assistance.**

## Using the 12V PWR Input



External power is provided via the 4-pin 12V PWR connector and is used to 1) charge all TDAS PRO system batteries (rack and modules) when system power is off, or 2) simultaneously charge and run a TDAS PRO system when system power is on. If input power fails, the system will transition to internal battery reserves.

Input Voltage	Power Consumption, System OFF*	Power Consumption System ON**
13.2-14 VDC; 13.8 VDC nominal	25 mA per module + 600 mA for rack	1 A per module + 1 A for rack

\* charging all internal batteries

\*\* fully armed + charging all internal batteries

External power may also be provided via a 12 V, lead acid battery, however this will not charge the internal batteries of the TDAS equipment. Typically, TDAS equipment will use their internal battery reserves first until levels are low enough to begin drawing power from the external battery. When the rack or module batteries drop below ~9 V, a fault will occur.

Information on internal battery operational parameters begins on page 11.

### LED Indicators

TDAS PRO racks have five LEDs which provide ongoing status information. LED behavior is summarized in the tables below.

 + 		Internal battery charging (rack only)
		Internal battery charged (rack only)
 + 		Power on and OK
		Power warning (11.6–12 V)
		Power critical ( $\leq 11.2$ V)
		PC communicating with rack
		Rack communicating with modules
		All calibrations passed
		Calibration in progress
		Calibration fault
		System armed and waiting for start record –or– event signal
		Received start record signal; waiting for event signal
		No longer armed –or– no longer collecting data –or– received event signal
		No faults detected
		Received event signal
		Fault occurred; either: <ul style="list-style-type: none"> <li>- Low battery –or–</li> <li>- Rack fault –or–</li> <li>- Module fault</li> </ul>

**WARNING:**

Do not perform any critical tests when the BATT PWR LED indicator is yellow (power low) or red (power critical).

## Basic Care and Handling

TDAS PRO racks are precision devices designed to operate reliably in dynamic testing environments. Though resistant to many environmental conditions, care should be taken not to subject the unit to harsh chemicals, submerge it in water, or drop it onto any hard surface.

**WARNING:**

**Electronic equipment dropped from desk height onto a solid floor may experience up to 10,000 g. Under these conditions, damage to the exterior and/or interior of the unit is likely.**

When transporting the unit, treat it as you might a laptop computer and you should have no problems. When not in use or if shipping is required, we suggest that you always place the unit in the padded carrying case originally provided with your system.

TDAS PRO equipment is not user-serviceable and should be returned to the factory for service or repair.

### Shock Rating

TDAS PRO Racks are rated for 100 g, 12 ms duration, in all axes.

### *Mounting Considerations*

The unit should be bolted securely to the test article or dynamic testing device to provide the best shock protection. Mounting methods and hardware selection should be carefully calculated to withstand expected shock loading and facilitate proper grounding. Check bolt tightness periodically to ensure that 1) the unit is securely fastened to the baseplate, and 2) the baseplate is securely fastened to the testing platform. (See Appendix B for the unit's mechanical specifications.)

### Thermal Considerations

TDAS PRO systems use extensive power management to minimize heat generation. Since the system draws the most power when armed, running the calibrations and arming as late as possible will minimize self-heating.

It is extremely unlikely that excessive heat will ever be an issue in real-world testing applications using TDAS PRO systems. However, if high ambient temperatures, exposure to other heat sources, or severely restricted airflow will cause case temperatures in excess of 50°C (too hot to touch comfortably), the airflow created by a small fan will increase heat transfer by a factor of 3 to 5. Additionally, always shield the units from exposure to direct sunlight.

## Power Management

A good power source is of paramount importance. Each TDAS PRO rack system should be powered from either:

- 1) A high-quality 13.8 V (13.2-14 V range) power supply with a current rating of at least 5 amps (full four-module rack) or 9 amps (full eight-module rack);
- 2) A fully-charged 12 V lead-acid battery with sufficient capacity for the application.

Be sure to consider any power drop due to cable length. Always remember:

- To ensure the internal batteries are fully charged, the minimum input voltage received by the rack at its power input connector must be  $\geq 13.2$  V.
- DTS always recommends using an external power source during set-up and check-out. This will ensure that the internal batteries in all units are always fully charged.

Input Voltage	Power Consumption, System OFF*	Power Consumption System ON**
13.2-14 VDC; 13.8 VDC nominal	25 mA per module + 600 mA for rack	1 A per module + 1 A for rack

\* charging all internal batteries

\*\* fully armed + charging all internal batteries

External power provided via a 12 V, lead acid battery will not charge the internal batteries of the TDAS equipment. Typically, TDAS equipment will use their internal battery reserves first until levels are low enough to begin drawing power from the external battery. When the rack or module batteries drop below ~9 V, a fault will occur.

## Internal Battery

In a typical testing environment, the internal battery is used only in the event primary power fails. To ensure a smooth transition from external to internal power, each TDAS PRO rack contains a battery sufficient to provide primary power and sustain full operation for a short time. Once the system is armed, loss of external power will result in a reported fault condition, however the system will continue to function until battery power becomes too low to sustain operation.

**WARNING:**

**Do not perform any critical tests when the BATT PWR LED indicator is yellow (power low) or red (power critical).**

The actual useful operational duration will depend upon the number of channels in use, the resistance of the connected sensors, and whether or not the internal battery was fully charged before testing. (DTS does not recommend performing tests using TDAS PRO equipment without the use of an external power source.)

	Standard Capacity Battery*	Extended Capacity Battery
Operational duration	~10 minutes	~30 minutes

\* The standard capacity battery should be used as a back-up power source only.

If the useful operational duration of the internal battery has decreased to half of normal, the battery has reached its end of life and should be replaced. Contact DTS to arrange for service or repair.

## Communication Features

The 19-pin COM connectors on the control panel allow access to all communication features and status lines. These connectors are functionally identical so you may use either one to connect the communication and trigger cables provided with your system. (Please see Appendix A for the connector specifics and pin assignments.)

### **WARNING:**

**Do not apply external voltages to the event, communication, status or control output and inputs—this could result in damage to the unit.**

## Communication Methods

### ***Ethernet 10BaseT***

TDAS PRO racks support the industry-standard Ethernet 10BaseT communication method via an REC cable (P/N 10700-0015x) using either COM port. Communication is enabled after the initialization sequence has completed (~10 seconds). (See Appendix D for the network parameters of your equipment.)

If you need to change the IP address of your rack, see Appendix C for more information.

### ***RS232 (Serial)***

The TDAS PRO rack also supports serial communications via an RS2 cable (P/N 10700-00160) connected between either 19-pin COM connector and the PC. The maximum communication speed supported by TDAS PRO hardware is 460.8K baud, however most PCs are limited to 115.2K baud. The maximum cable length is limited to 50 feet.

If you need to change the IP address of your rack, this cable is required. A USB-to-serial adapter (P/N 12000-00090) may also be needed if your PC is not equipped with a 9-pin serial port. See Appendix C for more information.

## Using Multiple TDAS PRO Rack Systems

TDAS PRO, TDAS G5 and SLICE PRO equipment can be daisy-chained to create higher channel-count systems. In this way, one rack, Docking Station or Ethernet Controller can act as the main terminal point for a multiple-device Ethernet system. Up to 7 TDAS PRO, TDAS G5 or SLICE PRO systems can be daisy-chained via the COM connector using an RDC cable (P/N 10700-0014x). The procedure for the making the interconnections begins on page 6.

## Auxiliary Signals

Additional auxiliary signals are available on either of the 19-pin COM connectors. (Please see Appendix A for the connector specifics and pin assignments.) These signals are:

- Start record input (optically-coupled 0-5 V signal);
- Status output (0-5 V, 20 mA output).

### **Start Record Input**

The start record input (used only in Recorder mode) is used to send a signal to the system to begin recording data *independent* of any event signal. The desired length of recording time is entered into the software. Once the start record signal is received by the system, data is recorded only for the length of time specified. (An event signal can be used separately to facilitate post-processing of the data.) Care should be taken when using this feature so that the desired event is captured within the data window. (See your software manual for additional information.) Please contact DTS for additional information on how this may be useful in your application.

### **Status Output Signal**

The status output signal is available for use as an indicator of system status. A typical application would be in an environment where operators may be a substantial distance away from the test equipment, in a control room or other remote location, and desire confirmation from the system that it is armed and healthy prior to testing. The table below describes this function.

#### **Status Output Functional Description**

When the rack is not armed, the status output is always low (near 0 V), regardless of signals on the event input.

The status output will be high (near 5 V) ONLY when:

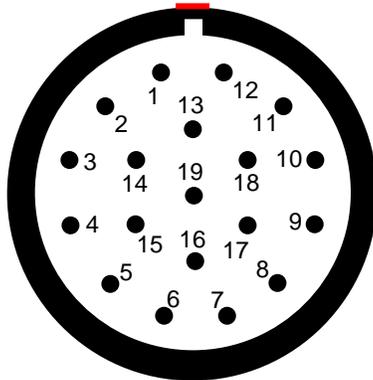
1. The rack is armed, AND
2. The rack is ready to record data (is in Circular Buffer mode or has received a start signal in Recorder mode), AND
3. The rack has not received an event signal, AND
4. The rack's power status is within acceptable levels.

In Circular Buffer mode, the status output will go high as the system is armed. It will go low when the rack receives an event signal, any A/D circuit stops functioning, or if the system's power is outside of acceptable limits.

In Recorder mode, the status output will remain low until the system is actually recording data. The status output will go high when the rack receives a start record signal and all other diagnostic checks are within acceptable limits. It will go low when the rack receives an event signal, the end of the recording time window is reached, any A/D circuit stops functioning, or if the system's power is outside of acceptable limits.

## Appendix A: Connector Information

### 19-pin COM connectors (EGG.2B.319.CLL)

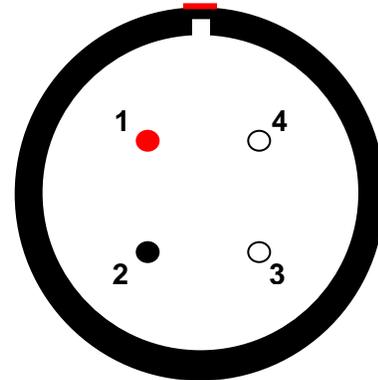


(panel view)

Suggested cable connector P/N:  
FGG.2B.319.CLADxx\*

Pin	Function
1	RS232 Rx
2	RS232 Tx
3	Shield (RS232 reference)
4	Start recording input, optically coupled (apply 5 V with respect to pin 16)
5	Common
6	Status output, 5 V via 110 ohm (referenced to common)
7	(+) Status input, optically coupled
8	Ethernet Tx2 (-)
9	Ethernet Tx2 (+)
10	RS232 daisy-chain input
11	Ethernet Rx3 (-)
12	Ethernet Rx3 (+)
13	Ethernet Tx3 (-)
14	Ethernet Tx3 (+)
15	+ Event, rack-to-rack, CC to pin 19
16	(-) Common for start record and status inputs
17	Ethernet Rx2 (-)
18	Ethernet Rx2 (+)
19	- Event, rack-to-rack, CC to pin 15

### 4-pin 12V PWR connector (EGG.2B.304.CLL)

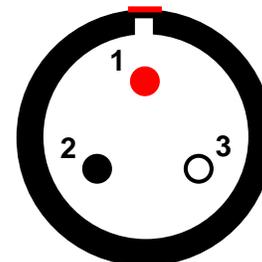


(panel view)

Suggested cable connector P/N:  
FGG.2B.304.CLADxx\*

Pin	Function
1	+ VDC input
2	- VDC input/Ground
3, 4	Ground

### 3-pin EVENT connector (EGG.1B.303.CLL)



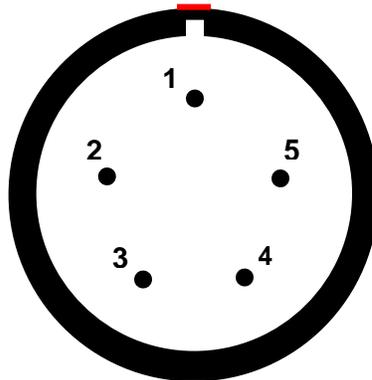
(panel view)

Suggested cable connector P/N:  
FGG.1B.303.CLADxx\*

Pin	Function
1	+ Event, CC to pin 2
2	- Event, CC to pin 1

\* xx denotes diameter of cable to be used; e.g., 52 = 5.2 mm. See [www.lemo.com](http://www.lemo.com) for more information.

**5-pin EVENT connector (optional)**  
(EGG.1B.305.CLL)



(panel view)

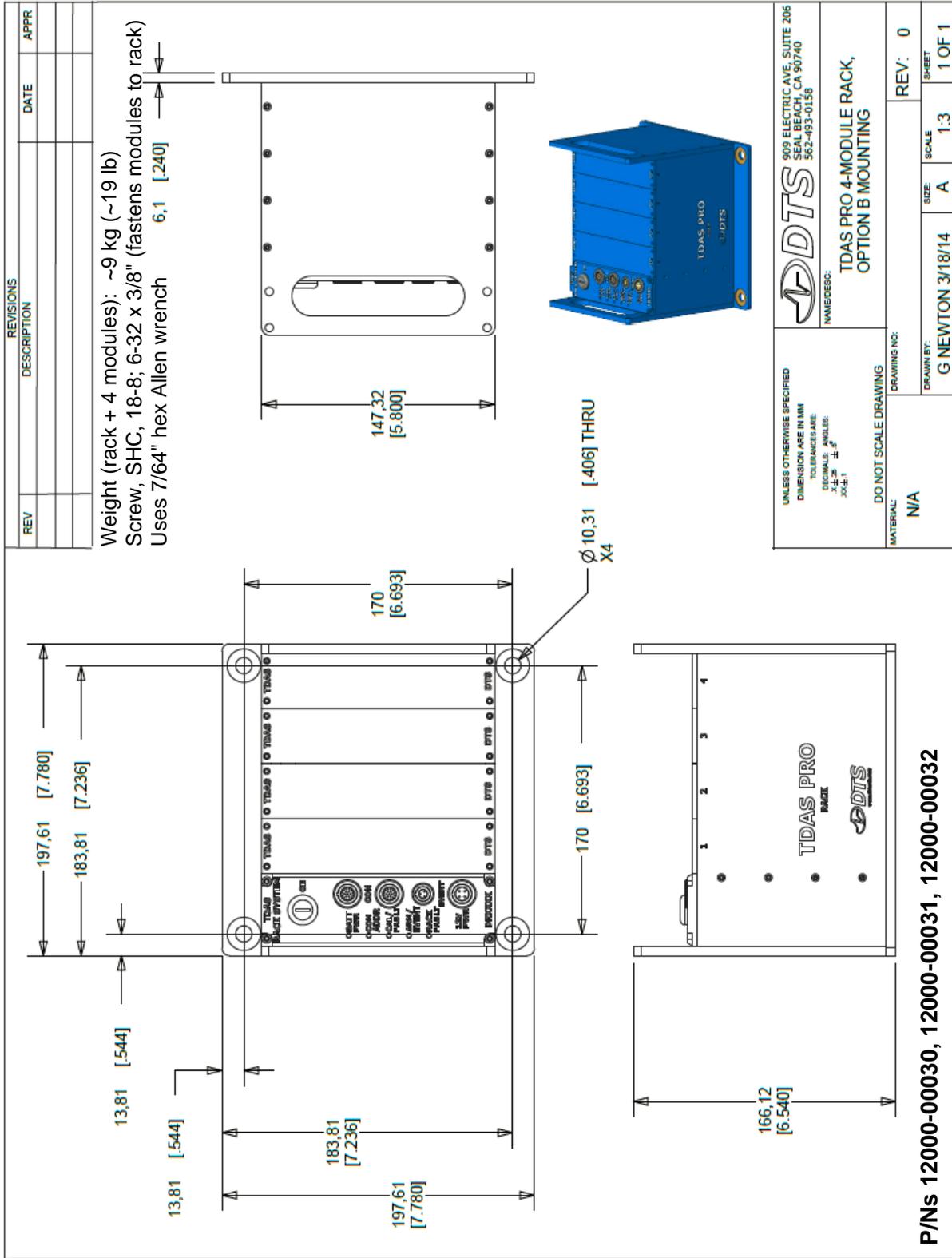
Suggested cable connector P/N:  
FGG.1B.305.CLADxx\*

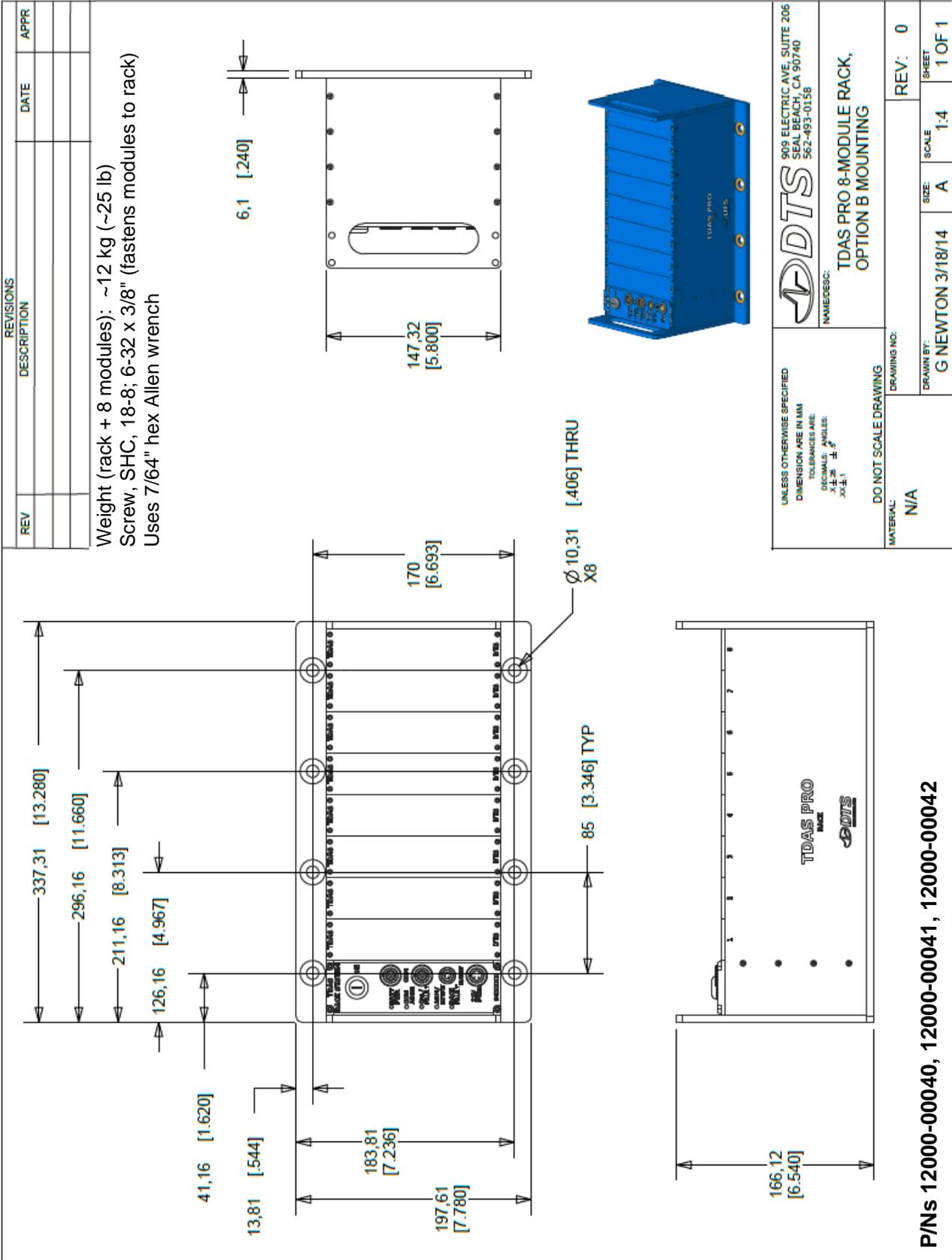
Pin	Function
1	+ Event, CC to pin 2
2	- Event, CC to pin 1
3	Remote on, CC to pin 4
4	Remote common
5	Remote off, CC to pin 4

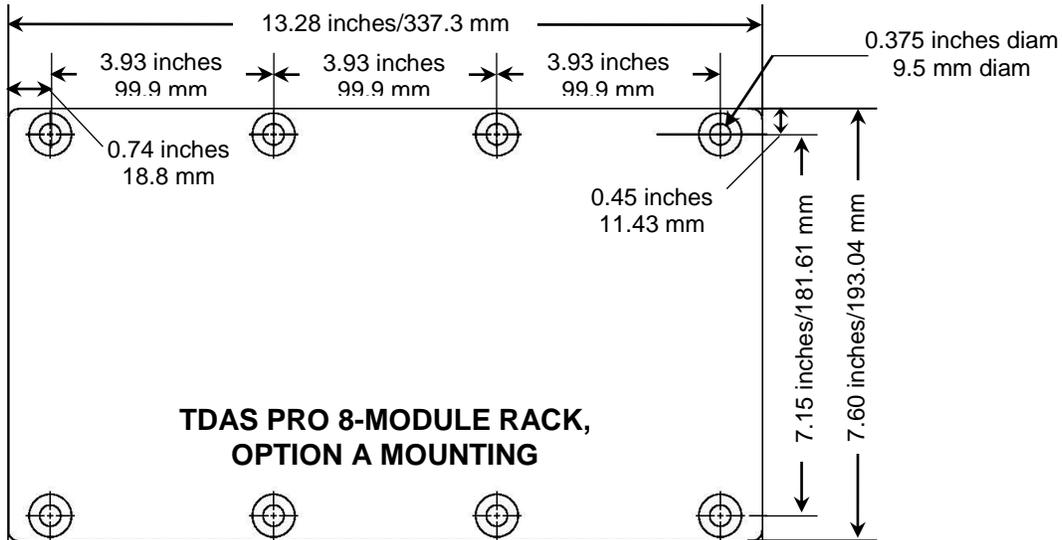
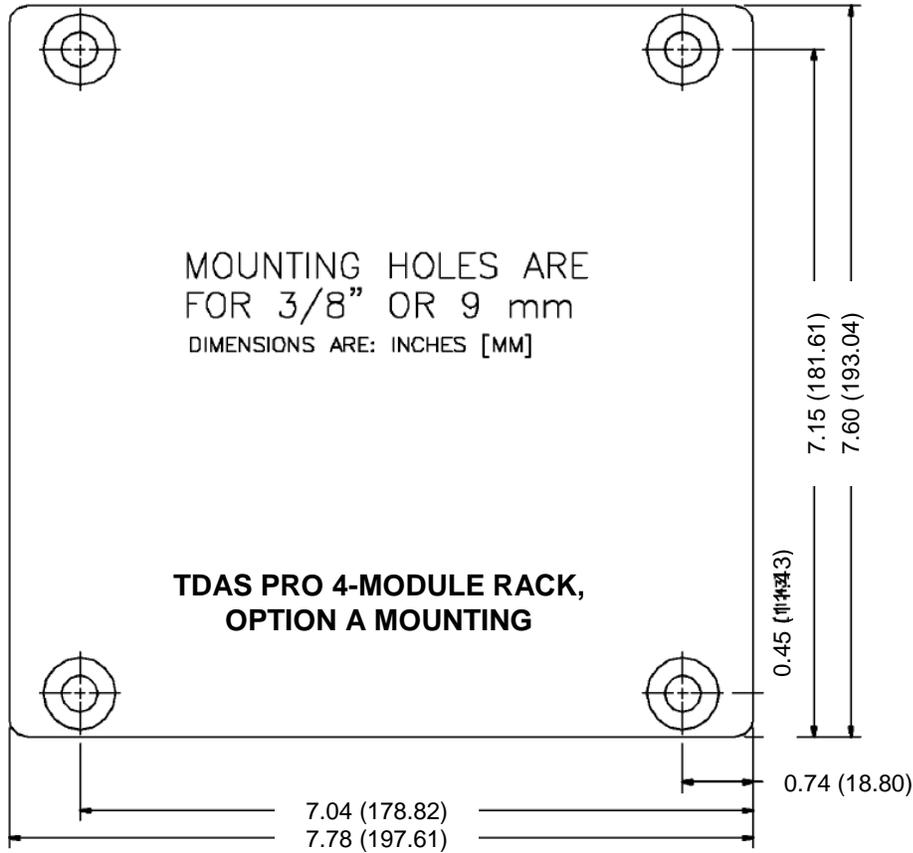
**Suggested Connector Sources**

DTS uses LEMO connectors on TDAS PRO Racks. If you need to purchase LEMO connectors, we suggest first going to LEMO directly (<http://www.lemo.com>). Their web site and worldwide sales team are very helpful. Should you have difficulty obtaining a specific part number, they can suggest connector variations or alternates and explain options that may be useful for your particular application. Another U.S. source is Alpine Electronics ([www.alpine-electronics.com](http://www.alpine-electronics.com)) in San Jose, California. They are a stocking distributor for LEMO and LEMO-compatible connectors.

# Appendix B: Mechanical Specifications







**Accessories/Support Equipment**

- 10400-00010: Power supply; 15 VDC, 20 A (90-240 VAC in, screw term) (PS-01)
- 10600-0011x: Cable, power, long grounded (PPL)
- 10600-0012x: Cable, power, short grounded (PPS)
- 10600-00130: Cable, power, 1 input (S) to 2 outputs (P) (PY2) (2 ft)
- 10600-00140: Cable, power, 1 input (S) to 3 outputs (P) (PY3) (1 m)
- 10600-00150: Cable, power, 1 input (S) to 4 outputs (P) (PY4) (1 m)
- 10600-0016x: Cable, power, POWER port to pigtail termination (RPX)
- 10700-0014x: Cable, COM port daisy chain (RDC)
- 10700-0015x: Cable, PC comm, Ethernet via COM port (REC)
- 10700-00160: Cable, PC comm, serial via COM port (RS2) (4 m)
- 10700-0018x: Cable, TDAS PRO rack event (RVB)
- 10700-0025x: Cable, TDAS G5 VDS event (VVB)
- 10700-0051x: Cable, TDAS event/start record/status, COM to pigtail term
- 10700-00610: Cable, COM to PC (Ethernet) + Control pigtails (1 m)
- 10200-00020: Cable, TDAS/SLICE PRO status, COM port to green LED (5 m)
- 12000-00090: TDAS PLUS USB-to-Serial (RS232) Adapter
- 13000-30860: Cable, COM port to status LED + event input pigtails (5 m)
- 89000-05230: TDAS PRO rack dummy panel/cover plate
- 90000-S0047: Screw, SHC, 18-8; 6-32 x 3/8" (fastens modules to racks)
- 99000-00074: Wrench, Allen, ball point, 7/64" hex; L-key, 3-21/32" length

(x = multiple lengths available)

## Appendix C: Changing the TDAS PRO Rack Network Parameters

TDAS PRO racks communicate using either RS232 (serial) or the industry-standard 10BaseT Ethernet protocol. Your TDAS PRO rack was shipped with fixed IP address (*myip*) and subnet mask (*netmask*) parameters already loaded in the flash memory of the microcontroller. The steps below describe the process to change the rack's Ethernet parameters. *Note: This process may require the help of your network administrator. If your in-house network support person is not available, we encourage you to contact DTS for help.*

### CAUTION:

Great care should be taken when changing any network parameters. The IP address and subnet mask should not be changed without full knowledge of the impact on the communication environment. If you have any questions, please contact your network administrator for help.

### Establish Communication

Using the TDAS Firmware Loader provided with the TDAS Control software, establish communication with the rack. To do this, change the fields to the appropriate hardware (rack), serial number of the unit, and communication method (Ethernet). (You can ignore the IP address field for the moment.) Click on the "Discovery" button to search the network for the requested serial number. If the serial number is found, the IP address field will be updated with the current address for that rack. (This step is performed to ensure that the computer and rack are communicating.)

### NOTE:

Both the computer and TDAS PRO rack must be on the same netmask for "Discovery" to be successful. If "Discovery" is not successful, please contact DTS for assistance.

### Change the Network Parameters

Once communication has been established, use the rack boot-loader program to change the network parameters. The rack boot firmware recognizes the following standard firmware parameters:

<b>myip</b>	specifies the target's IP address ( <i>required</i> )
<b>netmask</b>	subnet mask ( <i>required</i> )
<b>gateway</b>	gateway IP address (if needed – see your network administrator)

The following commands are used to read and set the network parameters:

**fget** – Get parameter (print parameter from flash memory)

Command  
 fget [<name>] - read parameter

Example  
 >fget  
 myip = 192.168.1.8  
 netmask = 255.255.255.0  
 ?N = DR0025  
 ...  
 ?P = 11-01-00  
 >

**fset** – Set parameter (set parameter into flash memory)

Command  
 fset <name> <value> - set parameter

Example  
 >fget myip  
 myip = 192.168.1.25  
 >fset myip 192.168.1.8  
 >fget myip  
 myip = 192.168.1.8

Use the following steps to change the rack's network parameters:

1. With the rack powered off, connect the PC to the rack using an RS2 (serial) cable (P/N 10700-00160). A USB-to-serial adapter (P/N 12000-00090) may also be needed if your PC is not equipped with a 9-pin serial port.
2. Set-up your serial terminal program (HyperTerminal is included with Windows) for 9600 baud and 8 bits, no parity, 1 stop bit and NO hardware flow control.
3. Connect to the serial port using the terminal program so that you will receive the boot message from the rack when power is first applied.
4. Turn on the rack. Immediately after you see the boot message, press the **[ESC]** key to stop the auto-boot process and access the boot-loader program prompt. (When auto-booting, you have three seconds to press the **[ESC]** key on the keyboard to cancel the auto-boot operation.) To re-try, turn the rack power off for 10 seconds, then on again.
5. If you do not receive a boot message at this point, carefully check all connections and make sure that your serial port is correctly configured.
6. Your screen should now look similar to this:

```
BSE 10 Dec 1999
bootcmd "go FE010000"
>
```

- At the prompt, use the **fget** and **fset** commands to change the parameters. **Note:** *Be careful not to change any other parameters in the flash memory or your rack will not work properly.* A typical change sequence might look like this:

```
BSE 10 Dec 1999
bootcmd "go FE010000"
>fget
myip=192.168.1.124
netmask=255.255.255.0
...
>fset myip 192.168.3.150
>fget
myip=192.168.3.150
netmask=255.255.255.0
...
>
```

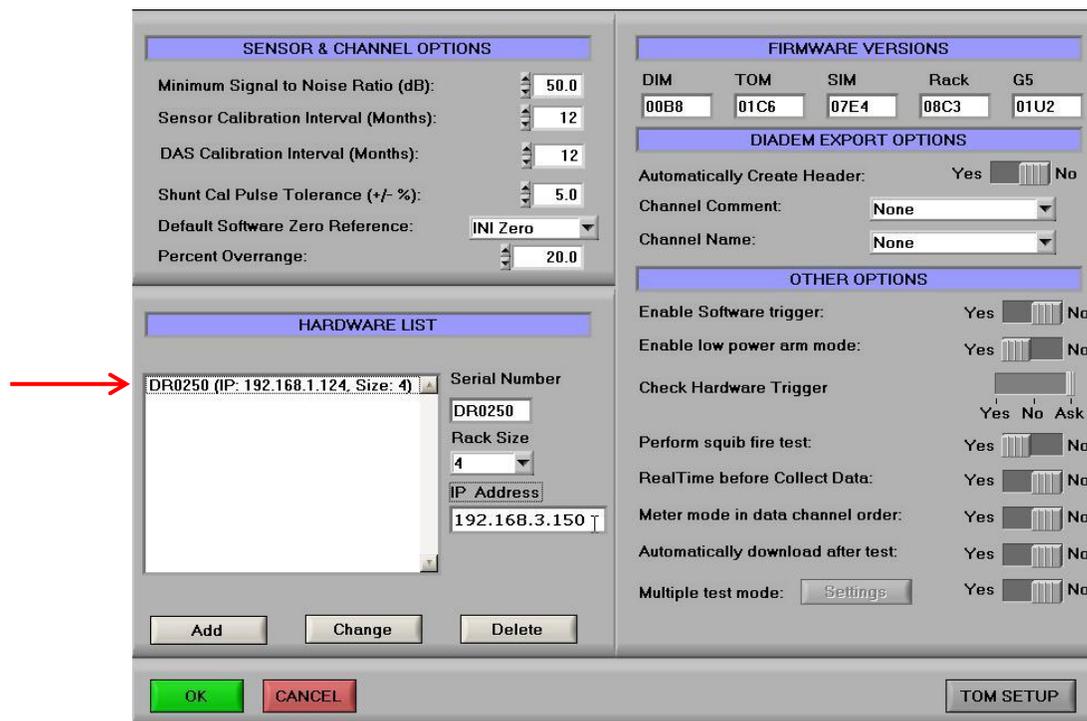
- Reboot the rack by turning off the key switch, waiting until 10 seconds after the module BAT LED indicators go dark, and then turning on the key switch.

The rack's network parameters have been updated.

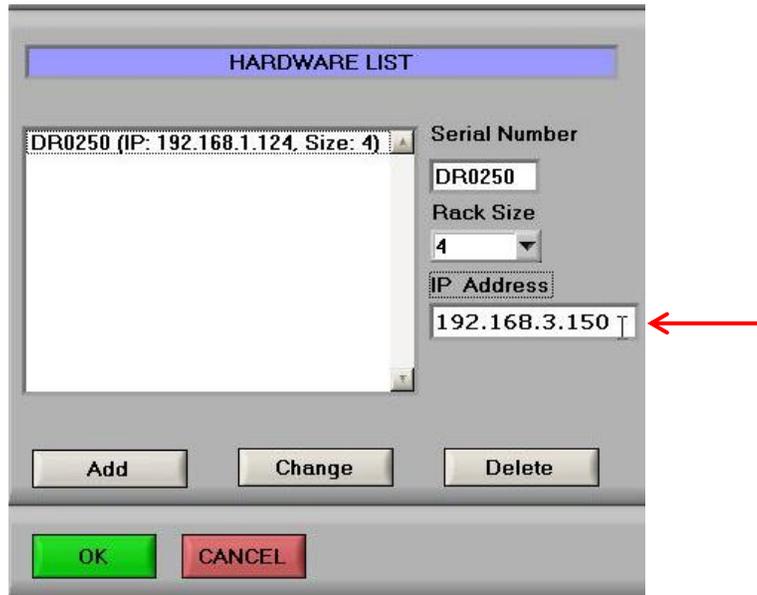
### Using the New Settings

Use the following steps to update the system with the new network parameters:

- Double-check that you are (now) using an Ethernet cable (P/N 10700-0015x) for communications between the rack and computer. Start the TDAS Control software.
- Select the *Setup*→*Edit Options* menu.
- Select the "Advanced" button.
- From the screen below, click on the rack entry from the Hardware List.



- Change the IP address associated with the serial number for the rack to the new address. *Note: Change only the IP address and not the rack's serial number.*



- Select "Change" and then "OK". Confirm that the rack is found at the new address.

## Appendix D: Hardware Configuration Specifications

TDAS PRO racks are delivered with a default IP address as follows:

IP address	192.168.1.xx where xx = the last 2 digits of S/N
Netmask	255.255.255.0

The packing list for your equipment identifies the IP address as shipped from the factory. If the packing list is not available, try using the default address as described in the table above.

If you need information on the specifics of your equipment, please submit a request through the DTS Help Center web portal ([support.dtsweb.com](http://support.dtsweb.com)) and include the serial number(s) of the equipment and parameters you are asking about.

**Revision History**

<b>Rev</b>	<b>Date</b>	<b>By</b>	<b>Description</b>
2	13 July 2016	EK	Updated battery info. Updated Appendices A, B and C; added Appendix D. Revised format; reorganized.
1	Nov 2001		