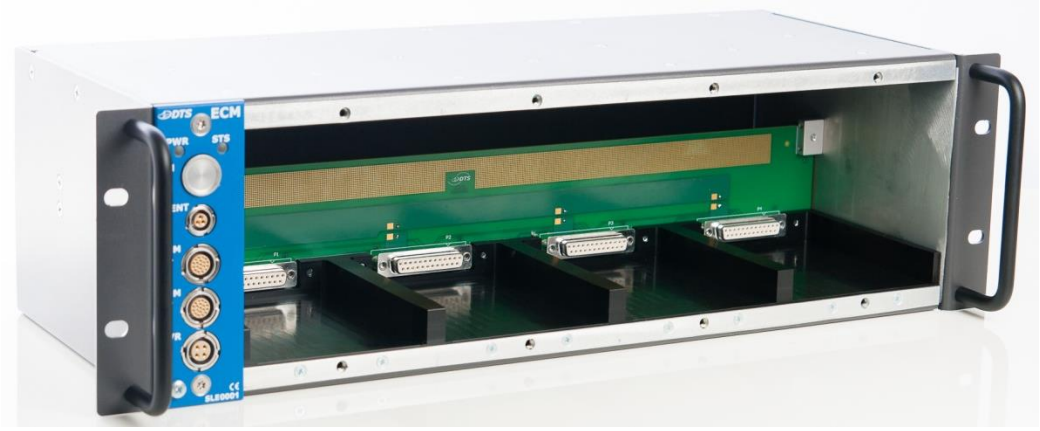
SLICE PRO/SLICE PRO LAB
Ethernet Controller
User's Manual



May 2019

13000-30610-MAN (Rev. 5)

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DTS Support

SLICE PRO systems are designed to be reliable and simple to operate. Should you need assistance, DTS has support engineers worldwide with extensive product knowledge and test experience ready 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). You must be registered (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 the following products:

13000-30610: SLICE PRO Ethernet Controller
13100-00010: SLICE PRO LAB 4-module Rack, Ethernet

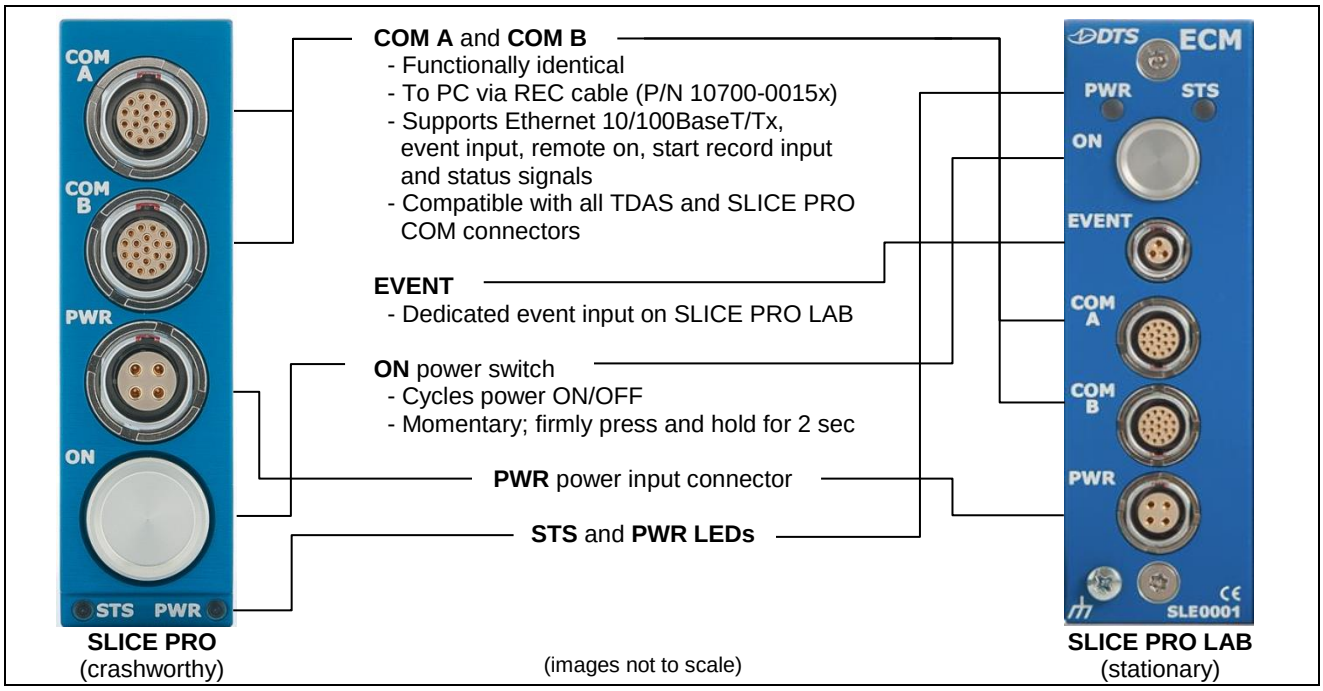
Introducing the SLICE PRO Ethernet Controller

The SLICE PRO Ethernet Controller is a communications and signal interface for a SLICE PRO system. It supports event, start record and status signals, and is compatible with all SLICE PRO and TDAS COM connectors. It supports up to 4 SLICE PRO modules, including the SLICE PRO SIM.

- Shock hardened to 100 g for dynamic testing environments (crashworthy version only).
- Ethernet 10/100BaseT/Tx supports daisy-chained systems up to 500 channels.
- Internal battery with 1 hour capacity functions as primary or back-up power (crashworthy version only).
- LED indicators for power and system status.
- Primary system input power via the power input connector is protected against reverse current, over-current, and limited transient over-voltage conditions.
- Compatible with SLICE PRO and TDAS equipment via the COM connectors.

Control Panel

The two 19-pin COM connectors are functionally identical and allow access to all communication features and signal lines. The PWR connector supports primary system input power and the ON power switch will power up or power down the system. See Appendix A for connector information and pin assignments. Mechanical specifications are included in Appendix B. Appendix C discusses the network parameters of your equipment.



Using the PWR Input

External power is provided via the 4-pin PWR connector and is used to 1) charge all SLICE PRO system batteries (Ethernet Controller and SLICE PRO modules) when system power is off, or 2) simultaneously charge and run a SLICE PRO system when system power is on. If input power fails, each unit in the SLICE PRO system will transition to its own internal battery—the Ethernet Controller will *not* power the connected SLICE PRO modules. (When fully charged, battery capacity is sufficient to provide primary power and sustain full operation for 1 hour.)

Input Voltage, System OFF/ON	Input Current, System OFF*	Input Current, System ON**
11.5-15 VDC; 15 VDC nominal	7.5 W; 500 mA per module***	15 W; 1 A per module***

* charging all internal batteries ** fully armed + charging all internal batteries

*** Ethernet Controllers are considered modules for the purposes of power calculations.

SLICE PRO LAB systems do not contain internal batteries and must be connected to external power at all times (15 VDC nominal; 9-15 V range at 40 W).

Using the ON Power Switch

A low-profile piezo switch is used for on/off control. There is no detectable movement in the switch; you must press and hold firmly for 2 seconds to start or stop the system. Total time from ON initiation to system ready is typically between 1-2 minutes. Multiple units in a chain may be started in any order. Be sure to follow proper procedures to avoid an unstable condition.

Remote ON

A SLICE PRO system may be powered on and off remotely via the COM connectors. This has the same effect as using the ON power switch. The system will power up and remain on as long as the signal is applied and will power down when the signal is removed. To use this feature, see Appendix A for pin assignments. (Note: A small number of early units do not have this feature. To quickly determine if this is available, short pin 10 to the case. A power-up LED sequence will confirm operation.)

Using the COM Connectors

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

Communications are supported via an Ethernet REC cable (P/N 10700-0015x) using either COM port. SLICE PRO, TDAS G5 and TDAS 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.

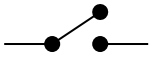
Steps 2 and 3 are repeated for additional units. Each unit in the middle of the chain must contain one MASTER and one SLAVE connection. Up to 7 SLICE PRO, TDAS G5 or TDAS PRO systems can be connected in this manner.

Using the Event Input

The SLICE PRO Ethernet Controller contains an isolated, ESD-protected, contact-closure event input. The event input is available through both of the 19-pin COM connectors. SLICE PRO LAB also includes a dedicated event input connector. This input provides a way to use a contact-closure switch in harsh or noisy environments without negatively affecting the data acquisition system. A software trigger can also be used—please see your software manual for information on how to set a software level trigger.

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.

Simple Contact Closure 	Self-powered with a current conducting capability of at least 5 mA Polarity must be observed if applying an event signal via a semiconductor device such as a transistor or FET 1000 V isolation

LED Indicators

There are two LED indicators. The status LED indicates communication and arm status and the power LED indicates power status. LED behavior is summarized below.

STS	State
Idle or no power input	●
Armed in Recorder mode and waiting for Start Record signal to begin data collection	●
Recording; status line low	●
Recording; status line high	●
Communicating with PC (not armed)	✸

Firmware version A1B6 or higher

Battery Charge Status[1]	PWR			
	Power up	**OFF**	**ON**	
		Charging (0.4 Hz)		Discharging (1 Hz)
>90%		✸	●	✸
50% - <90%		✸	●	✸
20% - <50%		✸	●	✸
<20% or FAULT		✸	●	✸

Firmware version A1B2 or lower

PWR	**ON**	**OFF**
Power up	✸	
Connected to external power and unit is charging (power OK)[1]	●	
Connected to external power and unit is charging (power OK)[1]		✸
Connected to external power and unit has fully charged[1]		●
Battery low[1]	✸	
Connected to external power; power fault	●	

[1] SLICE PRO LAB systems do not contain internal batteries and must be connected to external power at all times.

Basic Care and Handling

SLICE PRO systems 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.

The SLICE PRO Ethernet Controller is supplied with calibration data from the factory. DTS recommends annual recalibration to ensure that the unit is performing within factory specifications. The SLICE PRO Ethernet Controller is not user-serviceable and should be returned to the factory for service or repair.

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 unit.

Shock Rating

The SLICE PRO Ethernet Controller is rated for 100 g, 12 ms half-sine duration, in all axes.

The SLICE PRO LAB equipment is not crashworthy and should not be exposed to shock, vibration or other extreme environmental conditions.

Mounting Considerations

Crashworthy SLICE PRO equipment should be bolted securely to the test vehicle 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.)

DTS strongly recommends that all equipment be properly grounded to minimize any risk of data noise due to high-current transients. The test vehicle or dynamic testing device should be connected to earth ground. Crashworthy SLICE PRO equipment should be grounded to each other and bolted to the test vehicle. SLICE PRO LAB modules should be bolted to the rack and the rack properly grounded. DTS recommends checking continuity between the enclosures of each unit to confirm resistance readings of <1 ohm.

Thermal Considerations

The SLICE PRO systems are low power devices with negligible self-heating and it is unlikely that self-heating will be an issue in real-world testing. Should you have any questions about using SLICE PRO in your environment, please contact DTS.

WARNING:

Due to battery chemistry, do not operate SLICE PRO DAS at temperatures below 0°C (32°F) or in excess of 60°C (140°F).

Power Management

A good power source is of paramount importance. Each SLICE PRO Ethernet Controller should be powered from a high-quality 15 V power supply with a current rating of at least 5 A for a fully-powered, 4-module SLICE PRO system. 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 Ethernet Controller at its power input connector must be 11.5 VDC.
- DTS always recommends using an external power source during set-up and check-out. This will ensure that the internal batteries on all units are always fully charged.

Input Voltage, System OFF/ON	Input Current, System OFF*	Input Current, System ON**
11.5-15 VDC; 15 VDC nominal	7.5 W; 500 mA per module***	15 W; 1 A per module***

* charging all internal batteries ** fully armed + charging all internal batteries

*** Ethernet Controllers are considered modules for the purposes of power calculations.

SLICE PRO LAB systems do not contain internal batteries and must be connected to external power at all times (15 VDC nominal; 9-15 V range at 40 W).

Power Consumption

Power off: When connected to sufficient external power, the Ethernet Controller will draw up to 500 mA for charging its internal battery and 500 mA per module for charging the internal batteries of connected SLICE PRO modules.

Power on: When an Ethernet Controller is initially powered, all sensor excitation sources, signal conditioning electronics, filter circuits and analog-to-digital converters are in a shutdown state. The processor and support circuitry are always powered. The processor will remain in a reduced power state when not performing tasks. When the user runs a test set-up, the software automatically energizes the excitation sources and other circuits. The current draw per module will increase to as much as 1 A when the system is fully armed and powering full-bridge loads.

During data collection: Once the system has been armed for data collection, all circuits remain in a full power state until data collection is finished. After the data collection routine has completed, the system de-energizes several circuits to minimize power consumption.

Internal Battery

The Ethernet Controller contains an internal 7.4 V (nominal) lithium battery that operates as primary power or back-up power should primary power fail. When fully charged, battery capacity is sufficient to provide primary power and sustain full operation for 1 hour. If input power fails, each unit in the SLICE PRO system will transition to its own internal battery—the Ethernet Controller will *not* power the connected SLICE PRO modules. The internal battery charges whenever sufficient external power is connected. The maximum charge time is

3-4 hours from complete discharge to full capacity. It may be charged with or without modules attached and it does not need to be ON in order to charge.

Charging practices can affect the useful operational life of the battery. In addition to good charging habits, conditioning the battery may be useful—three deep-discharge/recharge cycles may help increase battery performance. The battery's useful capacity is greatly shortened near the end of its service life and should be replaced when it has decreased to 50% of its initial capacity. The battery is not user-serviceable and should be returned to the factory for battery replacement.

WARNING:

Due to battery chemistry, do not operate SLICE PRO DAS at temperatures below 0°C (32°F) or in excess of 60°C (140°F).

SLICE PRO LAB systems do not contain internal batteries and must be connected to external power at all times (15 VDC nominal; 9-15 V range at 40 W).

Power-up and Power-down Procedures

Firmly press and hold the power switch for 2 seconds to start or stop the system. Total time from ON initiation to system ready is typically between 1-2 minutes. Multiple units in a chain may be started in any order.

To restart a system, turn off the unit and wait ~30 seconds before reinitializing. If a system is armed for data collection, it will remain on until it is disarmed or power reserves are exhausted. An incomplete power-down/power-up cycle can result in errors, so be certain to follow proper procedures.

CAUTION:

Do not turn off the Ethernet Controller if the system is armed. You must disarm the system before initiating a system restart.

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 Method

The Ethernet Controller supports the industry-standard Ethernet 10/100BaseT/Tx communication method via an REC cable (P/N 10700-0015x) using either COM port. Communication is enabled after the initialization sequence has completed (1-2 minutes). (See Appendix C for the network parameters of your equipment.)

Using Multiple SLICE PRO Systems

SLICE PRO Ethernet Controllers, TDAS G5 Docking Stations, and TDAS PRO rack systems can be interconnected in a chain to create higher channel-count systems. In this way, one Ethernet Controller, Docking Station or rack can act as the main terminal point for a multiple-device Ethernet system. SLICE PRO, TDAS PRO and TDAS G5 equipment 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 4.

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 Ethernet Controller 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:

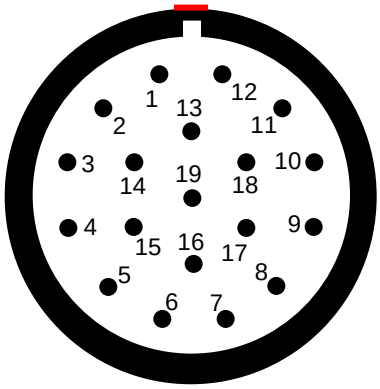
1. The unit is armed, AND
2. The unit is ready to record data (is in Circular Buffer mode, or has received a start signal in Recorder mode), AND
3. The unit has not received an event signal, AND
4. The unit's power status is within acceptable levels.

In Circular Buffer mode, the status output will go high as the system is armed. It will go low when the unit 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 unit receives a start record signal and all other diagnostic checks are within acceptable limits. It will go low when the unit 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
(EEG.2B.319.CLL)

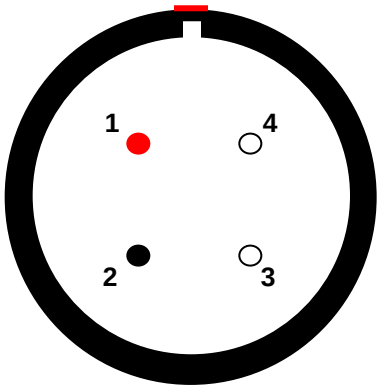


(panel view)

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

Pin	Function
1	Internal function only
2	Internal function only
3	Shield
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	Remote ON, CC to pin 5**
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 POWER connector
(EEG.2B.304.CLL)



(panel view)

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

Pin	Function
1	9-15 VDC input
2	- VDC input/Ground
3, 4	Ground

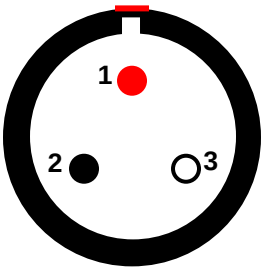
DOWN
(Omnetics A98000-015)

(panel view)

1, 2	12.2 VDC out
3, 4	Ground
5	/ON, CC input to ground
6	/EVENT, CC input to ground
7	/START, CC input to ground
8	Status output (5 V via 10k with respect to ground)
9, 10	12.2 VDC out
11, 12	Ground
13	USB_DP
14	USB_DM
15	USB power

* xx denotes diameter of cable to be used; e.g., 52 = 5.2 mm. See www.lemo.com for more information.
** A small number of early units do not have this feature. See page 5 for more information.

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

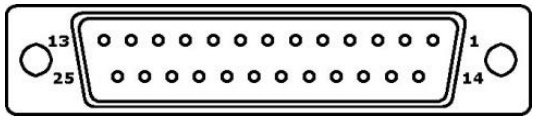


(panel view)

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

Pin	Function
1	+ Event, CC to pin 2
2	- Event, CC to pin 1
3	No connection

25-pin Bus connector
(172-025-212R021)

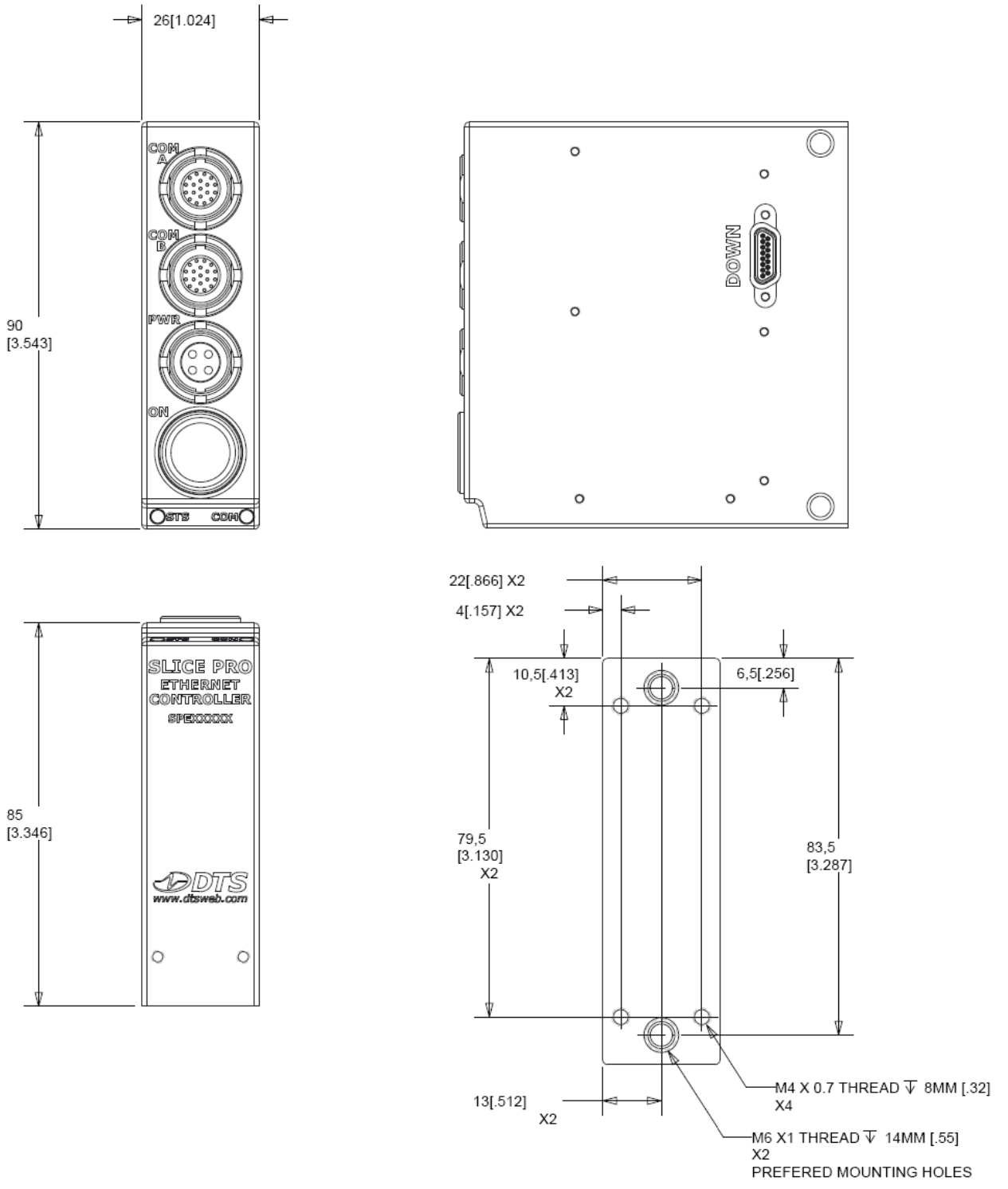


(panel view)

Pin	Function
1	Reserved
2	Reserved
3	No connection
4	USB_DM (DOWN)
5	USB_DP (DOWN)
6	USB power (DOWN)
7	No connection
8	Reserved
9	Reserved
10	VDC out
11	VDC out
12	VDC out
13	VDC out
14	Reserved
15	USB_DM (UP)
16	USB_DP (UP)
17	USB power (UP)
18	Status (5 V via 10k with respect to ground)
19	/START, CC to ground
20	/EVENT, CC to ground
21	/ON, CC to ground
22	Ground
23	Ground
24	Ground
25	Ground

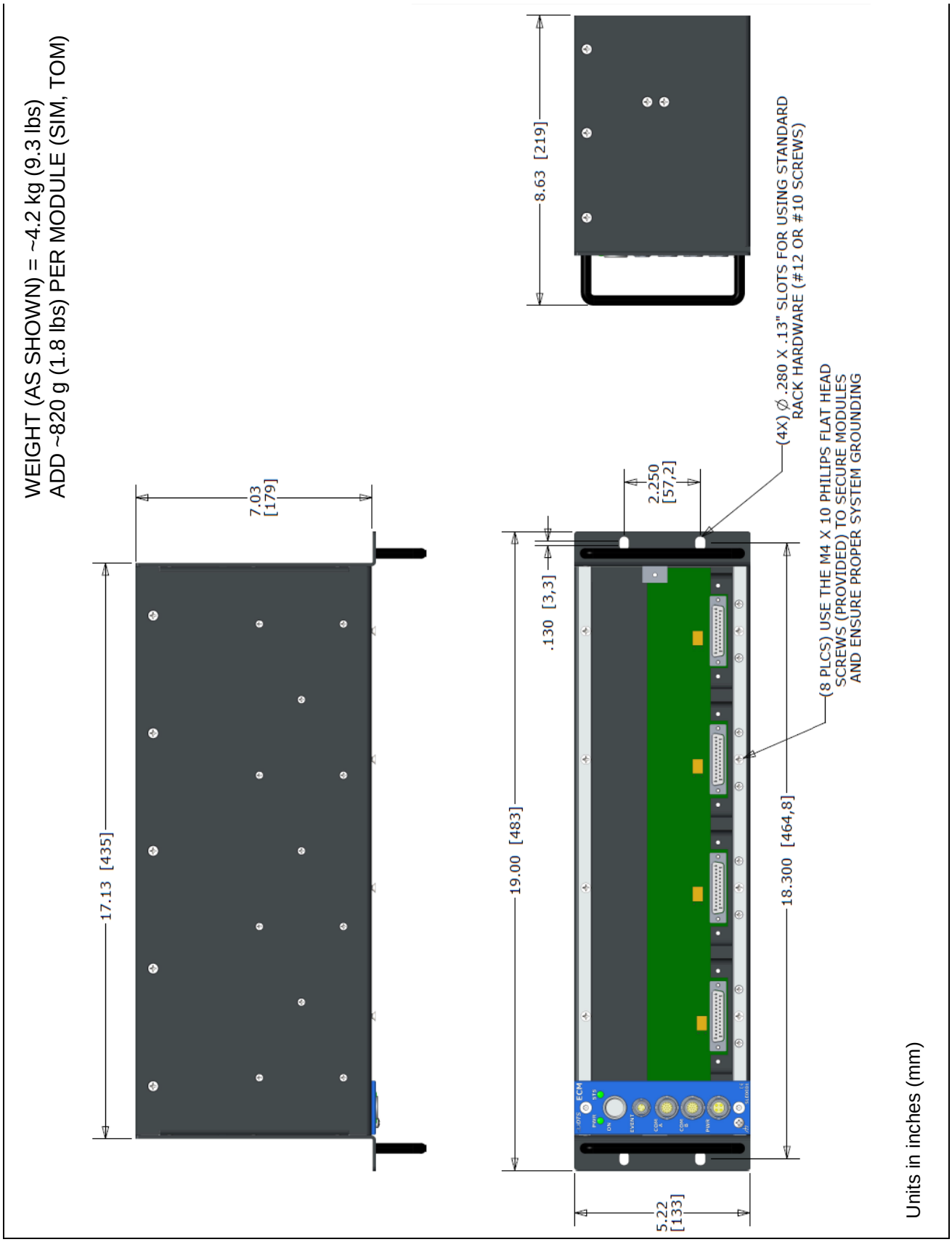
Appendix B: Mechanical Specifications

Weight: ~305 g (10.8 oz)



Units in mm (inches)

Torque spec: 84 in-lb (M6)


WEIGHT (AS SHOWN) = ~4.2 kg (9.3 lbs)
ADD ~820 g (1.8 lbs) PER MODULE (SIM, TOM)
8.63 [219]
7.03 [179]
17.13 [435]
2.250 [57,2]
(4X) Ø .280 X .13" SLOTS FOR USING STANDARD RACK HARDWARE (#12 OR #10 SCREWS)
.130 [3,3]
(8 PLCS) USE THE M4 X 10 PHILIPS FLAT HEAD SCREWS (PROVIDED) TO SECURE MODULES AND ENSURE PROPER SYSTEM GROUNDING
19.00 [483]
18.300 [464,8]
5.22 [133]
Units in inches (mm)

Accessories/Support Equipment

10400-00060: Power supply; 15 VDC, 4 A (90-240 VAC in, LEMO term) (PS-05)
10600-0016x: Cable, power, POWER port to pigtail termination (RPX)
10700-0015x: Cable, PC comm, Ethernet via COM port (REC)
10700-0014x: Cable, COM port daisy chain (RDC)
10700-0018x: Cable, TDAS PRO rack event (RVB)
10700-0025x: Cable, TDAS G5 VDS event (VVB)
10200-00020: Cable, TDAS/SLICE PRO status, COM port to green LED (5 m)
13000-30840: Power supply; 15 VDC, 7 A (90-240 VAC in, LEMO term)
13000-30860: Cable, COM port to status LED + event input pigtails (5 m)

(x = multiple lengths available)

Appendix C: Hardware Configuration Specifications

SLICE PRO Ethernet Controllers are typically delivered with a default IP address as follows:

IP address	192.168.0.x where:
	x = 1-9 for S/Ns SPE00001-SPE00009 or SLE0001-SLE0009;
	x = 10-99 for S/Ns SPE00010-SPE00099 or SLE0010-SLE0099;
	x = 100-199 for S/Ns SPE00100-SPE00199 or SLE0100-SLE0199
	x = 200-299 for S/Ns SPE00200-SPE00299 or SLE0200-SLE0299
	x = 300-399 for S/Ns SPE00300-SPE00399 or SLE0300-SLE0399

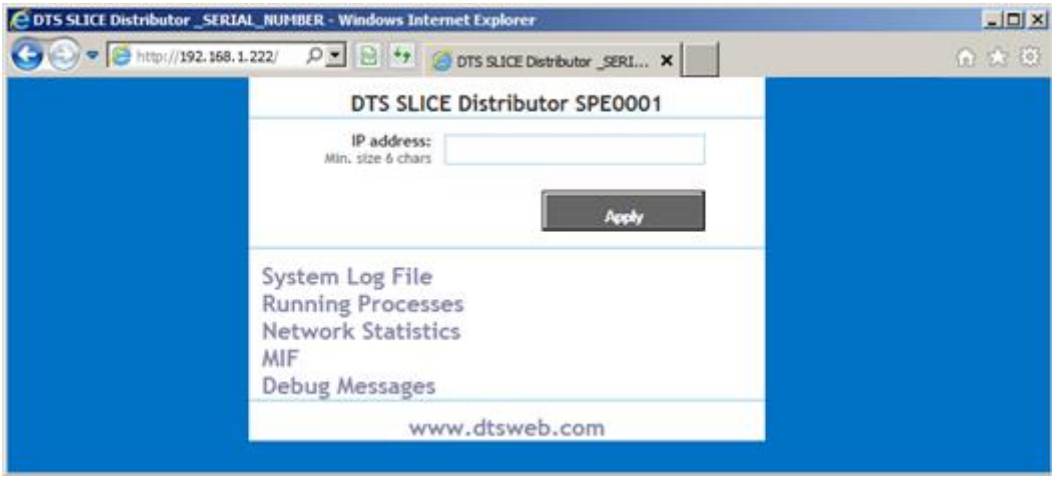
Netmask	255.255.252.0

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

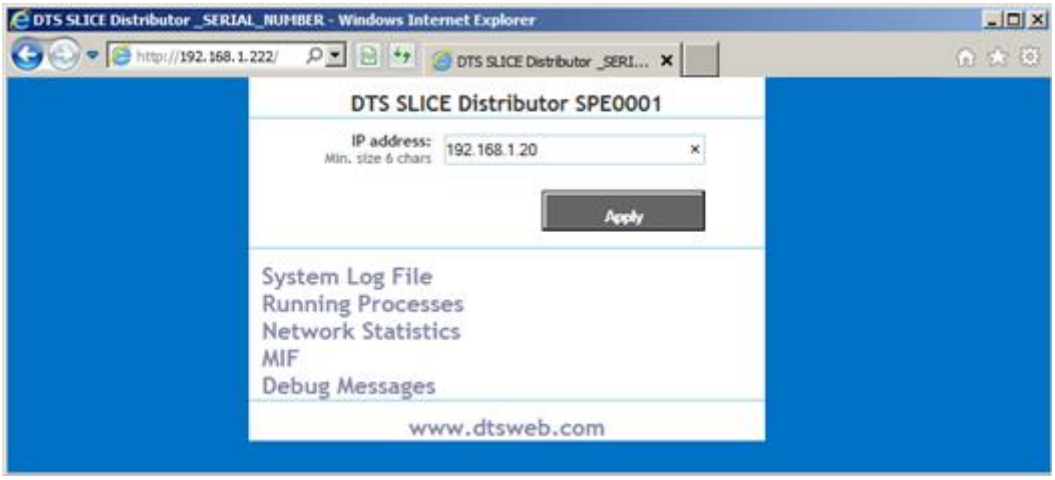
If you need information on the specifics of your equipment, please submit a request through the DTS Help Center web portal (support.dtsweb.com) and include the serial number(s) of the equipment and parameters you are asking about.

Changing the IP Address

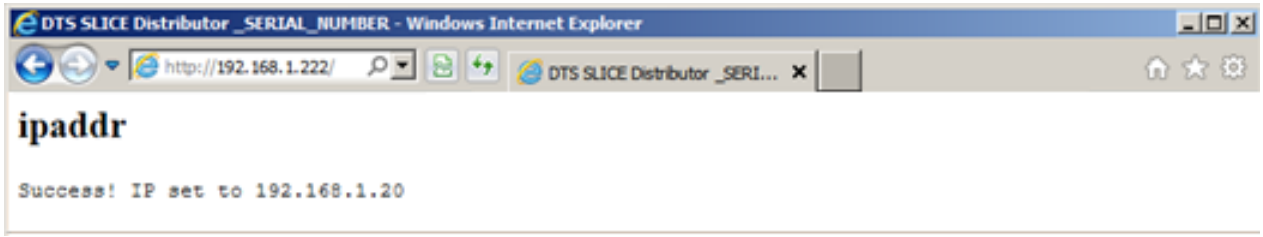
Using a web browser, enter the unit's current IP address. (Use compatibility mode with Internet Explorer.)



Enter the desired IP address and/or netmask into the available fields and click "Apply."



If the IP address is valid, the page will show success. Reboot the device for the settings to be applied.



If you receive an error, submit a request through the DTS Help Center and attach the system log file.

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Seal Beach, CA 90740 USA
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www.dtsweb.com

DECLARATION OF CE CONFORMITY

Description	Model
Data Acquisition Module	SLICE PRO Sensor Input Module
Data Acquisition Module	SLICE PRO Timed Output Module
Data Acquisition Module	SLICE PRO Digital Input Module
Data Acquisition Module	SLICE PRO Trigger Distributor
Data Acquisition Module	SLICE PRO Ethernet Controller
Data Acquisition Module	SLICE PRO USB Controller

The undersigned hereby declares that the products listed above, manufactured by Diversified Technical Systems, Inc., Seal Beach, California, USA, conform to the following directive and standards:

Applicable Council Directive: **89/336/EEC – Electromagnetic Compatibility**

Applicable Harmonized Standards: **EN 55022:1998, EN 55024:1998**

Stephen Pruitt, President
Diversified Technical Systems, Inc.

February 10, 2015
Date

Revision History

Rev	Date	By	Description
5	6 May 2019	EK	Added operational temperature warning. Updated Appendix C to reference cal data as source for IP address instead of packing list and added additional IP address formats. Moved section on "Changing the IP Address" to Appendix C and simplified. Added additional PWR LED indicator table for new firmware version. Removed power up PWR LED references in text.
4	19 May 2016	EK	Updated to include SLICE PRO LAB. Revised max VDC input. Added grounding info. Updated polarity requirement for event input. Reworked Appendix C to negate need for custom page. Added CE Declaration as Appendix D. Updated ECM weight (Fogbugz 5379).
3	6 May 2015	EK	Added remote on feature. Corrected weight. Updated power table. Updated Appendix C.
2	11 Mar 2015	EK	Updated input and output voltages on page 13. Updated DTS Support boilerplate. Fixed typo in "Communication Method" section.
1	24 Feb 2014	EK	Updated "DTS Support" section. Updated Power Switch section and all references. Removed reference to 26-pin connector in "Using the Event Input" section. Added 13000-30860 to accessories. Reorganized early sections and changed document font. Other minor changes.
0	13 Dec 2013	TK/CB/EK	Initial release.