



# SLICE PRO Trigger Distributor User's Manual



March 2018

# Table of Contents

- DTS Support ..... 3**
- Introducing the SLICE PRO Trigger Distributor ..... 4**
- Connector Panel..... 4**
  - TRIGGER OUTPUTS ..... 5
  - TRIGGER INPUTS ..... 5
  - POWER Input ..... 5
  - AUX Connector ..... 6
- UP/DOWN Interface Connectors ..... 6**
- LEDs ..... 6**
- Basic Care and Handling ..... 7**
  - Shock Rating..... 7
    - Mounting Considerations ..... 7*
  - Thermal Considerations ..... 7
- Power Management..... 8**
  - Power Consumption..... 8
  - Internal Battery..... 8
  - Power-up and Power-down Procedures ..... 9
- Communication Features ..... 9**
- Appendix A: Connector Information..... 10**
  - Suggested Connector Sources ..... 12
  - Suggested Cable Specifications ..... 13
- Appendix B: SLICE PRO Chain UP/DOWN Connector Information ..... 14**
- Appendix C: Input and Output Capabilities, Limits and Timing..... 15**
- Appendix D: Mechanical Specifications..... 18**
  - Accessories/Support Equipment..... 19
- Appendix E: Declaration of CE Conformity ..... 20**

## 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 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 the following products:

13000-30830: SLICE PRO Trigger Distributor (TDM)

13000-30831: SLICE PRO Trigger Distributor (TDM) (THF config)

# Introducing the SLICE PRO Trigger Distributor

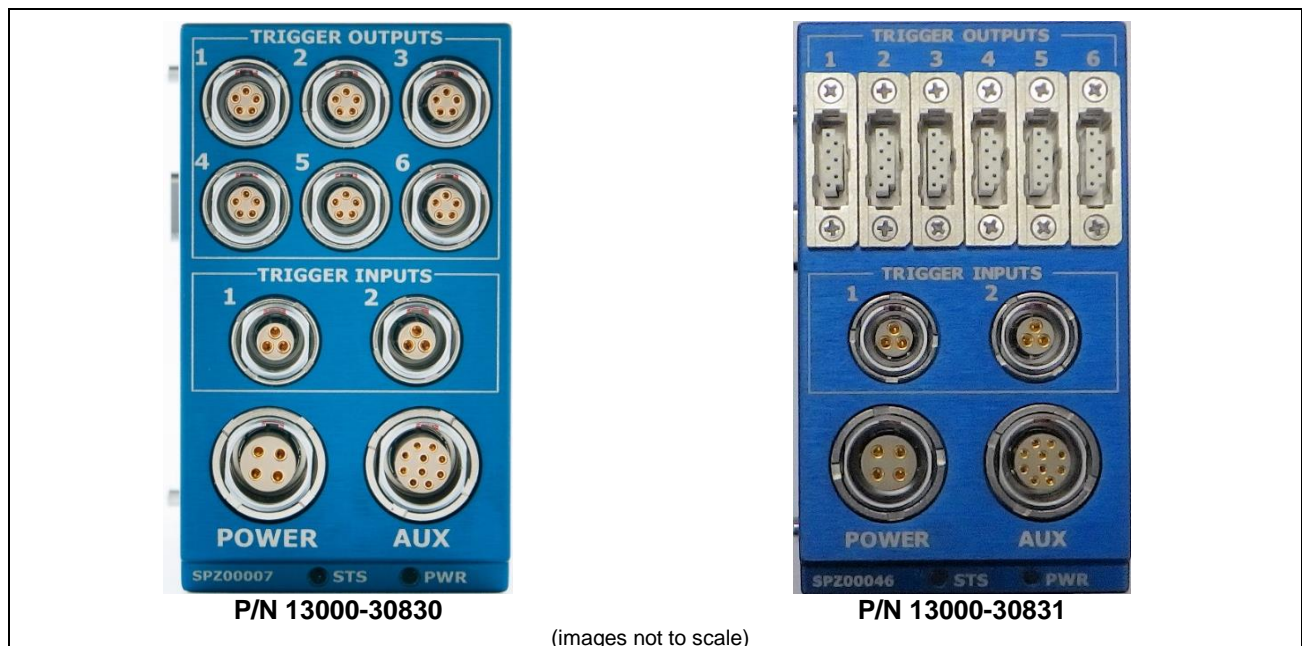
The SLICE PRO Trigger Distributor (TDM) is a trigger/event distribution unit that supports 2 isolated, multi-mode, contact closure event inputs and 6 isolated, multi-mode, programmable event outputs. While fully functional as a standalone device, it also integrates with plug-and-play ease into a SLICE PRO system chain.

- 6 isolated, multi-mode, programmable trigger outputs.
- 2 isolated, multi-mode, contact closure trigger inputs.
- Shock hardened to 100 g for dynamic testing environments.
- Multiple trigger inputs can be combined for “safing” pyrotechnic devices.
- Trigger signals protected from overcurrent, overvoltage and ESD.
- Internal battery with up to 24 hour capacity functions as primary or back-up power.
- LED indicators for power and system status.
- Use standalone or in a SLICE PRO system chain.

Connector information and pin assignments can be found in Appendices A and B. Input and output voltage and current limits, output current source and sink capabilities, and output timing information is included in Appendix C. Mechanical specifications are included in Appendix D. Please see your packing list for your hardware's specifications.

## Connector Panel

The SLICE PRO Trigger Distributor is available with LEMO 1B or Tajimi 7-pin trigger output connectors. The connector panel provides access to all trigger/event and control signals and includes a dedicated power input connector for standalone operation.



## TRIGGER OUTPUTS



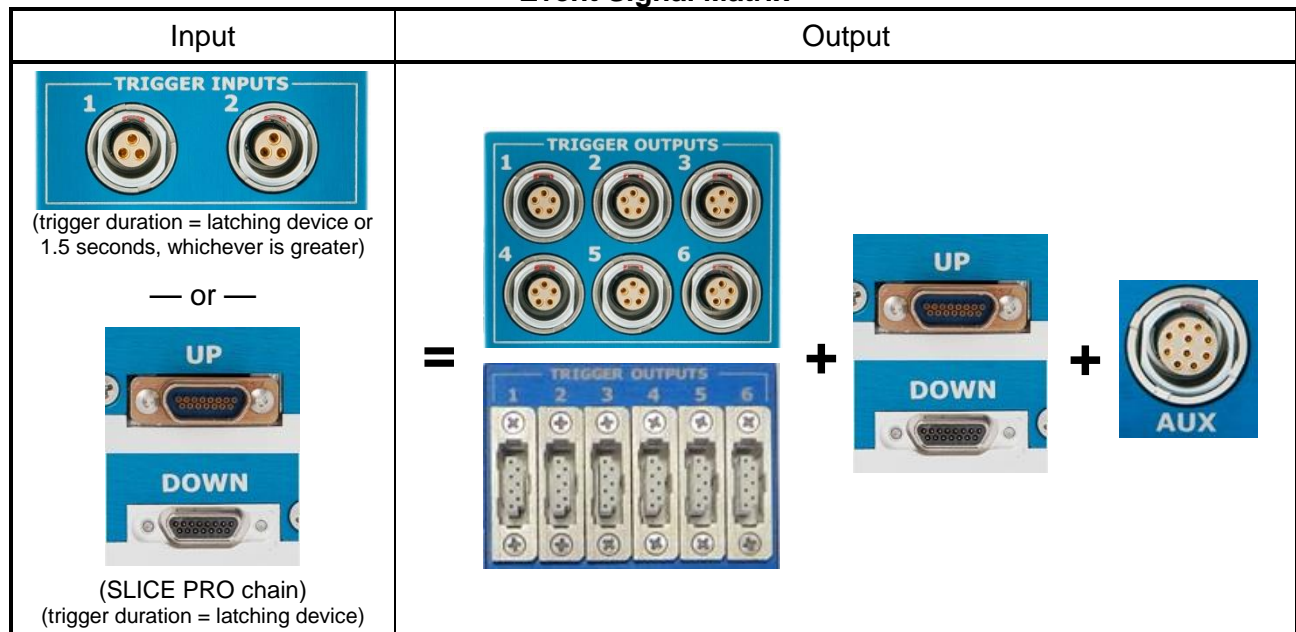
These 6 identical connectors support contact closure, reverse polarity, and programmable event signals. Each output can source and sink up to 5 mA. An event signal received via the TRIGGER INPUTS or SLICE PRO chain connectors is forwarded externally via the TRIGGER OUTPUTS and SLICE PRO chain connectors. See Appendix A for event condition, polarity, and programming mode information. See Appendix C for current source and sink capabilities, voltage and current limits, and timing information.

## TRIGGER INPUTS



These 2 identical connectors support discrete, isolated contact closure and reverse-polarity contact closure event signals. An event signal received via the TRIGGER INPUTS is forwarded externally via the TRIGGER OUTPUTS, SLICE PRO chain bus and AUX connector. Additionally, the TRIGGER INPUTS can be combined to create an AND condition using the AUX connector. See Appendix A for event condition information and input mode options. See Appendix C for voltage and current limits.

### Event Signal Matrix



## POWER Input



When used standalone, external power is provided via the dedicated POWER input connector. When the unit is connected to a SLICE PRO chain, external power is provided via the UP interface connector. If input power fails, the unit will transition seamlessly to its own internal battery. See Appendix A for pin assignments. (Note: Power applied to the POWER input connector is NOT forwarded externally via the UP/DOWN interface connectors.)

### AUX Connector



This connector supports status output, event output and ON signals, and auxiliary/accessory output power (400 mA maximum). Additionally, an input mode is available that combines the TRIGGER INPUTS to create an AND condition suitable for “safing” pyrotechnic devices. See Appendix A for pin assignments.

### UP/DOWN Interface Connectors



The UP interface connector allows the unit to interface to a SLICE PRO Ethernet Controller, USB Controller or another SLICE PRO module. The DOWN interface connector allows the unit to interface to another SLICE PRO module. See Appendix B for pin assignments.

(Note: Power applied to the POWER input connector is NOT forwarded externally via the UP/DOWN interface connectors.)

### LEDs

There are 2 LED indicators. The STS LED indicates communication and arm status and the PWR LED indicates power status. At system power-up, the red-green-blue LED initialization sequence is performed by the STS LED followed by the PWR LED.

Condition	STS	PWR
Charging (system off and connected to external power)		
Unit is charging (power OK)	●	☀
Unit fully charged	●	●
System on		
Power up	● ● ● ... ● ● ● ●	● ● ● ●
Power OK		●
30 sec timeout countdown after ON signal is removed; will re-set if Event is received during countdown		●
Power fault (out of range)		●

Note: Battery status is only available via the PWR LED.

Condition	STS
SLICE PRO chain Status Low	●
SLICE PRO chain Status High	●
Event input (SLICE PRO chain or TRIGGER INPUT) shorted	●
Event detected (clears on rising edge of status line)	☀



## Basic Care and Handling

The 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 Trigger Distributor 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 Trigger Distributor 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 Trigger Distributor is rated for 100 g, 12 ms half-sine duration, in all axes.

#### ***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 D 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

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. The SLICE PRO Trigger Distributor can be powered from a SLICE PRO chain or from the dedicated POWER input connector. Be sure to consider any power drop due to cable length.

Input Voltage	Power Consumption (OFF/ON + charging battery)
11.5-15 VDC; 15 VDC nominal	6 W; 400 mA per module

### Power Consumption

When connected to sufficient external power, the SLICE PRO Trigger Distributor will draw up to 400 mA for charging the internal battery. (Whether the unit is OFF or ON, the change in power consumption is negligible.)

### Internal Battery

The SLICE PRO Trigger Distributor contains an internal 7.4 V (nominal) lithium battery that operates as primary power or back-up power. If input power fails, the unit will transition to its own internal battery. When fully charged, battery capacity is sufficient to provide primary power and sustain full operation for 24 hours. It charges whenever sufficient external power is connected to the module. The maximum charge time is 3-4 hours from complete discharge to full capacity. The module does not need to be ON in order to charge the internal battery.

Charging practices can affect the useful operational life of the battery. In addition to good charging habits, conditioning the battery may be useful—3 deep-discharge/recharge cycles may 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).



## Power-up and Power-down Procedures

The SLICE PRO Trigger Distributor is powered up when 1) the proper signal is connected at the UP interface connector (SLICE PRO chain), or 2) the ON signal is received at the AUX connector (standalone operation). Power-up of the standalone module takes 10 seconds; when used in a SLICE PRO chain, the system takes between 1-2 minutes (Ethernet Controller) or 10 seconds (USB Controller).

To restart a system, turn off the Controller and wait ~30 seconds before reinitializing. (Press and hold the switch firmly for 2 seconds to start or stop the system.) 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:**

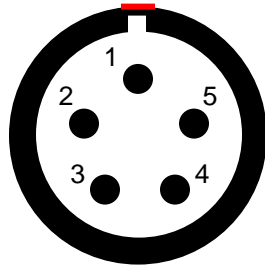
**Do not turn off the Controller if the system is armed. You must disarm the system before initiating a system restart.**

## Communication Features

The SLICE PRO Trigger Distributor does not support PC communications directly and will only pass-through USB signals to and from the SLICE PRO chain. It does not know whether it is being used standalone or in a SLICE PRO chain, and operates simply using 3 operational signals: On, status, and event/trigger.

## Appendix A: Connector Information

### 5-pin TRIGGER OUTPUTS (EEG.1B.305.CLL)

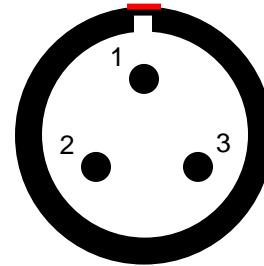


(panel view)

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

Pin	Function (see also Table 1)
1	+Event out, isolated, 0 V/+5 V to pin 2
2	-Event out, isolated, +5 V/0 V to pin 1
3	Polarity programming input (inverts active state of output signal)
4	Local ground
5	Mode programming input: Open = contact closure output signal Grounded = voltage output signal

### 3-pin TRIGGER INPUTS\*\* (EEG.1B.303.CLL)



(panel view)







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

Pin	Function
1	+Event in (contact closure to pin 2)
2	-Event in (contact closure to pin 1)
3	Input mode (to invert event input, short pin 3 to pin 2)

\*\* See also pin 8 on AUX connector

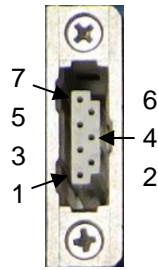
\* xx denotes diameter of cable to be used; e.g., 52 = 5.2 mm. See [www.lemo.com](http://www.lemo.com) for more information.

**Table 1: Event Output versus Pin 3 and Pin 5 Conditions\*\*\***

Pin 3	Pin 5	Pin 1 to Pin 2
Open	Grounded	+5 V to 0 V (  ) (5 mA nominal drive current)
Grounded	Grounded	0 V to +5 V (  ) (5 mA nominal drive current)
Open	Open	Contact closure OFF to ON (  ,  )
Grounded	Open	Contact closure ON to OFF (  ,  )

\*\*\* Trigger input signal duration:  
TRIGGER INPUTS = latching device or 1.5 seconds, whichever is greater  
SLICE PRO chain = latching device

**7-pin TRIGGER OUTPUTS**  
(3RT01-RW7F)

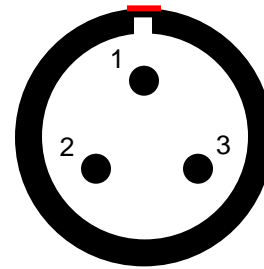


(panel view)

Suggested cable connector P/N:  
3RT01-PE7M

Pin	Function (see also Table 2)
1	+5 VDC output (200 mA total available for all 6 outputs)
2	-Event out, isolated, +5 V/0 V to pin 1
3	Polarity programming input (inverts active state of output signal)
4	Local ground
5	-VDC output/Ground
6	+Event out, isolated, 0 V/+5 V to pin 2
7	Mode programming input: Open = contact closure output signal Grounded = voltage output signal

**3-pin TRIGGER INPUTS\*\***  
(EEG.1B.303.CLL)



(panel view)







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

Pin	Function
1	+Event in (contact closure to pin 2)
2	-Event in (contact closure to pin 1)
3	Input mode (to invert event input, short pin 3 to pin 2)

\*\* See also pin 8 on AUX connector

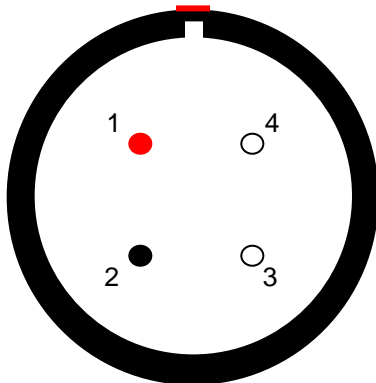
\* xx denotes diameter of cable to be used; e.g., 52 = 5.2 mm. See [www.lemo.com](http://www.lemo.com) for more information.

**Table 2: Event Output versus Pin 3 and Pin 7 Conditions\*\*\***

Pin 3	Pin 7	Pin 6 to Pin 2
Open	Grounded (to pin 4)	+5 V to 0 V (  ) (5 mA nominal drive current)
Grounded (to pin 4)	Grounded (to pin 4)	0 V to +5 V (  ) (5 mA nominal drive current)
Open	Open	Contact closure OFF to ON (  ,  )
Grounded (to pin 4)	Open	Contact closure ON to OFF (  ,  )

\*\*\* Trigger input signal duration:  
TRIGGER INPUTS = latching device or 1.5 seconds, whichever is greater  
SLICE PRO chain = latching device

**4-pin POWER connector\***  
(EEG.2B.304.CLL)



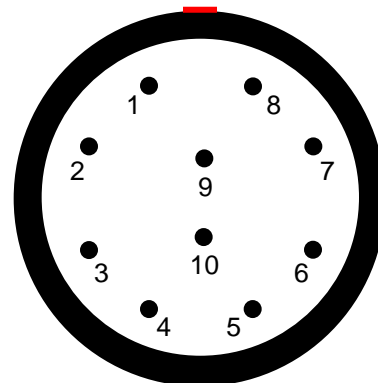
(panel view)

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

Pin	Function
1	11.5-15 VDC input
2	-VDC input/Ground
3, 4	Ground

\* Power applied to this connector is NOT forwarded externally via the UP/DOWN interface connectors.

**10-pin AUX connector**  
(EEG.2B.310.CLL)



Suggested cable connector P/N:  
FGG.2B.310.CLADxx\*\*

Pin	Function
1	Status output (5 V at 100 mA max)
2	Ground
3	+VDC (unregulated***, 400 mA max)
4	Ground
5	/ON (contact closure to Ground, continuous)
6	-Event output, isolated, contact closure to pin 7 (20 V, 20 mA max)
7	+Event output, isolated, contact closure to pin 6 (20 V, 20 mA max)
8	Input mode (contact closure to Ground jumpers TRIGGER INPUTS creating AND requirement)
9	Internal use only
10	Internal use only

\*\* 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.

\*\*\* uses highest voltage source from those available (internal battery, UP chain or dedicated POWER input)

**Suggested Connector Sources**

DTS uses LEMO connectors on the SLICE PRO Trigger Distributor. If you need to purchase connectors, we suggest first going to LEMO directly ([www.lemo.com](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 connectors.

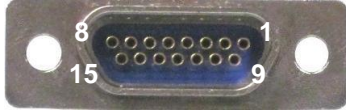
## Suggested Cable Specifications

DTS strongly recommends using a quality, shielded cable with the SLICE PRO Trigger Distributor. Cable shields should always be connected to the DAS end using either the connector shell or available ground/shield pin. *Do not connect the shield at both ends*—this will create a ground loop.

Belden 9451 (22 AWG) is suggested for use with the trigger input/output channels, but a larger gage could also be used for the trigger input channels (20 AWG is the maximum gage recommended for the LEMO trigger input solder contacts).

## Appendix B: SLICE PRO Chain UP/DOWN Connector Information

**UP interface connector\***  
(Omnetics A99077-015;  
MMDS-015-N06-SS)



(panel view)

**DOWN interface connector**  
(Omnetics A98000-015;  
MMDP-015-N00-SS)



(panel view)

Pin	Function
1	VDC in (UP)/VDC out (DOWN) (pass through)
2	VDC in (UP)/VDC out (DOWN) (pass through)
3	Ground
4	Ground
5	/ON (contact closure input to ground)
6	/EVENT (contact closure input to ground)
7	/START (contact closure input to ground)
8	Status input (UP)/output (DOWN) (5 V via 10k with respect to ground)
9	VDC in (UP)/VDC out (DOWN) (pass through)
10	VDC in (UP)/VDC out (DOWN) (pass through)
11	Ground
12	Ground
13	USB_DP (pass through)
14	USB_DM (pass through)
15	USB power (pass through)

\* The UP connector may appear loose. Do not tighten.



## Appendix C: Input and Output Capabilities, Limits and Timing

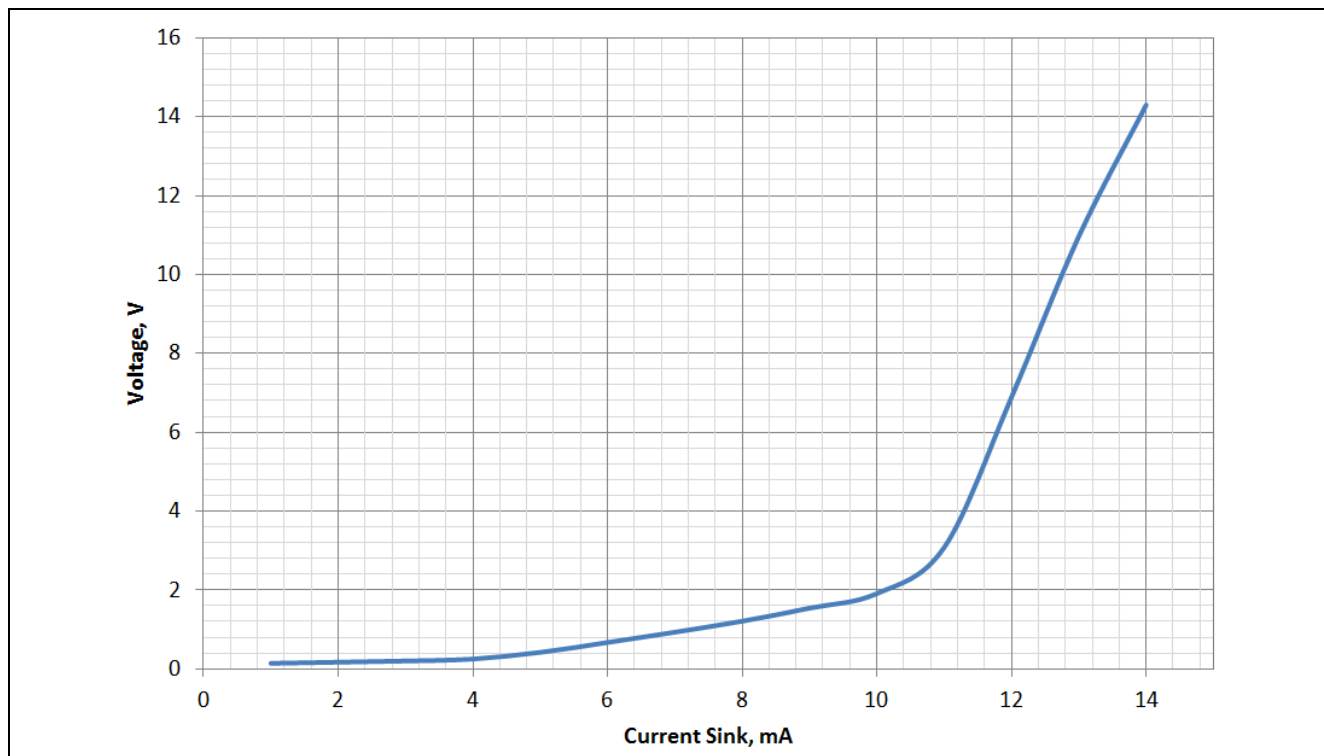


Figure 1: Output Current Sink Capability

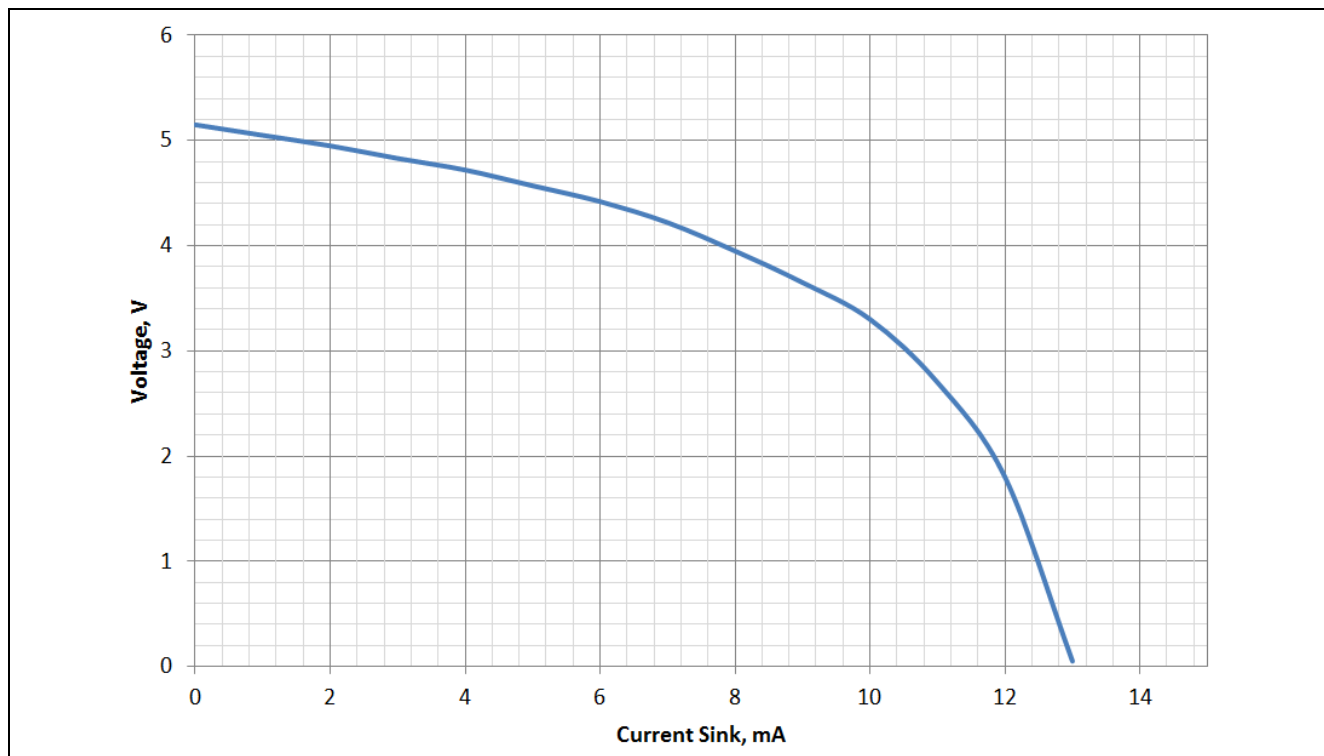
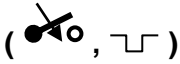
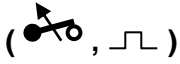
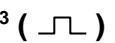



Figure 2: 5 V Output Current Source Capability

Table 3: Output Voltage and Current Limits<sup>1</sup>

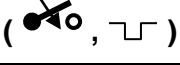
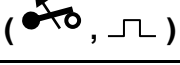
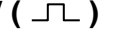
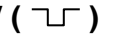
Mode	Absolute Maximum		Recommended Limit	
	Current	Voltage	Current	Voltage
<b>Contact closure, OPEN to CLOSED<sup>2</sup></b> 	30 mA	+80 V/-5 V	5 mA	+25 V/-0.7 V
<b>Contact closure, CLOSED to OPEN<sup>2</sup></b> 	30 mA	+80 V/-5 V	5 mA	+25 V/-0.7 V
<b>0 V to +5 V<sup>3</sup></b> (  )	30 mA		5 mA	
<b>+5 V to 0 V<sup>3</sup></b> (  )	30 mA		5 mA	

<sup>1</sup> Limits based on datasheet specifications for optocoupler and diodes. Absolute maximum specifications are for safety only; TDM performance may suffer under these conditions.

<sup>2</sup> Reverse-biased diode will conduct with negative voltage above 0.7 V, but will tolerate 500 mW. At 5 mA source/sink, TDM can pull an output down to ~1 V. At higher current loads, TDM will not be able to pull voltage down as far.

<sup>3</sup> When sourcing or sinking currents above 5 mA, voltage will be impacted, but not damage the TDM. At 5 mA output drive,  $V_{OUT}$  will be ~90%, 4.5 V.

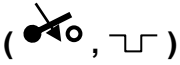
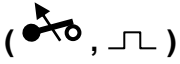
Table 4: Output Timing

Mode	Output Delay (maximum)	Output Delay (typical)	Output Skew (maximum)	Output Skew (typical)
<b>Contact closure, OPEN to CLOSED*</b> 	15 $\mu$ s	6 $\mu$ s	500 ns	250 ns
<b>Contact closure, CLOSED to OPEN**</b> 	15 $\mu$ s	12 $\mu$ s	4 $\mu$ s	1.5 $\mu$ s
<b>0 V to +5 V</b> (  )	15 $\mu$ s	8 $\mu$ s	500 ns	200 ns
<b>+5 V to 0 V</b> (  )	15 $\mu$ s	8 $\mu$ s	750 ns	425 ns

\* For all output modes, delay was measured from 50% of the falling edge of EVENT to 50% of final voltage of output.

\*\* Measured with 10 mA load; delay depends on current load. In contact closure mode and at lighter loads, the delay will be longer.

Table 5: Input Voltage and Current Limits<sup>1</sup>

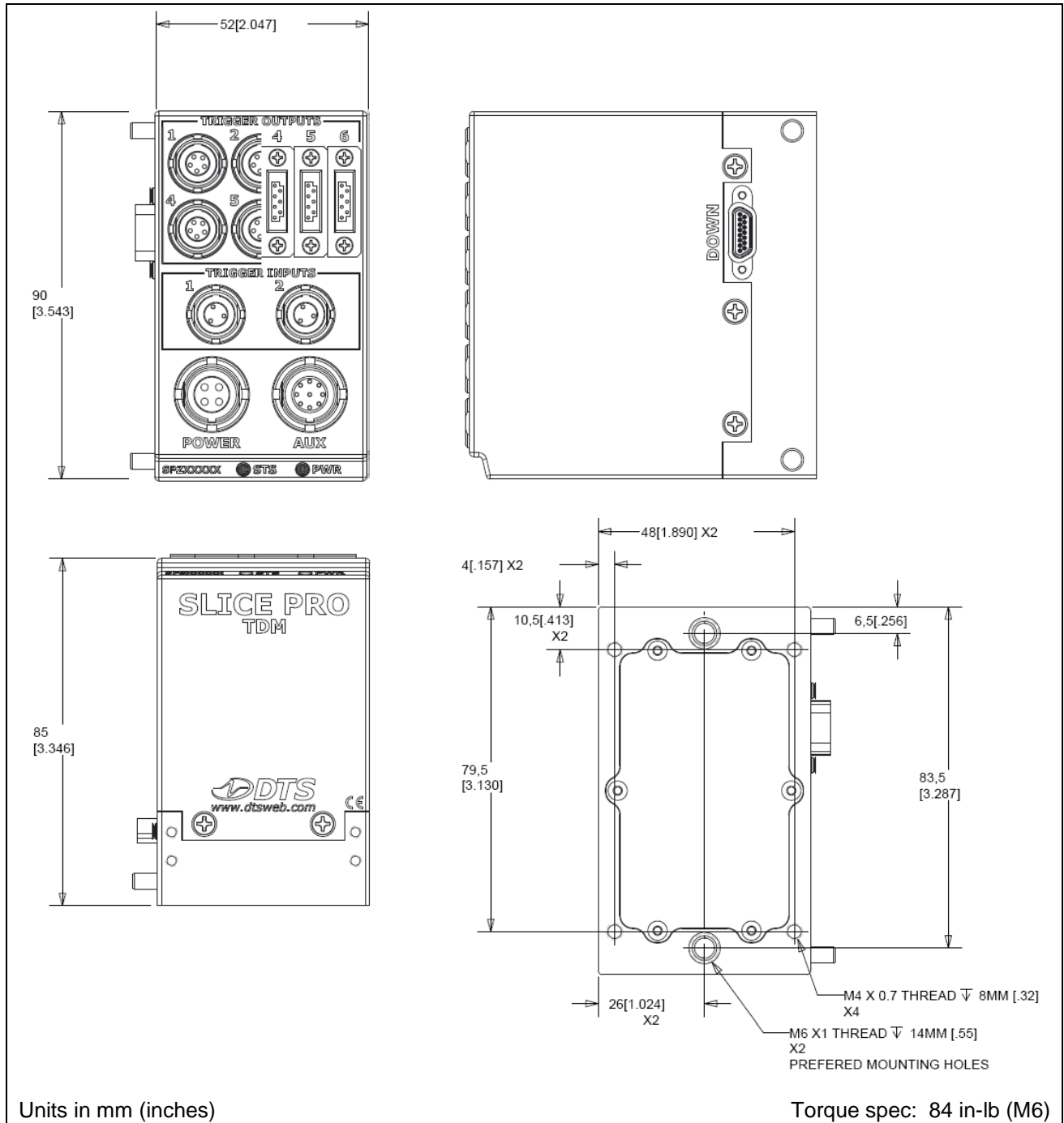
Mode	Absolute Maximum		Recommended Limit	
	Current	Voltage	Current	Voltage
<b>Contact closure, OPEN to CLOSED<sup>2</sup></b> 		±18 V		±15 V
<b>Contact closure, CLOSED to OPEN</b> 		±18 V		±15 V

<sup>1</sup> Limits based on datasheet specifications for optocoupler and diodes. Absolute maximum specifications are for safety only; TDM performance may suffer under these conditions.

<sup>2</sup> Positive limit trigger input will not conduct appreciable current unless 18 V limit is exceeded. If exceeded, a TVS diode will conduct and could fail if there is significant current applied to pins 1 and 2.

# Appendix D: Mechanical Specifications

Weight: ~554 g (19.5 oz)



## Accessories/Support Equipment

- 10400-00060: Power supply; 15 VDC, 4 A (90-240 VAC in, LEMO term) (PS-05)
- 10600-0011x: Cable, power, long grounded (PPL)
- 10600-0012x: Cable, power, short grounded (PPS)
- 13000-31040: SLICE PRO Trigger Distributor Module (TDM) On Enable Plug
- 80000-02074: LEMO plug; 1B, 3-pin, solder, 4.2 mm collet (FGG.1B.303.CLAD42)
- 80000-02078: LEMO plug; 1B, 5-pin, solder, 4.2 mm collet (FGG.1B.305.CLAD42)
- 80000-02085: LEMO plug; 2B, 4-pin, solder, 8.2 mm collet (FGG.2B.304.CLAD82)
- 80000-02093: LEMO plug; 2B, 10-pin, solder, 5.2 mm collet (FGG.2B.310.CLAD52)

(x = multiple lengths available)



1720 Apollo Court  
Seal Beach, CA 90740 USA  
+1 562 493 0158  
www.dtsweb.com

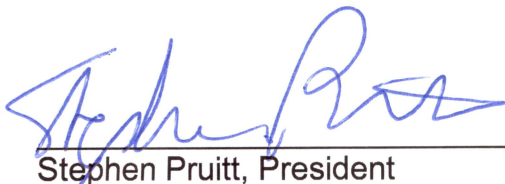
## DECLARATION OF CE CONFORMITY

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
Distribution Unit	SLICE Mini Distributor

The undersigned hereby declares that the products listed above, manufactured by DTS, 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  
DTS, Inc.

February 10, 2015  

---

Date



## Revision History

Rev	Date	By	Description
3	8 Mar 2018	EK	Added Tajimi version. Updated Event Signal Matrix and trigger input signal duration specs. Identified AUX event as output. Revised max VDC input. Added calibration reference. Added grounding info. Added operational temp range. Changed max mA spec for AUX pin 3. Added suggested cable specs section. Updated Accessories/Support Equipment. Added CE Declaration as Appendix E.
2	11 Dec 2015	EK	Added blue and green power LED conditions. Expanded explanation of Communication Signals. Revised Table 1 footnote and pins 6, 7 for AUX connector. Added info on output/input voltage and current limits, and output timing (Tables 2, 3 and 4) to Appendix C.
1	12 May 2015	EK	Changed DOWN to UP under POWER Input (page 5). Clarified power up specs for Ethernet and USB Controllers (page 8). Replaced CONTROL (connector) with AUX, updating photos and line art. Corrected input signal duration in Event Signal Matrix. Updated status LED table.
0	19 Mar 2015	EK	Initial release.