Bandweaver

OPERATION, INSTALLATION AND MAINTENANCE MANUAL

DISTRIBUTED TEMPERATURE SENSING

Bandweaver Product Family: **T-Laser**

Revision 1.0, May 2019

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Revision History

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1 Introduction

The T-Laser series linear temperature sensor, developed by Bandweaver, is a modularized distributed temperature sensor which employs an optical fibre as the sensor. It provides high-performance near real-time temperature sensing and alarm functionality with standard communication interfaces.

This latest generation is a rack mounted device of up to 8 channels, which incorporates standard communication interfaces to provide clients with real time temperature monitoring and alarming.

The T-Laser system is based on temperature-sensitive Raman scattering and optical time-domain reflection technology for distributed positioning. It can probe the temperature at every 1m interval along the whole optical fibre up to 40km per circuit (range of up to 10Km, 16Km, 20km, 30Km or 40Km, depending on the model). It also provides a series of alarm conditions such as a temperature maximum threshold, temperature rate of rise threshold and temperature deviation. Also, as an essential fail-safe scheme, it can detect a fibre break condition.

This product is particularly well suited to application of fire detection and it offers many distinct advantages over historical solutions to the Line Type Heat Detector solution. An important advantage of a distributed fibre optic sensor is that, the roles of the sensing elements and the transmission medium are combined utilising a single fibre, while retaining excellent temperature and position accuracy. High-speed optical signal detection and processing technology also provides for a quick system response time, which is critical in fire detection and power cable monitoring.

The interrogation of the sensing fibre uses light and the nature of the fibre means that it does not need any electric power nor does it generate any electrical signals. Therefore, the fibre is immune to electromagnetic interference and is an ideal sensor for electric field sensitive applications e.g. electrified railway tunnel applications, urban metros.

The fibre contains is a totally passive sensor and has a very long life. Over its lifetime, it will require little or no maintenance and is therefore suitable for applications where access for maintenance is a cost consideration.

Additionally, the optical fibre sensor has other advantages:

- Measurements are provided for the entire length of the sensing cable;
- Simple and low-cost installation, with minimal planning required for the position of the cable compared to point sensors;
- No electronics or moving parts;
- 30-year life time for the optical fibre;
- Low maintenance costs;
- Immune to shock/vibration and electromagnetic interference;
- Intrinsically safe for use in hazardous zones – the sensing cable cannot cause an ignition.

1.1 Glossary and abbreviations

DTS *Distributed Temperature Sensor*

DTSCM *Distributed Temperature Sensor Configuration Management*

FACP *Fire Alarm Control Panel*

FAS *Fire Alarm System*

FC/APC *A type of fiber optic connector*

ISCS *Integrated Supervisory Control Systems*

Differential temperature alarm *An alarm generated by the temperature rise rate of the fiber exceeding a set threshold. The red background colour is displayed when the alarm is in the main interface of the software, and the alarm type is **fire alarm**.*

Fiber Break *Indicates that the fiber is not connected or the fiber has a break. A yellow background is displayed when the alarm is in the main interface of the software, and the alarm type is **fault**.*

High temperature alarm *An alarm generated when the fiber temperature exceeds the set temperature threshold. A red background is displayed when the alarm is in the main interface of the software, and the alarm type is fire alarm.*

Zone *A configured section of fiber with start and end positions*

1.2 Related Documentation

Read this manual in conjunction with the following documents:

DTSCM2 User Manual – User Manual for Bandweaver's DTS Configuration Manager 2 software

Modbus COIL&REGISTER Definition – Manual that provides more detail for using MODBUS

2 Safety

Please read the following safety information and warnings before connecting or operating this product.

2.1 Safety Warning Information and Symbols

General Warning Symbol

DO NOT ATTEMPT TO OPEN THE UNIT.
The product does not contain any user serviceable parts.

If smoke or any burning smell is emitted from the product, or in the event of any other emergency, immediately cut the power supply to the product and inform Bandweaver or its authorised agents.

This symbol is used throughout the user manual whenever there is a mandatory requirement or a risk of personal injury or probability of damaging the product.

Laser Radiation Warning Symbol

DO NOT EXAMINE OR LOOK DIRECTLY INTO THE EXPOSED FIBRE OR CONNECTOR DURING MEASUREMENT.
DO NOT UNDERTAKE FUSION SPLICING OR SIMILAR FIBRE JOINING WHEN THE PRODUCT IS IN OPERATION AND CONNECTED TO THE FIBER.

This product incorporates a pulsed laser device whose invisible output radiation is potentially hazardous if viewed directly by eye.

Always turn off the product, and if possible, disconnect the fibre/connector, before any examination of the fibre.

High Voltage warning Symbol

DO NOT ATTEMPT TO OPEN THE UNIT.
This product has High Voltage (HV) components inside and voltages within the equipment are high enough to endanger life.
Only manufacturer trained and approved service personnel are authorised to remove the covers.

DO NOT GET THE PRODUCT WET, OR EXPOSE TO EXCESSIVE MOISTURE.
In the event of water (or other liquid) ingress, disconnect the power and inform Bandweaver or its authorised agents. Do not touch the case during a lightning storm.

2.2 Laser Safety

The system incorporates a pulsed laser device whose invisible output radiation is potentially hazardous if viewed directly by eye. The laser radiation emission from the laser within the system is permanently coupled into a 50/125µm multimode optical fibre whose end is terminated with an E2000 angled optical fibre connector.

The T-Laser system should be interfaced to the test fibre, using a patch cord or pigtail assembly. It is recommended that the T-Laser system is connected to a test fibre or use the E2000 connector cap to prevent the light emitting to free space, and the far end of the test fibre should be optically cut off.

It is recommended that the unit is located where only authorised personnel have access to the front and rear connectors. Similarly, all personnel with such access must be made aware of the risks of working with such equipment. For unused output fiber optic connectors at the rear of the instrument, the protective caps must be utilised.

The laser radiation from the T-Laser system has been classified in accordance with international standard IEC 60825-1 Edition 1.2 E2001-03, with the following classification outcome:

T-Laser Laser System Classification: Class 1M

In accordance with the international standard document for Class 1M laser radiation:

Class 1M lasers are safe under reasonably foreseeable conditions of operation, but may be hazardous if the user employs optics within the beam.

2.2.1 Additional Warnings

Avoid exposing the device to direct sunlight or other heat sources to protect sensitive components.

3 T-Laser Product Specifications

Operating Environment	
BS EN 54-22:2015 – Environmental Classification	Environmental Group I for Sensor Control Units, response class A1N
Operating temperature	0°C to +45°C
Operating Humidity	0 to 95% RH NC
Storage temperature	-10°C to +85°C
EMC Immunity	EN 61000-6-1:2007
EMC Emissions	EN 61000-6-3:2007+A1:2011
Laser Classification	IEC60825-1:2014 Class1M Laser
Ingress Protection	IP40 Note: By installing the T-Laser inside an appropriate cabinet, the IP rating may be significantly increased.
Physical Characteristics	
Dimensions	131 mm (Height) x 432 mm (Width) x 332 mm (Depth)
Weight	10 Kg
Material	Painted Steel
Colour/Finish	Black/Matt
Electrical Characteristics	
Supply Voltage	Nominal 24VDC (18 to 36 VDC)
Max. Operating current	2A
Power Consumption	~ 25W
Relays	2 fault relays, 4 fibre break relays 44 programmable fire zone relays
Electrical Interfaces	RJ45 (for advanced configuration via a PC/Laptop running DTSCM2 configuration software) RS485 or TCP/IP interface for communication via Modbus protocol
FireDetection Criteria	
Maximum circuit length	Model dependent – 10Km, 16Km, 20Km, 30Km, 40Km
Spatial resolution	1m
Channels	Model dependent – Up to 8 channels

3.1 Product Standard Packing List

No	Item description	Qty
1	T-Laser distributed temperature sensing unit	1
2	Packing list	1
3	CD (with Software and User Manuals)	1
4	Test report	1
5	Security Keys	2
6	SCSI Relay cable	2
7	SCSI 50P relay convertor	2
8	Network cable	2
9	RS485 cable	1
10	DB9 cable (double connector)	1
11	Power Adaptor	1
12	Power cable	1
13	Chassis bracket Screws	8
14	Chassis mounting brackets	1 set
15	Fiber optic pigtail	1 per channel

Table 3.1 Packing List

4 Product Start-Up and Operation

4.1 Typical Configuration

The T-Laser system comprises a central control unit coupled to up to 10km of 50µm/125µm graded-index multimode temperature sensing fibre, FireFiber. The range of the control unit depends on the T-Laser model. The fiber is installed in the area to be detected and communicates with Bandweaver's DTSCM2 software. The system can accurately monitor temperature changes in real time.

The fibre may be connected in a spur configuration and the length of sensor cable attached may be configured into multiple detection zones. Each zone may have its own individual alarm level. The alarm levels are typically in compliance with the sensitivity definition as per prEN54 part 22.

Each detection zone is configured in terms of:

- Its position along the length of connected fibre optic sensor cable
- Its sensitivity in relation to the relevant grade of detection
- Its alarm output as each zone is allocated a separate relay output

The T-Laser system has the capability to interface directly to a Fire Alarm Control Panel (FACP) circuit, typically via the use of the volt free relay interface. There are up to 50 relay outputs available on the T-Laser Relay interface.

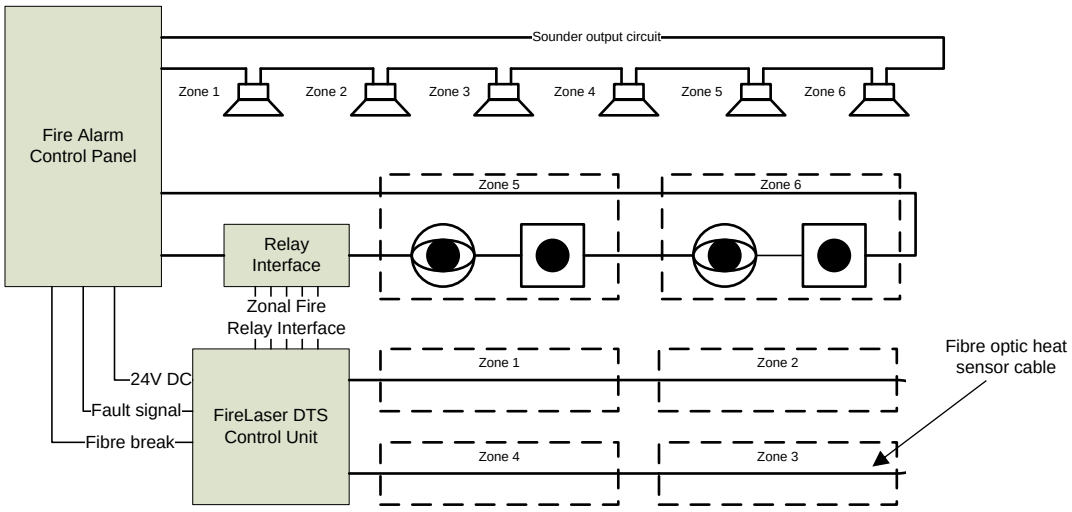

Figure 4-1 T-Laser connection with Fire Alarm Control Panel

Figure 4-1 shows an example configuration where the T-Laser unit is powered by, and interfaces directly to, the Fire Alarm Control Panel (FACP). The T-Laser signals to the FACP fire and fault conditions, which are in turn logged and signalled in the appropriate manner by the FACP.

T-Laser must be installed, connected and configured before measurements can be taken. The following sections will explain how to connect the T-Laser system to an optical fibre.

4.2 Front Panel View

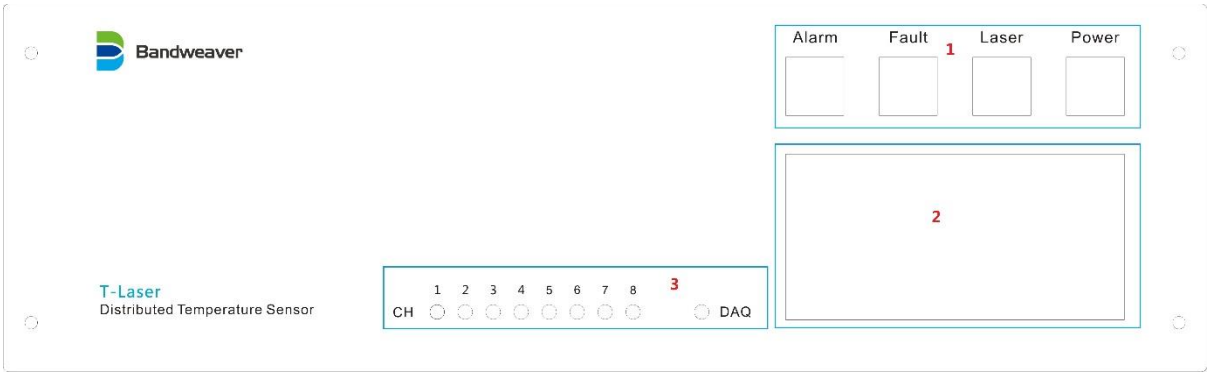

Figure 4-2 - Front Panel View

The front panel of the T-Laser is shown in Figure 4-2 above and the numbered items are described below:

1. LED indicators of the system status
   - Power When illuminated, this indicates that the power is on.
   - Laser When illuminated, this indicates the laser is operational and is emitting light
   - Fault When illuminated, this indicates a system fault
   - Alarm When illuminated, this indicates a temperature alarm (fire alarm event)
2. Lockable door to security controls
3. Channel indication showing the operating state of the system
   - Channel indication Green when a channel is in operation
     Yellow when there is a fiber break
     Red when there is a fiber alarm
   - DAQ Status Fast flashing: automatic data acquisition mode
     Slow flashing: manual mode / idle

Security controls:

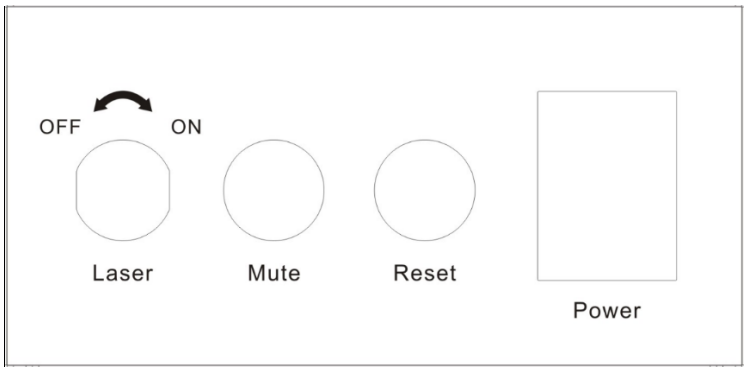

Figure 4-3 Security Controls view

Power: *Switch to **I** to turn the power, and **O** to turn the power off*

Laser: *Use to switch the laser on and off*

Reset: *Clears all current alarm information*

Mute: *Silences the audible alarm*

4.3 Rear Panel View

The T-Laser DTS is equipped with up to 8 channels of fiber output, 3 RJ45 network ports, 2 RS485 ports and 50 relay outputs.

The interfaces are located on the backplane of the host, as shown below:

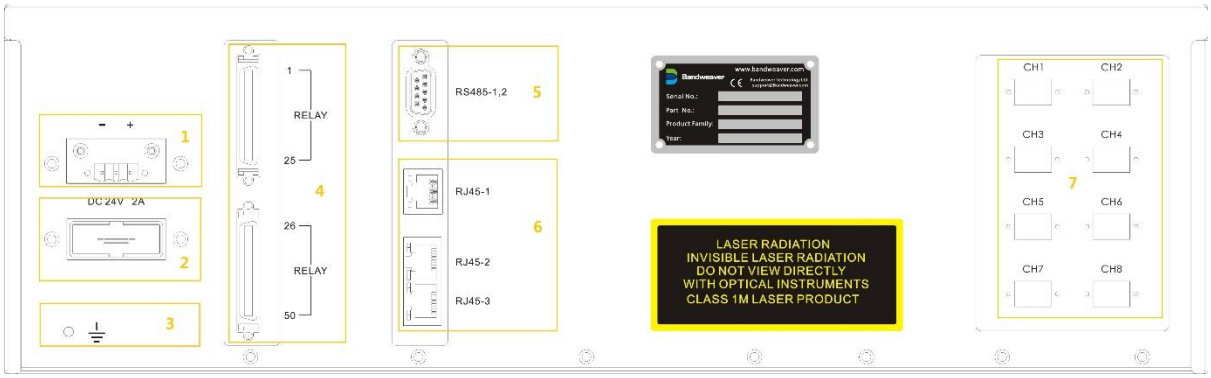

Figure 4-4-4 - Rear Panel View

4.3.1 Rear Panel Components

1. **24VDC in:** *DC power supply terminals, maximum current is 2A*
2. **Fuse box:** *Contains two 2A fuses. One is a backup fuse*
3. **Ground terminal:** *For grounding the chassis*
4. **Relays**: *50 relays for alarm outputs*
5. **RS485-1~2:** *Two RS-485 bus connectors that support Modbus RTU*
6. **RJ-45-1~3:** *Three 10/100Mbps Adaptive Ethernet Ports*
7. **CH1~4**: *Four E2000 type optic connectors for sensing fiber connections*

4.3.2 Power supply

The T-Laser requires nominal 24V DC power supply. The red and black terminals on the rear panel correspond to the positive and negative poles of the 24V DC power supply respectively.

In order to ensure system safety is maintained in an abnormal situation, a 2A fuse is mounted in the T-Laser rear panel.

Connect the DC 24V power input to the terminal block as shown in Figure 4-1 below, paying attention to the positive and negative poles.

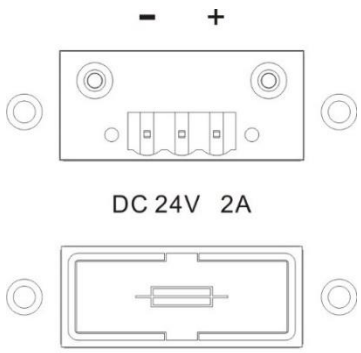

Figure 4-5 Power supply input and fuse

5 Quick Start Guide

5.1.1 Installation environment and initial checks

- Ensure that the operating environment of the T-Laser system is within specification.

  The environmental groups for the T-Laser is classified as Group I and the sensing element (FireFiber) is classified as Group III.
  The environmental groups are not be confused with the temperature response classifications (i.e. A1N, B1N etc.).
  Group I covers equipment likely to be installed indoors in commercial/industrial premises but for which the avoidance of extreme environmental conditions can be taken into account in the selection of the mounting site.
  Environmental Group II covers equipment likely to be installed indoors in commercial/industrial premises in all general areas.
  Group III covers equipment which is intended to be installed outdoors.

- Ensure the instrument is positioned in clean, dry and a well-ventilated area, with free air flow around the unit. Do not obstruct the air intakes or vents. If several hosts are installed in the same cabinet, ensure that is sufficient space around the hosts to promote adequate airflow. If the cabinet size does not allow for this, the cabinet should be fitted with fans or other cooling technologies, to maintain the operating conditions within specifications.

- After unpacking the unit, visually check the T-Laser for any signs of damage and ensure that all the accessories are included in the box. Refer to the packing list which is packed with the box. A copy can also be found in section 0 of this manual.
  Note: we recommend that the shipping box for the T-Laser is not discarded. This packaging provides the best protection for shipping or transporting the T-Laser when required.

- Before operating T-Laser, ensure all users have read and fully understood the safety sections of this user manual.

5.2 Configuring the T-Laser

The T-Laser can be configured via DTSCM2:

1. **Via Bandweaver's DTSCM2 configuration software**
   Allows for advanced configuration but requires a computer running the DTSCM2 software. Please refer to the DTSCM2 User Manual for connection and configuration of the T-Laser via the DTSCM2 software.

Required Equipment:

- T-Laser Distributed Temperature Sensor

  T-Laser should be installed indoors in commercial/industrial premises.
- Suitable Power Supply

  T-Laser requires 24V DC power supply. The red and black terminals on the rear panel correspond to the positive and negative poles of the 24V DC power supply.
  In order to ensure system safety in an abnormal situation, a 2A fuse is mounted in the T-Laser rear panel.
- Fiber Optic Sensor Cable:

  Standard 50µm/125µm graded index multimode optical fibre terminated with an E2000 connector

5.2.1 Connect the power

Refer to Section 4.3.2 to ensure the power supply is connected correctly.

5.2.2 Connect the fiber

If the user is unfamiliar with good practices in the use of fiber and this type of system, refer to Section 7 before continuing.

As a safety precaution **ensure the laser is OFF** before inserting the connector into the optical connectors on the back of the FenceSentry**.**

5.3 Switch on the T-Laser

Switch the power and the laser ON. The power and laser indicators on the front panel will light up and the device will run. T-Laser will load the configured parameters and start to measure automatically if there is no intervention within 30 seconds after power on.

5.3.1 Set the parameters

The DTS system is set to automatically load the internal storage configuration for automatic measurement if there is no intervention within 30 seconds after power on.

To configure the T-Laser for use – refer to DTSCM2 User Manual.

6 Alarms

In the event of the following conditions:

Alarm condition such as:

- The temperature exceeds an alarm parameter in a zone

Fault condition such as:

- Fibre break
- Laser fault

The following will occur:

- if the alarm is set to trigger a relay the relay will close contact (refer to Section 6.1).
  - Laser fault: Relay #2
  - Fiber break: Corresponding relay #3 ~ #6
- The corresponding LED indicator will light up
- if an IPC running the DTSCM2 software is connected, an alarm event window will pop up

In this situation, the user has two options to reset the alarm. The alarm may be reset from the **RESET** switch on the front panel or via the software.

After an alarm has been reset using the **RESET** button, the relays will open.

However, if the alarm condition has not been resolved the relay will close again after the next measurement is complete.

6.1 Relays

The T-Laser DTS integrates two SCSI connectors on the rear panel for output of relays. Each SCSI connector is 50 pins as dual-row for 25 relays. Together, the two connectors provide up to 50 relay outputs.

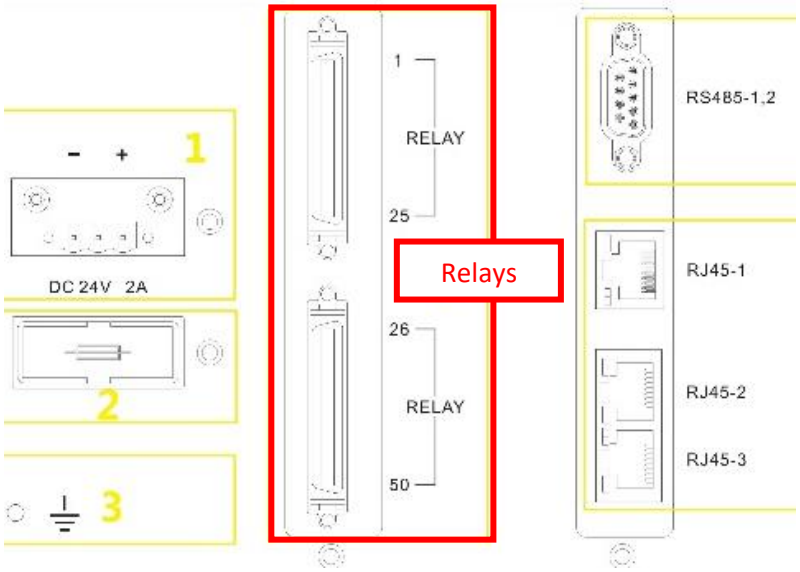

Figure 6-1 Relay connectors on rear panel

Connector 1: Relays 1 to 25 **Connector 2: Relays 26 to 50**

The two pins in the same row constitute the output of one relay. Two SCSI to PLC terminal convertors are supplied with T-Laser. The relays can be connected directly from the terminals of the convertor. The view of connector and convertor are shown in Figure 6-2 below:

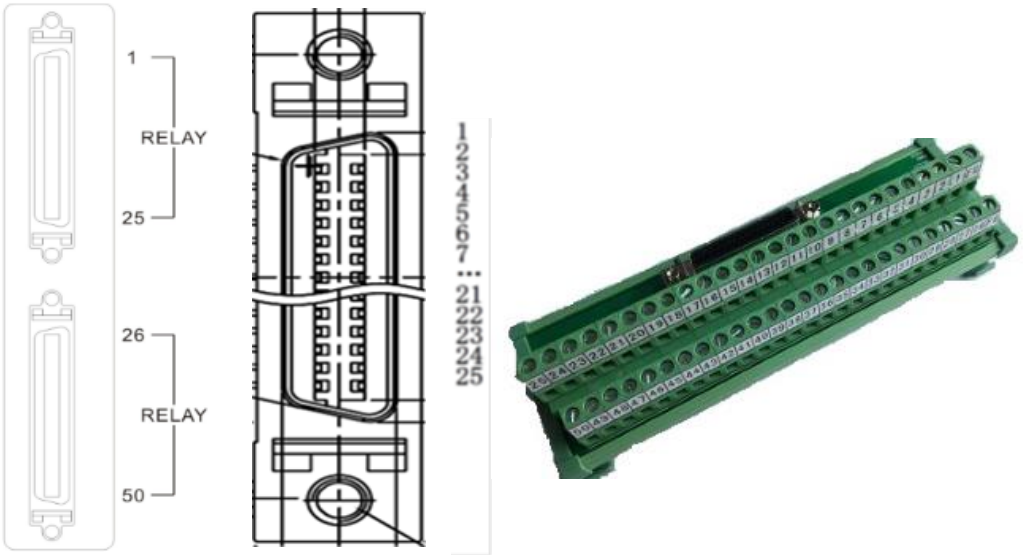

Figure 6-2 Output relays

Relay definitions:

Relay 1 *Power indicator*

Relay 2 *System status indicator*

Relay 3~6 *Broken fiber indicators for channel 1 to channel 8 respectively*

Relay 7~50 *User addressable alarm indicators for zones. Refer to Section* ***Error! Reference source not found.*** *for details*

The first 6 relays are reserved for system faults. The first use addressable relay starts at relay 7.

The relay mapping is as follows:

Pin	Port 1 – Relays 1 to 25	Port 2 – Relays 26 to 50
1/26	Power Fault COM / NC	COM / NO
2/27	System Laser Fault COM / NO	COM / NO
3/28	Fibre break CH1&CH5 COM / NO	COM / NO
4/29	Fibre break CH2&CH6 COM / NO	COM / NO
5/30	Fibre break CH3&CH7 COM / NO	COM / NO
6/31	Fibre break CH4&CH8 COM / NO	COM / NO
7/32	COM / NO	COM / NO
8/33	COM / NO	COM / NO
9/34	COM / NO	COM / NO
10/35	COM / NO	COM / NO
11/36	COM / NO	COM / NO
12/37	COM / NO	COM / NO
13/38	COM / NO	COM / NO
14/39	COM / NO	COM / NO
15/40	COM / NO	COM / NO
16/41	COM / NO	COM / NO
17/42	COM / NO	COM / NO
18/43	COM / NO	COM / NO
19/44	COM / NO	COM / NO
20/45	COM / NO	COM / NO
21/46	COM / NO	COM / NO
22/47	COM / NO	COM / NO
23/48	COM / NO	COM / NO
24/49	COM / NO	COM / NO
25/50	COM / NO	COM / NO

Table 6.1 Relay connector pinout

6.2 Modbus

Please refer to the Modbus COIL&REGISTER Definition for Modbus communication details not included in this section.

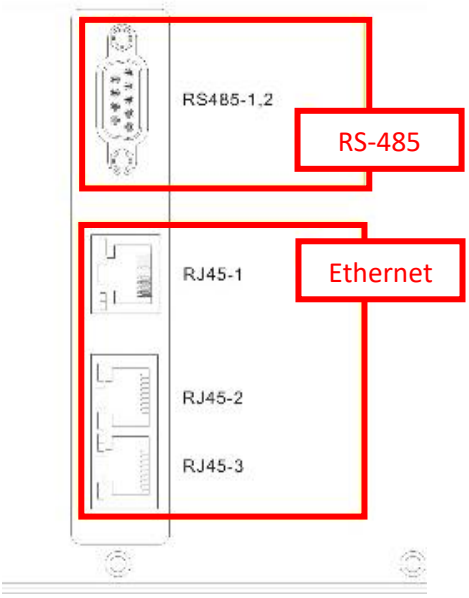

Figure 6-3 RS-485 and Ethernet ports

6.2.1 RS-485 Interfaces

The T-Laser DTS integrates two RS-485 bus into a DB-9 connector. They are configured as slave mode, and only used for Modbus RTU communication.

Please only use the RS-485 cable packing with the DTS.

The default settings are as below:

ID	1
Baud rate	19200
Stop bit	1
CRC	EVEN

6.2.2 Ethernet connection: RJ-45

The T-Laser DTS integrates three 10/100Mbps adaptive Ethernet network ports – labelled RJ45-1, RJ45-2 and RJ45-3 on the rear panel of the T-Laser.

Only RJ45-2 and RJ45-3 support Modbus TCP in server mode. See

	RJ45-1	RJ45-2	RJ45-3
Default IP address	*192.169.0.100*	*192.169.0.11*	*192.169.0.12*
Type	▪ *10/100M adaptive* ▪ *MDI/MDI-X adaptive*	▪ *10/100M adaptive*	▪ *10/100M adaptive*
Use	▪ *UDP (Port: 1025) for DTSCM2*	▪ *TCP(Port: 1026) & UDP(Port: 1025) for DTSCM2,* ▪ *Modbus TCP server (Port: 502)*	▪ *TCP (Port: 1026) & UDP (Port: 1025) for DTSCM2,* ▪ *Modbus TCP server (Port: 502)*

Table 6.2 Summary of RJ45 ports

Each Modbus TCP server can support a maximum of four sockets.

Note:
The three network cards have different MAC addresses. However, if there is more than one T-Laser on the same local area network, their MAC address must be changed to be distinct. Please refer to the DTSCM2 User manual on how to do this.

7 Good Practice

7.1 Use of fibre optic connectors ⚠

When the optical fibre is ready, the E2000 connector can be connected to the T-Laser system for temperature measurement.

Insert the E2000 connector into the back of the T-Laser. The connector must be firmly pushed into the receptor and an audible click will confirm a good connection.

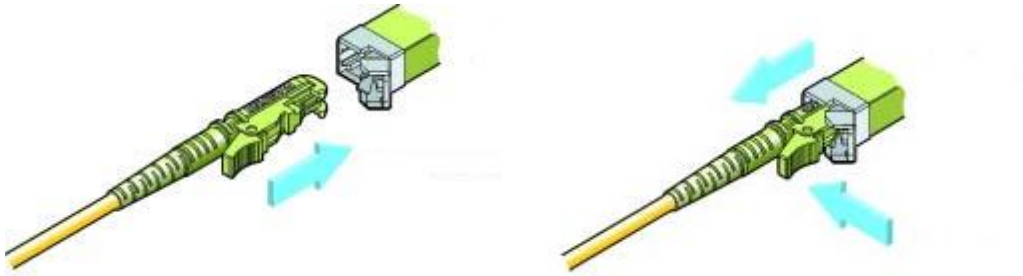

Figure 7-1 - E2000 Connector

NOTE:

- Always turn off the laser when inserting or removing a connector
- Do not look directly at the connector when the laser is on.
- The standard E2000 can only be inserted in one direction.
- The E2000 must be firmly pushed into the connector, an audible click will confirm a good connection.
- The connector has a built-in release catch that must be depressed before it can be removed
- Do not over bend or wind the patch cord too tightly as this can increase the attenuation in transmission
- Do not continue to use a connector if it has been damaged, and have it replaced as soon as possible.
- After use, ensure the connectors are well protected against dusts or grease contamination with a suitable cap.

WARNING:

As a safety precaution, before inserting the connector into the optical connectors on the back of the T-Laser, please turn off the laser or turn off the machine.

7.2 Terminating the far end of the sensing fiber

To prevent end reflections and inadvertent viewing of the laser light, at the far end of the fibre, the fibre must be appropriately terminated. These end reflections can damage the optical receiver if left unchecked.

There are several possible methods:

1. Splice on Bandweaver's RMU (Reflection Mitigation unit). The RMU provides a reliable and repeatable way to protect against the receiver saturating from the strong signals that can be produced from an incorrectly terminated sensing fiber. the RMU can be spliced to the fibre end and well protected in suitable enclosures. These are all standard procedures in field applications and no special equipment's and technology required.

2. Splice an angled connector to the end of the optical fibre and cover it with a protector.

3. Roughly break the end of the optical fibre and cover the end.

4. Tie a knot of approximately 5mm in diameter at the end of the optical fibre.

5. Immerse the end of the optic fibre in matched refractive index liquid and cover the end.

8 Troubleshooting

Problem	Common causes	Recommended solution
No lights are on	- Power switch is off	- Turn the power switch to "I"
Failure reported as soon as the unit starts	- The laser switch is not turned on - There is no fiber connected - The connector is dirty	- Switch the laser ON - Clean connectors - Ensure the fiber is plugged in correctly
Temperature trace too noisy	- Not a perfect connection - Dirty connectors - Large splice losses - Sharp bends or breaks in the fibre	- Clean connectors - Check raw data and find the fibre sharp bends / breaks - Re-splice fibre joints if necessary ***Note:*** *Typical connector loss is about 0.3dB and splice loss is 0.1dB or less.*
Temperature trace has different slopes	- Differing fibre types are joined together	- Check fibres used
Temperature trace exhibits step changes at fibre joints	- Dirty connectors - Large splice losses - Different types fibres	- Clean connectors - Re-splice fibre joints
DAQ timeout error	- Laser outside the operating temperature range	- Reboot system ***Note:*** *Contact Bandweaver if the problem persists.*
Fatal error	- Communication error	Reboot system ***Note:*** *Contact Bandweaver if the problem persists.*
No data being received from the T-Laser	- Communications warning indicated on the front page	- Try to Ping the system Start → run → cmd Ping 192.168.0.100 - Make sure network connection is enabled
Raw data is almost zero	- Laser is off	- Ensure that the laser switch is in the ON position

If any problem persists or if the user is unable to resolve it, please contact Bandweaver or an authorized distributor.

Please include the following information when requesting support:

1. Serial number of the product. This is located on nameplate on the rear panel of the product;
2. Full description of the problem and any troubleshooting measures already attempted;
3. Configuration of the product when the issue is experienced;
4. Data files while the issue is experienced. The data files can be found in the **data** subdirectory located in the **DTSCM2.exe** folder. The default path is **D:\DTSCM 2\Data.**

9 Installation, Care and Maintenance

The T-Laser system is designed to provide a low-cost monitoring solution for many years.

There are measures that the user can take to extend the life of the product and ensure trouble free operation of the DTS.

9.1 Connector Care and Maintenance

- Ensure all optical connectors are clean before mating and are tightened firmly.

  The E2000 optical connectors and couplings should be cleaned and/or inspected before attaching to the T-Laser system. Failure to ensure connectors and couplings are clean and free of foreign matter can severely compromise the performance of the system and may possibly damage the integral system connector.

  There are two methods for cleaning connectors and couplings which are approved by Bandweaver. The technique used is dependent on the type of contamination.

  Ensure the laser is off before cleaning any fibres. ⚠
  Do not use a connector with a broken or damaged flange cap. ⚠

  1. *If the connector has been exposed to slight dust contamination, the preferred method is using a 'cassette style' cleaning tape. When cleaning the connector, please wipe gently several times following the same direction.*

  2. *If the connector has been exposed to grease, lint free tissues wetted with alcohol or pre-soaked wet wipes should be used. When using pre-soaked wet wipes, excess residue should be removed using dry lint free tissues. When cleaning the connector, please wipe gently several times following the same direction.*

9.2 Fiber Optic Sensor Cable

- It is good practice to take a baseline reading of the fiber loss after installation. Periodic examination of the fibre loss can then be taken and compared to a baseline. This will help track any aging of the optical fibre.

9.3 Data Storage

- If data is being collected frequently, periodic examination of the hard disk will be needed to ensure sufficient free space. Excess data should be cleared before the hard disk reaches 95% capacity.

9.4 Annual Service

Bandweaver recommends an annual service by a qualified Bandweaver engineer or authorized distributor.

Please contact an authorised Bandweaver representative for further information.

This manual only provides maintenance advice on the T-Laser system and sensor cable. It is not intended to be used for maintenance on other systems to which the T-Laser system is connected. Inspection, testing and maintenance shall only be carried out by experienced and qualified personnel.

10 Routine System Testing

Inspection, testing and maintenance shall only be carried out by experienced and qualified personnel.

It is important that false alarms are prevented during routine system testing. Ensure that automatic dialling facilities are inhibited for the duration of the fire alarm system test. The occupants of the premises should be notified of any test of the system that may result in the sounders being operated. Suppression systems should be inhibited from activation for the duration of the test.

All system devices and releasing components must be returned to their normal condition after completion of the system testing.

10.1 Quarterly Inspection and Test

The purpose of the visual inspection is to ensure that there have been no significant changes to the installation site, regarding its structure or from its environment or any other factor that may affect the system performance. The cables and control unit should be visually inspected for mechanical damage, or other conditions, likely to interfere with correct operation. Visual inspections are carried out upon initial system installation and handover.

Many of the applications for Bandweaver's T-Laser are such that the systems are installed in critical areas, which are difficult to access. In such cases, it is important that the equipment servicing is carried out during periods of approved shutdown.

10.1.1 Power Supply Check

The T-Laser has a nominal 24VDC input. The health of the power supply should be routinely checked. A voltmeter may be used to verify that the voltage is between 18 and 36 V dc. If a Mains Changeover unit it fitted, its operation should be checked. If a UPS unit is fitted, its operation should be checked. If there are any faults present, maintenance should be carried out in accordance with the OEM instructions.

10.1.2 Functional Test

One should consider the system design carefully prior to deciding the test regime. It is possible to have staged alarms from a single length of detection cable or in many other cases staged alarms are programmed between corresponding detection zones on different sections of cable.

Bandweaver recommend that at least one detection zone should be tested per quarterly visit.

The functional test is to be done using a heat gun on a low temperature setting (not exceeding 80°C). The alarm event should be verified on the main Fire Alarm Control Panel (FACP). The FACP operation should be verified by the designated equipment maintainer.

10.1.3 Optical Loss Test

Ideally every quarter some baseline raw Stokes and Anti-stokes data should be recorded for reference. The optical loss of all connectors and splices should be measured and compared with the previous quarter to see if there is any degradation of the connections.

10.1.4 Optical Power Test

The output signal power of the laser should also be tested by the measuring the lowest signal level of the Stokes data and the power level in the reference oven (between -30m to -5m).

10.2 Annual Inspection

Visual Inspection: same as per quarterly inspection.

10.2.1 Functional Test

As per quarterly inspection. In addition, a fixed temperature reference oven with test coils of fibre 30m to 50m in length should be measured with the T-Laser. The temperature of the test coils should be compared with the T-Laser temperature reading. The system is adjusted as necessary.

All T-Laser relay outputs and the audible sounder should be checked. This functional test is normally achieved by instructing T-Laser to output each relay sequentially. This test can be performed using the DTSCM2 software, please refer to the DTSCM2 manual.

10.2.2 System Interrogation

The system shall be interrogated by a Bandweaver engineer using a proprietary software package that will allow history data to be uploaded from the control unit. This data contains information to be used by the manufacturer to examine the internal condition of the T-Laser system and therefore acts as an integral part of Bandweaver's preventative maintenance package.

11 Contacts

Please refer to the contact page of the following webpages for details to contact Bandweaver:

English: www.bandweaver.com

Chinese: www.bandweaver.cn

Or email us on support@bandweaver.com