**CXX Series**

# User Manual

**Teleste Corporation**


## CXE860

## Universal fibre node

## Contents

## Introduction

The CXE860 is a fibre deep optical node with high performance characteristics. It is designed for cases where high performance and cost effectiveness are a demand. The node and its accessories are fully functional up to 1 GHz.

The use of an integrated optical receiver and transmitter eliminates time-consuming mounting of connectors and fibre splicing inside the housing. The optical receiver supports light wavelengths from 1290 nm to 1600 nm.

The node is configured with practical jumpers and JDA plugs. Fibre connectors are situated at the housing wall. All this makes the node installation easy and comfortable.

## Installation

### Housing

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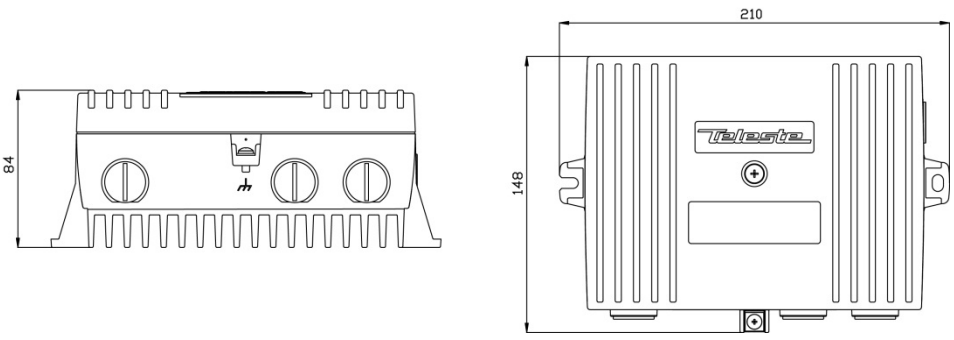


*Figure 1. CXE860 housing dimensions - side and top view*

The CXE860 can be installed either into a street cabinet or to a sheltered outdoor environment. **Note**: Fibre adapter is not waterproof. The class of enclosure is IP43. The amplifier should be installed in a vertical position so that the external cable connectors are underneath. At least 100 mm of free space should be left above the amplifier to ensure sufficient cooling air circulation.

The cover of the housing is closed by a single bolt. There are no hinges. Open cover is to be removed completely. When closing the cover use a PZD 2 screwdriver to tighten the bolt to a torque of 2.5...3.5 Nm. To ground the amplifier housing connect at least 4 $mm^2$ grounding wire (Cu) from a proper earth to the grounding point.

## Powering

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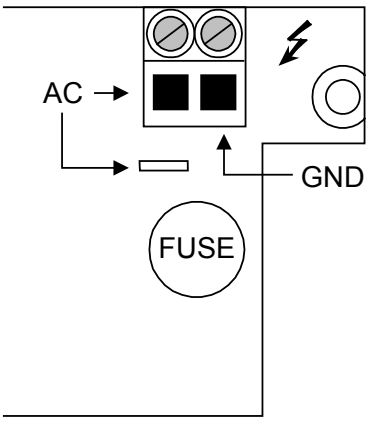


*Figure 2. Remote cable connector*

The node is delivered either with a 26…65 VAC PSU or 165…255 VAC PSU (both versions non-current passing).

When delivered with 26…65 V AC PSU the power is supplied to the node direct at AC inlet. When delivered with 165…255 V AC PSU the node is connected to the main voltage via its own power cord. The power supply is double shielded and does not require separate grounding. The supply voltage fuse (T3.15 A / 250 V) is located on the upper right corner of the amplifier, underneath the remote cable connector (Figure 2).

## Interfaces

Underneath the CXE860 fibre receiver are two optical fibre ports with fibre adapters and one RF output port with F-female connector. The coaxial output has a standard PG11 thread and they accept any KDC type adapter or connector. The length of centre conductor is illustrated in Figure 4.

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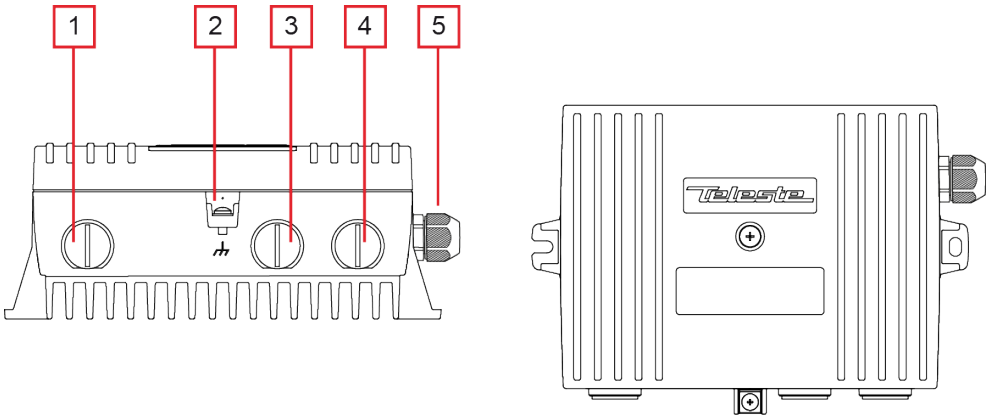


*Figure 3. CXE860 Fibre Optic Receiver, 1) Optical fibre input port, 2) Ground, 3) Optical fibre output port, 4) RF output port, 5) Power inlet*

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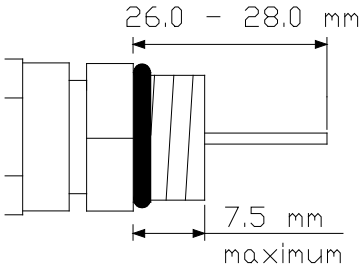


*Figure 4. Centre conductor length*

## Fibre installation

The CXE860 fibre optic receiver and transmitter come as standard with a bulkhead mounted SC/APC adapter. Fibre installation is a critical procedure and it should be done carefully. Incorrect handling of the fibre can result in damage and degraded performance.

The shielding cover of the node provides a protective enclosure for optical fibres and components.

**Warning:** The SC/APC adapter is connected to the integrated fibre receiver through a short length of fibre on the rear side of the bulkhead. To avoid damage to the fibre, take care not to rotate the adapter when installing or removing the fibre connector.

### Cleaning fibre connectors

- For correct optical operation ensure that all optical connectors are cleaned immediately before mating using a suitable optical connector cleaning kit.
- If a cleaning kit is not available, wipe the end of the connector using pure isopropyl alcohol (99%) and a lint-free wipe. Dry it with filtered compressed air. Wait until dry to insert connector into the adapter.
- When fibre optic connectors are unmated, the optical fibre end faces must be protected from contamination using suitable dust caps. Contamination of fibre end faces will reduce the performance of the optical fibre and could ultimately cause failure of the system. Contamination could also damage the fibre end faces when the connectors are mated.

## Front panel

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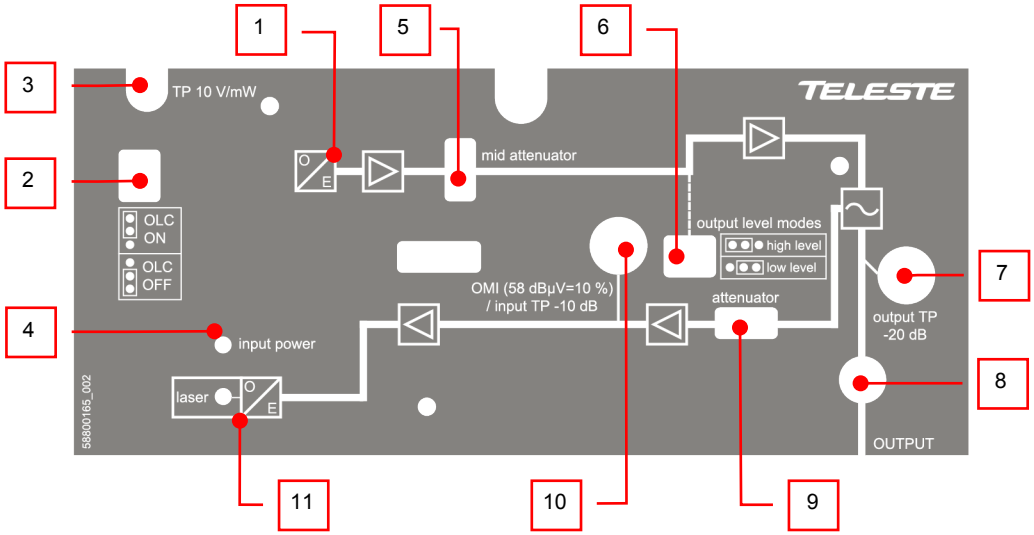


*Figure 5. CXE860 front panel*

1) Integrated optical receiver
2) OLC mode jumper
3) Optical power DC voltage test point
4) LED indicator for optical input power
5) Midstage attenuator
6) Output level mode selection
7) Output test point, -20 dB directional coupler
8) RF output port
9) Return path attenuator
10) OMI test point
11) Integrated optical transmitter with LED indicator for optical output power

| OLC mode jumper (Figure 5 pos. 2) | |
|---|---|
| On |  |
| Off |  |

| Output level mode selection jumper (Figure 5 pos. 6) | |
|---|---|
| High level |  |
| Low level |  |

*Figure 6. Jumper configurations.*

# Features

## Forward path / Optical receiver

The optical receiver is integrated within the CXE860 and will accept both 1310 and 1550 nm wavelength optical inputs. The optical receiver provides both LED indicator and DC voltage test point for received optical power to quickly determine status of the unit.

The output stage uses a GaAs MESFET output amplifier to improve RF performance over the entire 85 to 1000 MHz passband.

### Optical input power

Optical input power can be measured from the optical power DC voltage test point (Figure 5 pos. 3). The test point DC voltage is directly proportional to optical input power in mW e.g. 10 V corresponds to 1.0 mW average optical power for 1310 nm. Table below shows the correct measurements at the test point using a 1310 nm or 1550 nm transmitter.

| **Operating wavelength 1310 nm** | | **Operating wavelength 1550 nm** | |
|---|---|---|---|
| TP / V DC | Input / dBm | TP / V DC | Input / dBm |
| 6.3 | -2 | 7.1 | -2 |
| 5.0 | -3 | 5.6 | -3 |
| 4.0 | -4 | 4.5 | -4 |
| 3.2 | -5 | 3.5 | -5 |
| 2.5 | -6 | 2.8 | -6 |
| 2.0 | -7 | 2.2 | -7 |
| 1.6 | -8 | 1.8 | -8 |

*Table 1. CXE860 optical receiver, expected levels.*

Do not connect any voltage to the test point or short circuit it to ground. Use a voltage meter with an input resistance higher than 100 kΩ.

The mainboard provides also a LED indicator (Figure 5 pos. 4) which gives a visual indication of the optical input power.

| Optical power LED | Condition |
|---|---|
| Yellow | Optical input power is below -8 dBm |
| Green | Optical input power is within the nominal range (-8…-2 dBm) |
| Red | Optical input power exceeds -2 dBm |

*Table 2. LED indicator for optical input power on CXE860.*

**Forward path adjustment**

The following are instructions to be used for a normal adjustment procedure.

1. Do not connect fibres or apply power before all the adjustments described below have been made.
2. Test the optical input power present on the fibre service cable using an optical power meter. The CXE860 integrated optical input power range is from -8 dBm to -2 dBm.
3. Optical Level Control (OLC) circuitry provides gain control that compensates for changes in input level caused by external variations. The available gain reserve is factory-set for optimum operation. If needed the output level can be adjusted with the midstage attenuator. You can however, set an internal jumper (Figure 5 pos. 2) to disable the OLC. This enables you to operate the CXE860 optical receiver at full gain for applications that do not require gain stabilization.
4. Use the midstage attenuator to get wanted output level. The network plan should specify exact signal levels. Refer to the Table 3 *or* Table 4.

| Output level without OLC (dBµV) | | Midstage attenuator (dB] |
|---|---|---|
| High level | Low level | |
| 108 | 100 | 0 |
| 107 | 99 | 1 |
| 106 | 98 | 2 |
| 105 | 97 | 3 |
| 104 | 96 | 4 |
| 103 | 95 | 5 |
| … | … | … |

*Table 3. Midstage attenuator selection when input power is -8 dBm at 4% OMI.*

| Output level with OLC (dBµV) | | Midstage attenuator (dB) |
|---|---|---|
| High level | Low level | |
| 108 | 100 | 0 |
| 107 | 99 | 1 |
| 106 | 98 | 2 |
| 105 | 97 | 3 |
| 104 | 96 | 4 |
| 103 | 95 | 5 |
| … | … | … |

*Table 4. Midstage attenuator selection when input power is between -2…-8 dBm at 4% OMI.*

5. Use the output level mode jumper (Figure 5 pos. 6) to select the output level and midstage slope. Available options are high level modes: 11dB sloped, low level modes 9 dB sloped and 8 dB attenuated.
6. Apply the power.
7. Connect the fibre connector to the bulkhead adapter.

## Return path / Optical transmitters

A diplex filter is selected during configuration according to the preferred frequency split.

The CXE860 platform can be equipped either with a 1310 nm Fabry-Perot transmitter or with a CWDM transmitter. The CWDM lasers deploy eight wavelengths in range of 1470…1610 nm.

### Return path adjustments

The return transmitter is aligned in production eliminating the need for any user adjustments. The level of return signal can be measured from the optical transmitter's OMI test point (Figure 5 pos. 10). In shielding cover of the CXE860 is described the fixed RF driving level at the OMI test point that gives 10% OMI. The return signal level should be adjusted to match this level. Table below shows the RF drive levels for different OMIs. The signal level is adjusted with the return path attenuator (Figure 5 pos. 9). The adjustment range is 20 dB.

| OMI (%) | RF – drive level (dBµV) from OMI test point |
|---|---|
| 12 | 59.6 |
| **10 (default value)** | **58.0** |
| 8 | 56.1 |
| 6 | 53.6 |
| 4 | 50.0 |

For other OMI values, the needed adjustment setting can be calculated from the formula: Drive level = 58 dBµV + 20 x log (OMI wanted / 10 %)

Depending on the nature of the return signal, the input level can be measured as follows:

- When using a reference or test signal the level of the carrier signal is measured from the test point and it is adjusted to a value shown in the unit's label or calculated from it.
- When using a digital noise like signal the spectrum analyser's noise marker is adjusted to the same bandwidth as the digital signal has and the level is adjusted to the value shown in the unit's label or calculated from it.

The mainboard provides also a LED indicator (Figure 5 pos. 15) which gives a visual indication of the laser bias current.

| LED on CXE860 | Condition |
|---|---|
| Yellow | Laser bias current is below the nominal range. |
| Green | The laser diode bias current is OK. |
| Red | Laser bias current exceeds the nominal range. |

*Table 5. LED indicator for optical output power on CXE860.*

## Legal declarations



### WEEE Notice

This product complies with the relevant clauses of the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE). The unit must be recycled or discarded according to applicable local and national regulations.

### European Conformity

This equipment conforms to all applicable regulations and directives of European Union which concern it and has gone through relevant conformity assessment procedures.

CE

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