



# EUROPEAN SOUTHERN OBSERVATORY

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral.

Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

## VERY LARGE TELESCOPE

<p><b>TIME REFERENCE SYSTEM, Time Bus Installation and Maintenance Manual</b></p>
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**CHANGE RECORD.**

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## **1. INTRODUCTION.**

This manual describes the installation and maintenance of the VLT Time Bus and the Time Bus Distribution Boxes (TBDB).

The Time Bus and Time Bus Distribution Boxes form a 'tree-type' distribution network from the Central Time Standard (CTS) to all Service Connection Points (SCP).

All definitions and the overall specifications are defined in AD1.

## **2. REFERENCES.**

- |     |   |
|-----|---|
| AD1 | VLT Time Reference System Specification. VLT-SPE-ESO-17300-0376, Iss. 1, 4 May 1993.  |
| AD2 | VLT Electronic Design Specification. VLT-SPE-ESO-10000-0015, Iss. 4                   |
| AD3 | VLT Time Ref. System, CTS installation and maintenance manual. VLT-MAN-ESO-17300-1254 |

## **3. TIME BUS.**

The Time Bus is a single fiber, compliant with the specification of the Ethernet fiber according AD2. The system uses 830nm optical components. The fibers have 'ST' connectors.

The maximum design length of a fiber between:

- CTS (First TBDB) and next TBDB, or,
- 2 TBDB's, or
- a TBDB and a Time Interface Module,

is 1km. This value allows 4 connections in the fiber.

Maximum delay in the fibers between CTS and any LCU in the VLT Telescope area must be kept below 2 microsecond, which corresponds to a total fiber length of 600m.

Note: this is a budgeted value, see AD1.

## **4. TIME BUS DISTRIBUTION BOXES.**

### **4.1. GENERAL**

The Time Bus Distribution Box (TBDB) is mounted at splitting locations of the Time Bus tree. It acts as an 'optical fanout': the optical signal level is restored and multiple outputs are available.

The TBDB has a receiver board and 1 or more transmitter boards.

These are mounted in a 19 inch, 3HE chassis, which also includes a power supply.

### **4.2. MAXIMUM NUMBER OF TBDB'S IN THE TREE**

AD1 states:

No more than 5 TBDBs shall be interposed between the CTS and any LCU Time Interface Module.

There is 1 TBDB reserved to be used in a subsystem, i.e. below the SCP level, if needed. So a maximum of 4 is allowed to be used in the distribution tree.

If this number is exceeded, excessive delay and (more critical) pulse distortion occurs.

#### 4.3. RECEIVER BOARD

##### 4.3.1. LOCATION

The receiver board has to be located in slot 1 (the most left hand slot) of the TBDB. Slot 2 has to be kept free.

Note: Receiver and transmitter boards are electrically interchangeable, so nothing is going defective when this is not done. This has to be done for EMC reasons.

##### 4.3.2. JUMPER SETTINGS

There is a jumper field, JP1, which selects between the coax (LEMO) or fiber input of the TBDB. Only the first TBDB, the one close to the CTS, utilises the coax input because the GPS receiver has a BNC output. That installation is described in AD3.

All other TBDB utilise the Time Bus fiber as input.

The jumper settings are:

Jumper location:	Setting:	Function:
JP1	1-2 and 3-4 inserted	Use fiber input (default setting).
JP1	3-4 and 7-8 inserted	Use LEMO coax (TTL) input
JP1	Other combinations	Illegal

##### 4.3.3. RECEIVER SIGNAL MONITORING

There are several possibilities to monitor the incoming signal in the TBDB:

1. The light out of the fiber (830nm) is visible.
2. A LED on the receiver board front panel lights green if the incoming Time Bus signal is detected. This LED is enabled with a switch 'LED ON' on the front panel.
3. A display can be connected to the 'D'-connector on the receiver board front panel.
4. A testpoint on the receiver board allows to monitor the decoded 1Hz signal with an oscilloscope.

#### 4.4. TRANSMITTER BOARD

Each transmitter board in a TBDB has 4 outputs.

Transmitter boards can be added according to the need up to a maximum of 6, providing up to 24 outputs.

#### 4.5. POWER

The TBDB has a power supply that must be connected to the 230VAC mains power. Using of the UPS power is recommended. The power supply must be adjusted for +5, +15 and -15Volt.

### 5. INSTALLATION ON THE VLT UNIT TELESCOPES.

The TBDB's on the Unit Telescopes are mounted in the Network Access Point (NAP). There are 2 TBDB's mounted, 1 in each patch panel cabinet.

Recommended is to have 2 fibers from the CTS to the NAP, each feeding 1 TBDB.

Patches are made from the TBDB's to the patch panels of the SCP's (in the NAP). There are typically 5 junctions from the TBDB to the Time Interface Module in the LCU:

- the TBDB output,
- the SCP patch panel in the NAP,
- the SCP Part B, close to the subsystem,
- the feedthrough on the panel in the LCU chassis,
- the Time Interface Module input

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