Product Manual

for

Tower Mounted Booster amplifiers

TMBs

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1 Document history

Revision	Content	Date/Author
MMP-10065A	New document number	July 2002 / Jesper Trier
MMP-10065B	Updated with TMB-1900	April 2003 / Jesper Trier

2 About the Documentation

2.1 Dear Customer

Thank you for choosing a product from LGP Telecom. This product has been carefully developed with your satisfaction in mind. LGP Telecom believes in long relationships with its customers and the importance of good support.

2.1.1 LGP home page

LGP Telecom's web site provides some public available TMB documentation as well as the latest news on new products and product options.

LGP Telecom's home page: http://www.lgp.com

2.1.2 Contact LGP

For further documentation, product information, questions, suggestions or complaints, please contact your nearest LGP office or representative. You will find an up-to-date list of offices and representatives on our home page. You may also call the LGP Telecom head office and ask for Technical Support.

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	e-mail:	mailbox@lgp.se or
		tech.support@lgp.se

2.2 About the documentation

2.2.1 Overview

This set of documents describes the LGP Tower Mounted Boosters, release 1. The documentation has been divided into sections, most sections describing a specific user task.

The document format is Adobe's PDF (Portable Document Format). The documents can be viewed and printed with any computer running Adobe Acrobat® Reader, version 2.1 or later. Acrobat® Reader is freeware from Adobe Systems Incorporated.

2.2.2 TMB models

The documentation for LGP TMBs is valid for the following TMB models:

LGP 00901:	P-GSM 900 (115/230 VAC)
LGP 00902:	P-GSM 900 (48 VDC)
LGP 00903:	E-GSM 900 (115/230 VAC)
LGP 00904:	E-GSM 900 (48 VDC)
LGP 01001:	GSM 1800 (115/230 VAC)
LGP 01002:	GSM 1800 (48 VDC)
LGP 01101:	GSM 1900 EDGE (115/230 VAC) for external LNA
LGP 01102:	GSM 1900 EDGE (48 VDC) for external LNA
LGP 01105:	GSM 1900 EDGE (115/230 VAC) with internal LNA
LGP 01106:	GSM 1900 EDGE (48 VDC) with internal LNA
LGP 01201:	CIU for TMB900
LGP 01202:	CIU for TMB1800
LGP 01203:	CIU for TMB1900
LGP 16901:	Current Injector Kit for TMB-900, 48V models.
LGP 16902:	Current Injector Kit for TMB-1800/1900, 48V models.

2.2.3 Disclaimer

The contents of these documents are subject to revision without notice due to continued progress in methodology, design, and manufacturing. LGP Telecom AB or its subsidiaries assume no legal responsibility for any error or damage resulting from the use of these documents.

2.3 Abbreviations

ARP	Antenna Reference Point
BTS	Base Transceiver Station
BW	Bandwidth
CIN	Current Injector
CIU	Control Interface Unit
CSU	Control Surveillance Unit
CW	Continuos Wave
EDGE	Enhanced Data for GSM Extension
E-GSM	Extended GSM
GSM	Global System for Mobile communications
HPA	High Power Amplifier
IM	Intermodulation
LED	Light Emitting Diode
LNA	Low Noise Amplifier
MRT	Mean Repair Time
MS	Mobile Station
MTBF	Mean Time Between Failure
MTTR	Mean Time To Restoration
NF	Noise Figure
O&M	Operation & Maintenance
PBU	Power Back-up Unit
PSU	Power Supply Unit
TMA	Tower Mounted Amplifier (Low Noise)
TMB	Tower Mounted Booster

3 Functional Description

3.1 Schematic overview

Figure 1 shows a block-diagram of the LGP TMB system with an external Control Interface Unit. For module functionality descriptions, see the following sections. For technical data, refer to the “Specifications” part of this document (Chapter 8).

The TMB system includes:

- a 2-carrier integrated Tower Mounted Booster unit (TMB)
- one Control Interface Unit (CIU)
- one software package

and various optional installation kits.

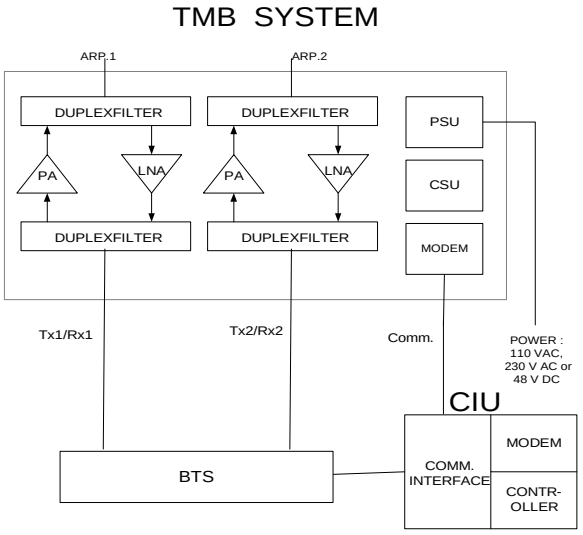


Figure 1a. Functional diagram of TMB with external CIU

The TMB contains one dual duplexer for each carrier; one duplexer at the antenna port and one duplexer at the BTS port. A high power amplifier (HPA) is in the Tx path (downlink), and a low noise amplifier (LNA) is in the Rx path (uplink).

The TMB contains a switch mode power supply unit (PSU). The power supply is available as either an AC or a DC version (115/230 VAC or +48 VDC).

The micro controller (CSU) handles all monitoring of the TMB as well as communication to the CIU. Communication to the CIU is achieved via the RF modem.

The CIU is the main interface to the BTS. The CIU contains the physical alarm interface to the BTS, which is relay contacts (3 pole), as well as the infrared PC interface and the serial RS232 interface.

3.2 TMB-1900

The TMB-1900 is available in two configurations: With and without in-build LNA.

The TMB-1900 with in-build LNAs is intended for Tower Top mounting close to the antenna and is equivalent to TMB-900 and TMB-1800 as described in figure 1a.

The TMB-1900 without LNAs is intended for base mounting close to the base station and includes support (power supply and alarm interface) for four external TMAs to be mounted close to the antennas. The functional diagram is shown in figure 1b.

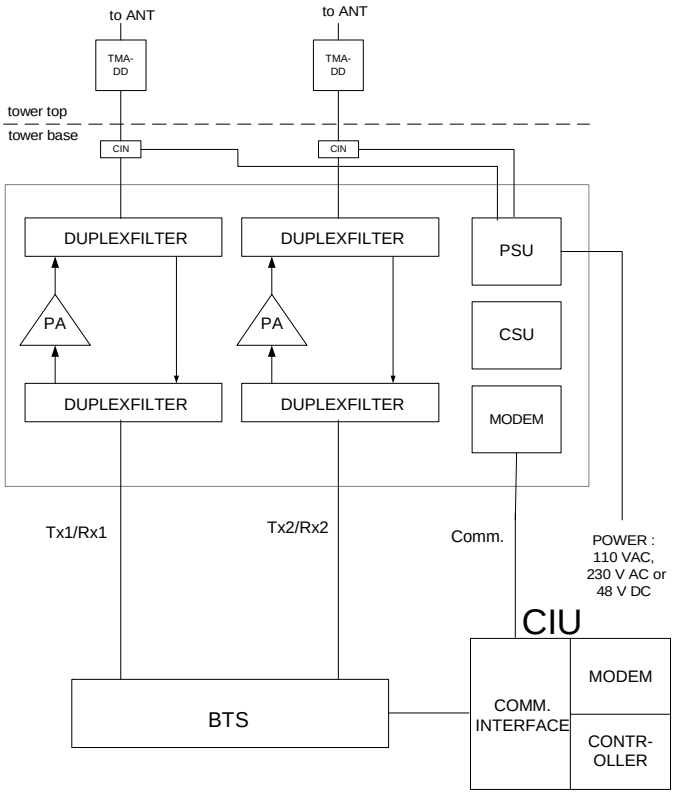


Figure 1b. TMB-1900 with external TMAs

3.3 The TMB enclosure

The TMB enclosure is made of aluminium. All screws are made of stainless steel. All metallic interconnections have seals which prevent dust and humidity from entering the unit.

Figure 2 shows the mechanical layout of the TMB.

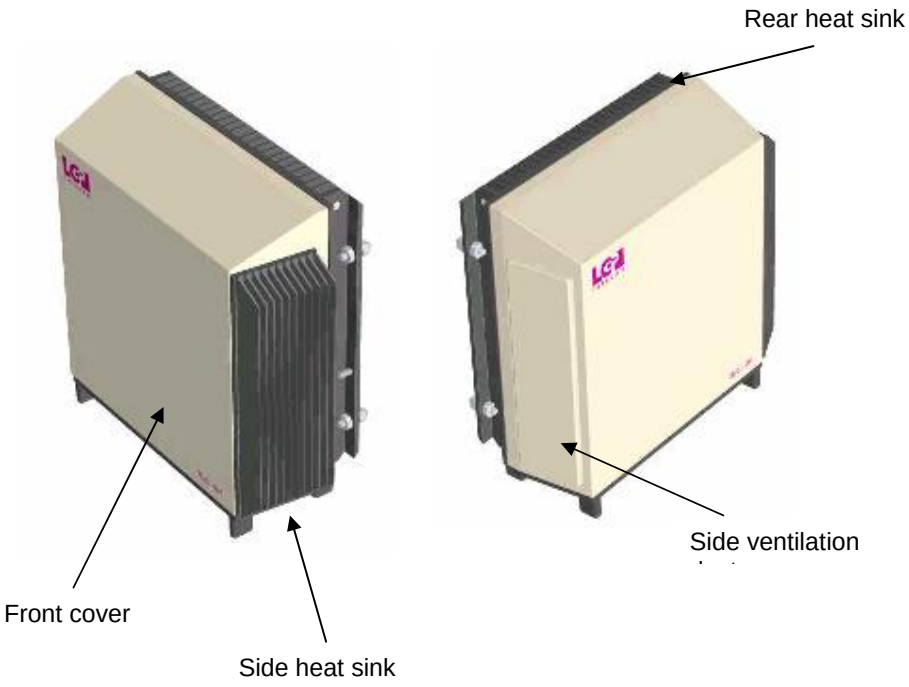


Figure 2 TMB mechanical layout

Front cover

The TMB front cover is attached to the large heat sink on the back of the unit as well as to the bottom plate. The cover is made of aluminium.

***Note**: Do not remove the front cover. Unauthorised opening of the TMB will destroy the seals and will void LGP Telecom's product warranty.*

Rear heat sink

The large heat sink on the rear of the TMB forms the back of the TMB. In most installations the heat sink is protected from direct sun (solar radiation, heat) due to the mounting plate and structure on which the TMB is fitted. Although the TMB is designed to withstand direct sun, it is recommended to prevent/minimise direct exposure to solar radiation.

The air-gap between the main heat sink and the mounting plate serves as a "chimney", to which airflow should not be restricted.

***Note**: Do not paint the heat sink.*
***Note**: Do not restrict free airflow to the rear heat sink.*

Side heat sink

The smaller heat sink located on the right hand side of the TMB provides heat sink for the power supply.

***Note**: Restriction of free airflow to the heat sink must be avoided.*
***Note**: Do not paint the heat sink.*

Side ventilation

The left side of the TMB contains the ventilation system. The ventilation design works in such a way that any moisture (condensation) inside the TMB will be vented out. The arrangement will accept direct rain (tropical rain). The unit is IP65 classified.

***Note:** Restriction of free air to this part must be avoided.*

Handle

The handle is to be used when hand carrying the unit or lifting the unit up onto a tower. The handle can be left attached to the TMB after installation (recommended) or removed.

Figure 3 TMB with handle/lifting wire

3.4 Control Interface Unit (CIU)

Figure 4. CIU outline view

The CIU is the remote control element of the TMB system. The CIU handles all communications with the BTS as well as a PC during setup.

Having the controller of the TMB system as a remote unit enables a flexible installation. The CIU interfaces with the TMB via a RF modem using a coaxial cable (TNC connector).

The small size of the CIU will in some cases allow for installation inside the macro BTS. However, the CIU is shielded according to IP55 and does not require additional weather protection. Therefore an outdoor installation of the CIU next to a micro BTS is an example of an alternative highlighting the flexibility of installation.

The CIU is powered via the communication cable between the TMB and the CIU and does not need a separate power supply line.

The CIU contains three types of interfaces:

- RS232
- Alarm relay contacts

The alarm lines are relay contacts (closed or open). See “Operation” chapter for more detail.

The CIU is the “master” and the TMB the “slave” in the overall control architecture of the TMB system. Both the TMB and the CIU contains microprocessors with peripheral memory circuits. The control architecture is however very robust. In case the connection between the CIU and the TMB is lost (broken cable) the TMB will continue service without interruption using its current settings. However, no alarms or new settings can be handled until the TMB/CIU interface is re-established.

Software updates (user interface software) can be downloaded into the CIU via the RS232 interface. This software is stored in flash PROM. For downloading procedure please see “Operation”.

RS-232 interface can also be used to remotely access the TMB using a GSM-type modem or data-enabled handset. This is described in chapter 6.

3.5 LED indicators

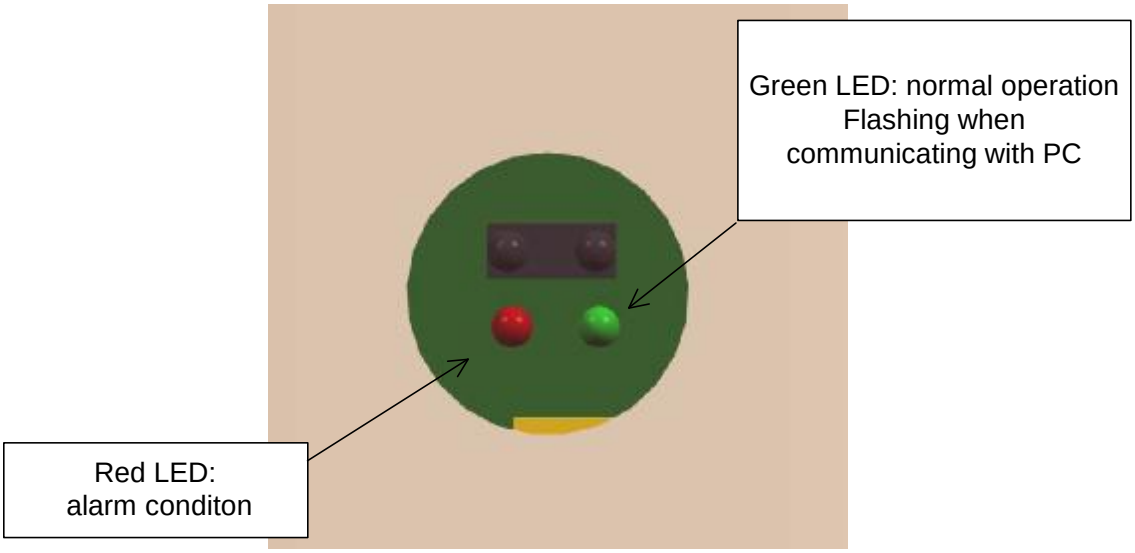


Figure 5 Zoom view of the LEDs on the CIU

There are no LED indicators on the TMB itself.

The CIU has two LEDs.

- A red LED (steady light) is indicating “TMB has alarm condition” and service of the TMB system may be required, depending on the type of alarm.
- A green LED (steady light) indicates “power on” and normal operation. When flashing, it indicates that communication with the PC is in progress.

Note: *The user can program the CIU in order to enable/disable all LEDs making them non-visible; this, in example, if visible LEDs may provoke vandalism of the equipment.*

3.6 Antennas

The antennas are connected to the antenna ports (“ANT”) of the TMB via a standard RF jumper cable and aligned traditionally to give coverage in the intended area. Virtually any antennas can be used given the desired coverage pattern. Dual polarised antennas can be used with one TRX on each polarisation.

The only requirement is that the antenna isolation between the two TRX’s is better than 30 dB (ETSI requirement for cross-polar antennas) to comply with –120 dBm reverse intermodulation specification. Antenna isolation may on a real site installation be lower than stated by the manufacturer due to reflections. If the isolation of minimum 30 dB between antennas (or between the two polarisations inside a dual polarised antenna) is not fulfilled, a different frequency planning will solve the problem.

3.7 Feeder cables

The BTS feeder cables are connected to the TMB “BTS” port. Virtually any type of RF feeders can be used. The concept of using TMBs means that the high power is being generated at the antenna, which means that feeder loss is relatively uncritical. As the power supply to the TMB is using a separate cable, even thin lossy RF feeders can be used. Using thin RF feeders might result in more flexible and easier installations.

Using thin RF feeders has also a big cost impact on the site cost.

Note: *Using thin RF feeders, which result in high loss, will however mean that the output power will be very low if the by-pass mode is activated, as the total attenuation in this case is very high.*

Note: *Using thin RF feeder cables cannot be combined with the CIN option.*

Note: *It is recommended to use jumper cables from the feeder lines to the TMB to avoid stress in the connectors on the TMB.*

3.8 Software diskette or CD

The TMB is controlled by a client software installed on a PC. The Windows based software is supplied with the unit. Installation of the software is described on the page that pops up on the screen when the CD is inserted, or in the “readme.txt” file on the diskette. It is also described in chapter “Configuration & Operation” of this manual.

3.9 CIU Cables

Various cables are supplied as options with the TMB. You may want to configure your own cables, in this case consult “Installation”.

CIU – TMB comm. cable: The TMB is controlled by the CIU. A thin (RG58 or similar) coaxial cable is needed to connect the two units. The cable type is uncritical and maximum allowed cable attenuation between the CIU and the TMB is 20 dB @10 MHz and 10 ohm DC resistance. This means that the choice of communication cable type is relatively free and flexible allowing for high degree of freedom in terms of installation.

Note:	*The cable must be fitted with watertight TNC type male connectors at both ends. Proposed is Huber & Suhner type 11TNC–50-3-6 or equivalent.*

CIU – BTS alarm cable: The CIU-BTS alarm cable interfaces the TMB alarms to the BTS via the CIU. There is a total of 4 alarm relays on the CIU available for wiring up to the external alarm interface on the BTS. The relays have three terminals allowing for either “normal closed” or “normal open”. The wires are attached inside the CIU by simple screw terminals. The relays are operated as failsafe. This means that the relays are engaged during normal operation.

Note*:*	*Be sure to tighten the water tight cable gland arrangement for the alarm cable.*

CIU – RS232 cable: This cable provides the interface between the CIU and a BTS controller or a PC - using the on-board RS232 interface connection on the CIU.

Note:	*Place moisture cap on CIU’s RS232 connector when the RS232 cable is not attached.*

See “Installation” concerning cable configuration.

3.10 Alternative installation using only RF feeders (CIN option)

A Current Injector (CIN) option is available for the 48V DC version of the TMB. This eliminates the need for a separate power cable and the CIU-TMB cable. A CIN is mounted external to the TMB on the BTS2 port. A similar CIN is then mounted at the BTS on the feeder that connects to BTS2 of the TMB. The DC power to the TMB and the communication between the TMB and the CIU is now all done on one of the RF feeders.

In this case the CIU will be connected to the BTS CIN. The 48V supply will also be connected to the BTS CIN.

The details of the CIN installation is described in chapter 4.10.

3.11 Alarms

The following table shows the available alarms on the TMB (per carrier).

Uplink minor (one LNA) failure
Uplink major (both LNA's) failure
Downlink minor (HPA) failure
Downlink major (HPA) failure
Temperature high/low
Input power overload
Output power overload
VSWR above threshold (available at additional cost)
TMB communication error
TMA alarm (TMB-1900 only)

All alarms can be monitored on the O&M interface. A total of 4 relays (12 wires) are available from the CIU to the BTS. Software configuration determines which alarms are presented to the BTS. Normally closed (NC) or normally open (NO) for all relays can be configured independently.

The relay operation is 'fail-safe', meaning that the relays will engage during normal operation, and will disengage when there is an alarm condition. This also means that a power failure will generate an alarm condition.

The TMB system operates with "Auto Recovery", meaning that it automatically will try to come back to normal operation / performance following an alarm situation.

3.11.1 Uplink failure

Uplink failure alarm has two levels, minor and major. This alarm is indicating that the low-noise amplifiers are deviating from original setting/performances.

The uplink LNA amplifiers are balanced, i.e. two LNA devices working in parallel for each carrier.

A minor alarm will be activated if one of the LNA amplifiers of a balanced pair is failing. A major alarm is activated if both LNAs are out of operation.

It is configurable by software, what action shall be taken upon an uplink failure. You have the choice between:

For Uplink Minor alarm	For Uplink Major alarm
Alarm only	Alarm only
Increase gain in LNA	By-pass mode

"Increase gain in LNA": An action that can be set to compensate for a failing transistor. In this case the "surviving" transistor will "attempt" to bring back the uplink gain to the original value by increasing its gain and thereby compensate for the failing transistor. This can be used if the uplink gain is set lower than the maximum gain (12 dB).

"By-pass mode": The by-pass relay will be activated upon a transistor failure, and the entire uplink LNA amplifier by-passed.

"Alarm only": This setting will only report an uplink amplifier failure, but will take no further action.

3.11.2 Downlink failure

The downlink failure alarm has two levels, minor and major. This alarm indicates that the power amplifiers are deviating from original setting/performance.

A minor alarm will be generated if the TMB system automatically reduces the output power, either because of "output overload" (see below) or because of an internal decision by the system in order to prevent destruction of the TMB (see below as well). The TMB system will revert to normal setting when the fault condition disappears.

Downlink major failure alarm will be generated if there is a fatal error with the power amplifiers, i.e. transistor failure. Upon such a failure, the PIN diode switch will be activated automatically and will by-pass the power amplifier.

3.11.3 Temperature high/low

The temperature inside the TMB is monitored at three test points: on the two power amplifiers and on the power supply. The temperatures are shown on the Info or Status menu in the control software.

The “Temperature Low” alarm is a minor alarm and may show up at cold start, when the TMB is started up from extreme cold temperatures like –40 ºC. In this extreme situation the TMB may run with reduced output power until the temperature inside the TMB has reached a level where it is safe to run the TMB with max output power (2 x 20 W).

This “Temperature Low” alarm will not be set, if the TMB is already running in normal traffic mode and the outside temperature falls to- 40 ºC. In this case the self heating of the TMB is sufficient to maintain full performance.

“Temperature High” alarm will be set, if the TMB gets overheated. The TMB is designed for an ambient temperature of up to +55 ºC and designed to be exposed to direct sunlight. However, in order to protect the TMB from destruction and ensure prolonged trouble-free operation (high MTBF), the system monitors extreme high temperatures.

At a “Temperature High” alarm a minor alarm will be sent and the TMB will automatically reduce the output power gradually and ensure that the internal temperature does not exceed +85 ºC.

When this “normal” temperature level is reached the TMB will revert to its original power setting. This reduction of output power is considered a ‘downlink minor alarm’.

3.11.4 Input overload

The TMB is designed to withstand +43 dBm input power (20 W). Exceeding +43 dBm may damage the TMB.

The “Input Overload” alarm will be raised when the input power level is reaching a critical high level. The input power level will together with the current gain setting determine how strong the internal circuitry (bypass, power amplifiers, etc.) is driven. In other words: is there a risk of product destruction, extreme intermodulation levels, etc.?

In this case the TMB will automatically reduce the gain to avoid overload and thereby prevent the TMB from saturation and destruction.

If the TMB downlink gain is already set at minimum (5 dB) the gain cannot be reduced further and the system is not able to compensate for this false operation of input overload.

The input overload alarm will always be preceded by the output overload alarm, as the output saturates before the input is damaged.

3.11.5 Output overload

The TMB is designed to run at maximum 20 watt output power (+43 dBm). Exceeding +43 dBm output power results in the power transistors entering their saturation level and the heat generation will increase dramatically.

If the TMB is operating with a certain gain value, which results in full output power (+43 dBm), and the input power is subsequently increased, then due to the fixed gain, the power amplifiers will be pushed into saturation.

A saturated power amplifier will generate intermodulation and may cause interference. Overheating of the TMB will reduce the lifetime of the TMB (MTBF). Consequently the TMB system will send an “Output Overload” alarm and reduce the gain to a non-critical setting.

3.11.6 VSWR over threshold

The TMB can be provided with an antenna Voltage Standing Wave Ratio (VSWR) monitor built into the system (optional). The VSWR alarm is not an exact return loss measurement, but a simple broad band detection of the termination impedance at the Antenna port of the TMB.

The VSWR alarm sensor is capable of detecting a poor antenna VSWR, i.e. when the antenna is not present or the jumper cable is defective.

The VSWR function is only operational between 5W and 20W output power (37 - 43 dBm).

Nominal VSWR threshold is 4.5:1 (Return Loss equal to 4 dB). This will guarantee an actual threshold between 1 and 8 dB (all phases).

3.11.7 TMB communication error

3.11.8 TMB fail

Not implemented. Reserved for future use.

3.11.9 TMA failure

This alarm is only used for TMB-1900 with external TMAs.

The current consumption of the TMAs is measured by the TMB and if outside limits (<40 mA or >160 mA), an alarm is raised.

The TMA power supply also has short circuit protection which turn off the DC at a current higher than 300 mA.

4 Installation

4.1 Safety precautions

The TMB is intended for professional use and must be installed by qualified personnel only.

Please pay close attention to the following safety precautions before handling, installing and operating the TMB:

- ***The TMB does not contain any serviceable parts inside. Do not open the TMB.***
- ***The TMB might have sharp edged on the heat sinks. Use durable gloves when handling the TMB.***
- ***When the TMB is in operation, the heat sinks are hot, up to 80°C. Do not touch heat sinks.***
- ***The TMB does not radiate (microwave , X-ray, radioactive) by itself, but only when connected to antennas. Do not touch antennas connected to a TMB in operation.***
- ***Keep clear of antennas connected to a TMB in operation (microwave radiation).***
- ***The grounding wire must be installed before connecting the power supply. The grounding is protective.***
- ***All cables must be connected before the TMB is turned on.***

Please contact LGP Telecom if in any doubt about handling, installing or operating the TMB.

4.2 Unpacking the equipment

The TMB and its accessories are packed in a strong cardboard box, to protect them from damage in transit. We recommend that this crate is kept for future transportation.

After unpacking the TMB, check that the equipment, as indicated by its type label, corresponds to the order.

Note:	*Warranty is only valid if original TMB crate material is used when returning the unit.*

4.3 Checking the equipment

Before mounting, check that the equipment is complete and unharmed.

The TMB standard package contains the following parts.

Standard delivery:

1. TMB unit
2. Mounting plate for the TMB
3. CIU unit
4. Mounting plate for the CIU
5. Power supply connector for the power supply cable
6. Two TNC connectors
7. Test sheet incl. unit specific data (S/N, hard- and software version etc.)
8. Simple mounting instruction
9. TMB/CIU interface cable, 30 meters

Following options may also be in the box:

1. TMB installation kit which consists of:
    - Handle / lifting wire
    - RS232 cable to the PC (4 meter)
    - Disk or CD containing PC software
    - Technical Product Manual (this document)

2. Pole mounting brackets incl. bolts and nuts

    - Two inner clamp halves
    - Two outer clamp halves, each with 2 holes and a reinforced M8 thread
    - Four M8 × 12 mm bolts, for securing the inner clamps to the mounting plate
    - Four M10 × 200 mm bolts, for joining the inner and outer clamp halves, when mounting to a vertical pole having a diameter of 90 – 140 mm.
    - Four M10 × 140 mm bolts, for joining the inner and outer clamp halves, when mounting to a vertical pole having a diameter of 60 – 90 mm.

3. Current Injector Kit.

    - CIN for mounting by TMB
    - CIN for mounting by BTS
    - Short TNC cable
    - Long TNC cable
    - Short DC supply cable

4. Remote Access Cable.

    - RS-232 cable to modem

Other items, such as AC/DC power supply cables, RF jumpers etc. will also be needed for the job, but should be provided by the installer and is therefore not specified here.

4.4 Attentions prior to installation

Rear heat sink

In most installations the heat sink is protected from direct sun (solar radiation, heat) due to the mounting plate and structure on which the TMB is fitted. Although the TMB is designed to withstand direct sun, it is recommended to prevent/minimise direct exposure to solar radiation.

Note: *Do not paint the heat sink.*

Note: *Do not restrict free airflow to the rear heat sink.*

Side heat sink

The smaller heat sink located on the right hand side of the TMB provides heat sink for the power supply.

Note: *Restriction of free airflow to the heat sink must be avoided.*

Note: *Do not paint the heat sink.*

Side ventilation

The left side of the TMB contains the ventilation system. The ventilation design works in such a way that any moisture (condensation) inside the TMB will be vented out. The arrangement will accept direct rain (tropical rain). The unit is IP65 classified.

Note: *Restriction of free air to this part must be avoided.*

4.5 Equipment and tools for mounting

4.5.1 Carrying / lifting handle

The carrying handle / lifting wire is used to carry the TMB by hand or when lifting the TMB in a wire. The handle is easily attached to the bolts found on the back upper most of the big heat sink. The handle can be left on the TMB after installation (recommended) or removed.

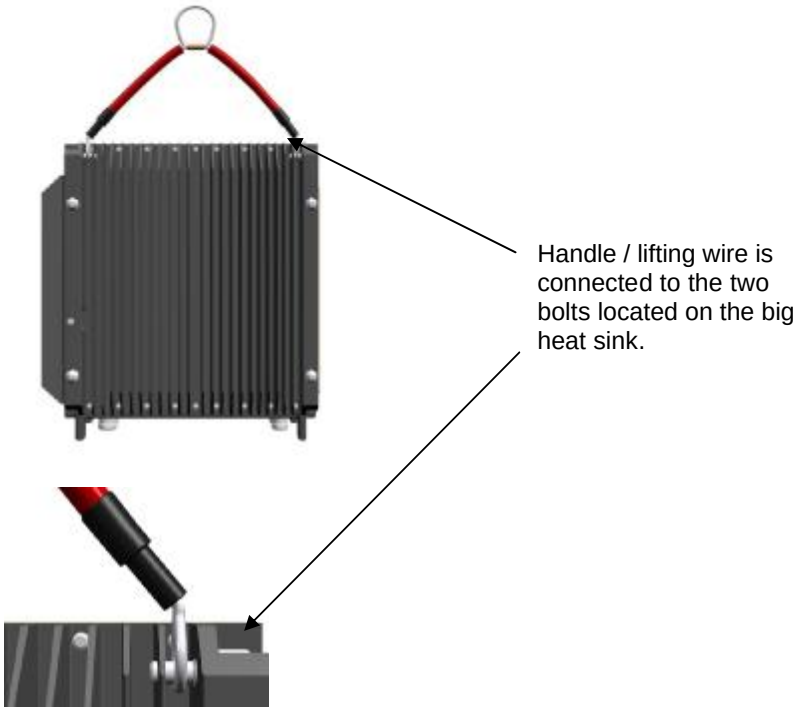


Figure 6 TMB with handle

Note:	*The handle should be removed after the installation. Replace the bolts when the handle has been removed.*

4.6 Hoisting the TMB

The handle can be used for hoisting the TMB by attaching a rope or wire to it.

Note:	*The wire uses for hoisting MUST be fixed to the loop of the handle.* *When hoisting a TMB it is strongly recommended that you ensure the TMB from banging into the tower etc. by having a steering rope from the TMB and down to the ground.*

4.7 Mounting the TMB on a wall

Wall mounting comprises two steps:

Securing the mounting plate to the wall

Fitting the TMB to the mounting plate

Securing the mounting plate

The holes in the mounting plate can be used for securing the plate to the wall, as shown below. If necessary, new holes may be drilled in the plate, as long as this does not detrimentally reduce the strength of the mounting plate.

The installer decides how to fit the plate to the wall. However, in order to ensure proper cooling and ventilation, the TMB must be installed in vertical position.

Figure 7: Install the mounting plate on a wall using normal plugs and screws. Use existing holes in the mounting plate, or drill new ones as required.

Mounting the TMB

Fit the TMB to the mounting plate and tighten the screws to a torque of 40 Nm.

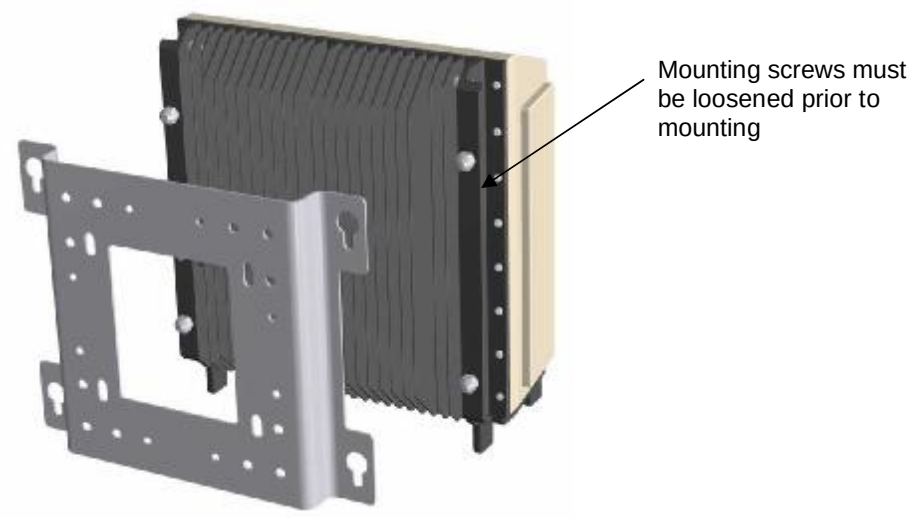


Figure 8: Loosen the four big mounting screws on the back of the TMB. Fit the TMB to the mounting plate and tighten the screws to a torque of 40 Nm*.*

4.8 Mounting the TMB on a vertical / horizontal pole

The pole mounting hardware is designed for pole diameters in the range of 60 mm – 140 mm (2.4" – 5.5"). For your convenience, two sets of bolts are found in the mounting gear.

- M 10 x 140 mm for pole diameter: 60 – 90 mm
- M 10 x 200 mm for pole diameter: 90 – 140 mm

Mounting the TMB on a vertical pole comprises two steps:

- preparations on the ground
- mounting.

Before installing the heavy TMB, install the mounting plate on the pole using the procedure described below.

Note:	*The TMB must always be installed upright to ensure best cooling. If at all tilted make sure the TMB is tilted backwards and maximum 5 degrees.*

On the ground

Step 1: Check that the four mounting screws on the back of the TMB are un-tightened to the extent of slotting on to the mounting plate. The screws cannot drop out. Fig. 9.

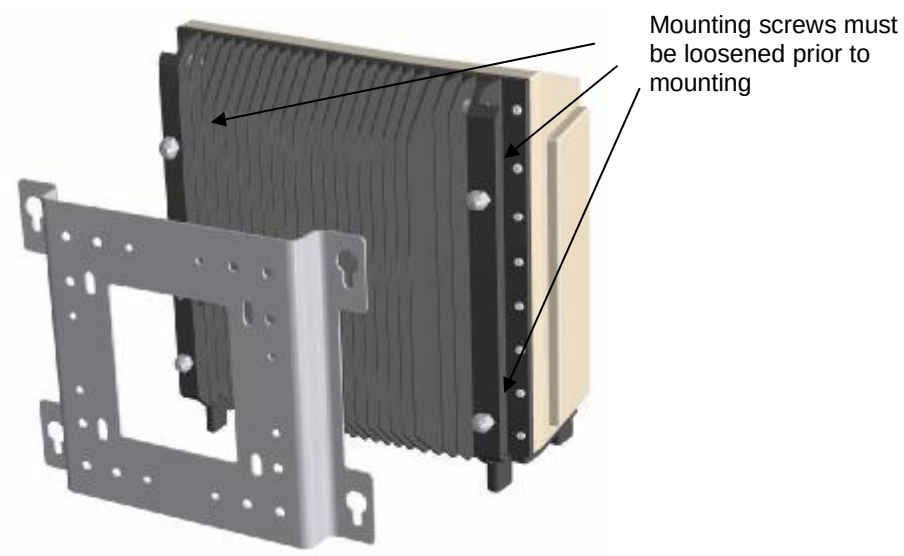


Figure 9: Un-tighten the four mounting screws on the back of the TMB before you hook it onto the mounting plate.

Note:	*Check that all four screws leave enough space for the mounting plate.*

Step 2: Join the inner clamp halves (1) and the mounting plate, using the four M8 × 12 mm bolts (2). Tightening torque, 21 Nm. See figure 10.

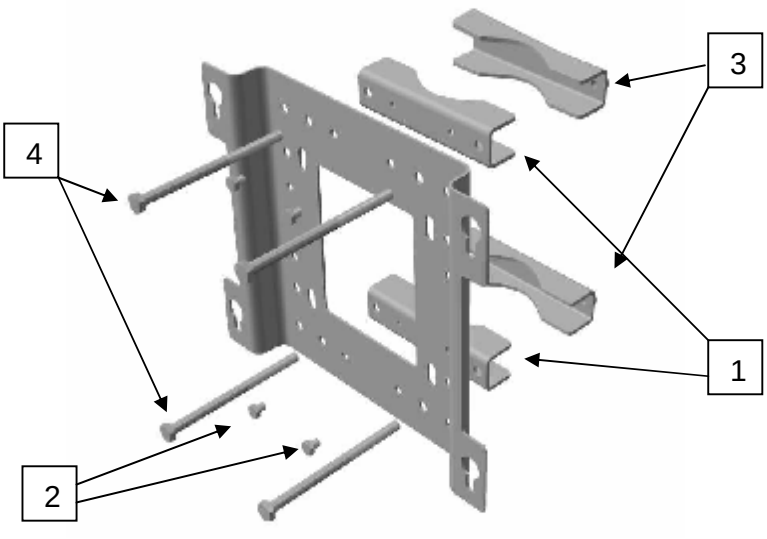


Figure 10: Fix the inner clamps to the mounting plate by using the four small screws.

Step 3: Then mount the outer clamps (3) loosely, each with one of the long bolts (4) (M 10 × 200 mm or M 10 x 140 mm). Check that there is enough space for the pole. See figure 10.

Step 4: Finally check that the two remaining long bolts (4) are accessible.

Mounting

There are two stages involved in mounting the TMB on a vertical pole:

Step 1	Clamping the mounting plate to the pole
Step 2	Fitting the TMB to the mounting plate

Clamping the mounting plate to the pole

Position the clamps around the pole and insert the two remaining long bolts (M10 × 200 mm or M10 x 140 mm). Position (4) on figure 10. Tighten all four bolts, taking care to keep the two halves of each clamp parallel. See figure 11.

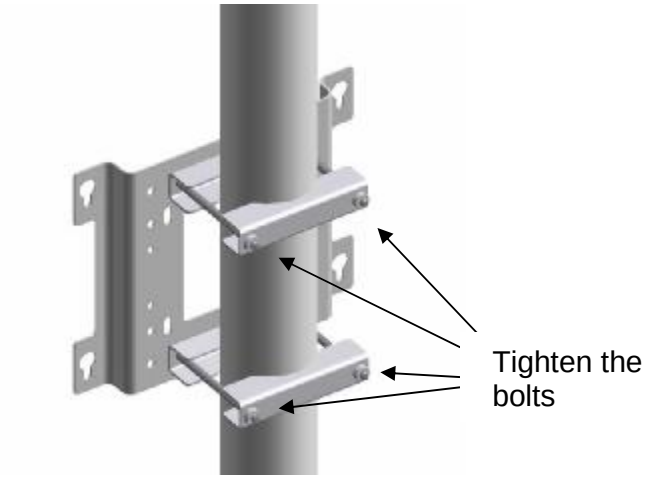


Figure 11: Fixing the mounting plate on a pole.

Finally, tighten the bolts to a torque of 25 Nm.

Note:	*Be sure to tighten the bolts hard on the pole in order to prevent the TMB from turning around the pole during high wind load.*

Fitting the TMB to the mounting plate

First pass the heads of the screws through the keyhole slots in the mounting plate and lower the TMB until the screw heads are retained by the narrow lower portions of the slots, see figure 12.

Tighten the screws to a torque of 40 Nm.

Figure 12 *Insert the heads of the screws through the keyhole slots in the mounting plate and lower the TMB until the screw heads are retained by the narrow portions of the slots. (2): Tighten the screws.*

The TMB can also be mounted on a horizontal pole using the same hardware, as shown below in figure 13.

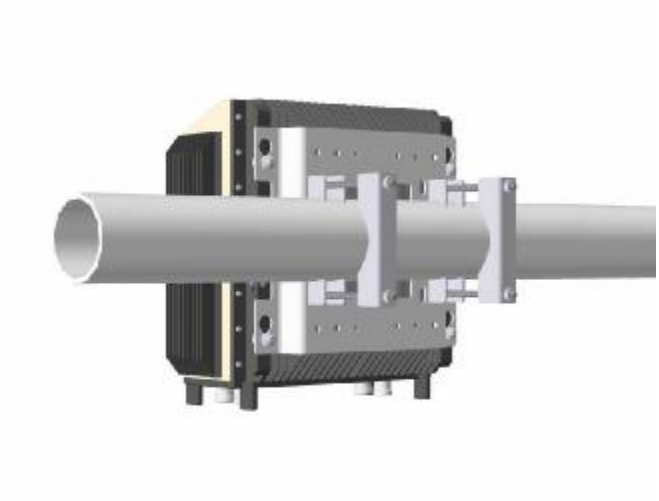


Figure 13 *The TMB mounted on a horizontal pole*

4.9 Mounting the CIU

The CIU comes with a small mounting plate. The plate is prepared for wall mounting as well as pole mounting.

For wall mounting use two or four screws appropriate to the nature of the wall.

In case of pole mounting use the metallic belt.

The CIU slides on to the mounting plate and is locked in position with the lock screw (Allen key) on the side of the CIU. The Allen key is part of the installation kit.

Figure 14 The CIU can be wall or pole mounted using the small mounting place.

4.10 Connecting the TMB and CIU

4.10.1 Connecting the earth cable

The TMB cabinet must be connected to earth. For this purpose, it has an M6 bolt in the lower left corner (when looked at from behind) with a locking washer and a nut.

Fit the lug of the earth cable over the bolt and then fit the locking washer. Secure the lug and washer with the outermost nut.

Minimum cable size for ground connection: AWG 4. Use green/yellow cable.

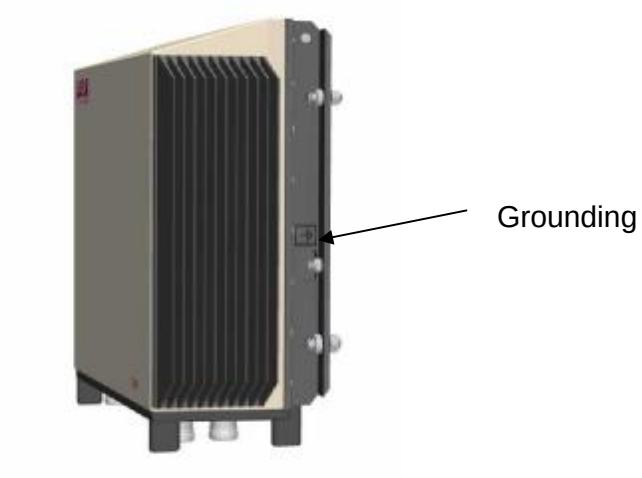


Figure 15 Grounding stud is found on the right hand side of the big heat sink.

Note:	*It is recommended to use a 16 mm² cross section grounding wire (AWG 5)*

4.10.2 Connecting the RF feeder cables

Connect the RF feeder cables to the respective RF connectors at the bottom plate of the TMB. The RF connectors are clearly marked “Antenna” and “BTS”.

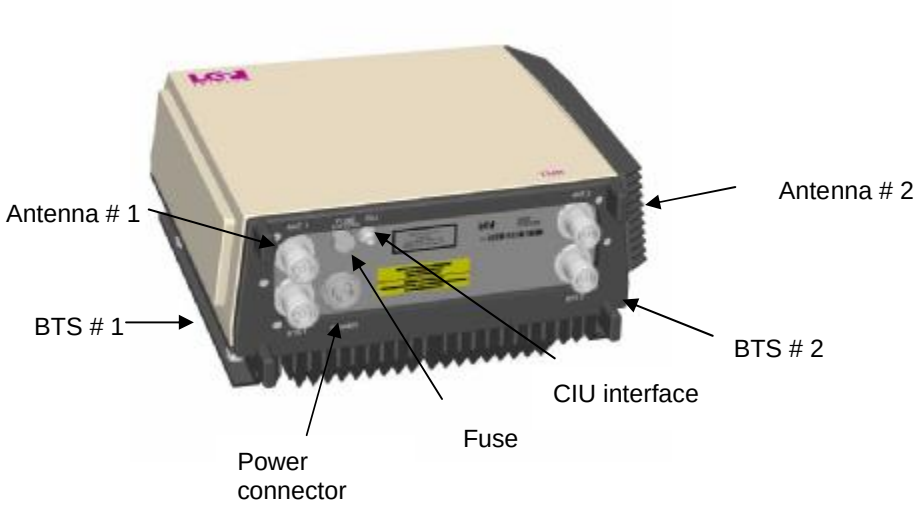


Figure 16 All connectors are found on the bottom plate of the TMB, giving the best natural weather protection. All connectors are clearly marked.

Note:	*Be sure always to connect the RF feeder cables and the grounding wire before the power cable. The power plug is made of rigid plastic, but it can be broken by a big spanner used to tighten the RF feeders.*

4.10.3 Configuring a power supply cable for <u>115V/230V AC versions</u>

The TMB is supplied with a female connector for the power cable fitting.

Disassemble the connector as shown below by un-screwing the small front ring.

Un-tighten the cable retaining nut and guide the power cable through.

The maximum outer dimension of the power cable is 6-8 mm.

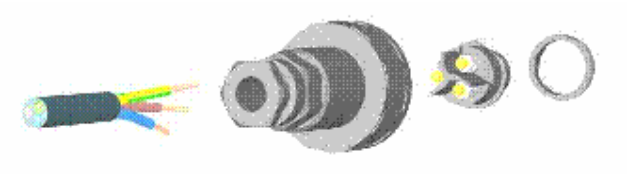


Figure 17 Power supply connector shown disassembled.

The connector has three terminals. They are clearly marked:

N = Neutral

L = Line (phase or Live)

0 = Earth (ground)

Cable recommendations:

UV resistant

LS0H (Low Smoke, Zero Halogen)

Outdoor cable

Extended temperature range

4.10.4 Connecting the power supply cable for 115V/230V AC versions

The TMB has always a preinstalled power supply connector (male) located at the bottom plate.

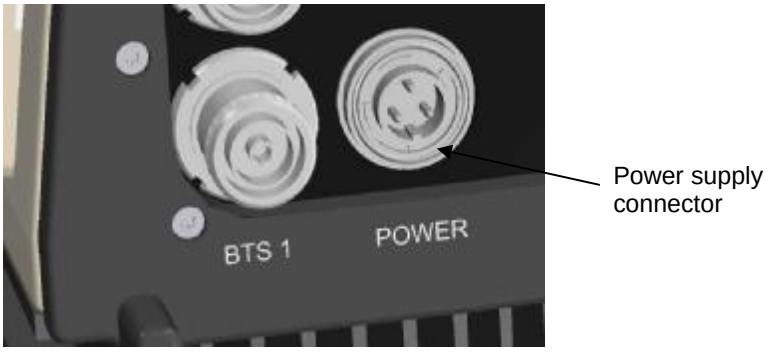


Figure 18 Close up view of the TMB bottom plate where the power supply connector (AC) is located.

Power supply connector type: Bulgin mini Buccaneer IP68

Pin configuration of male connector (front view):

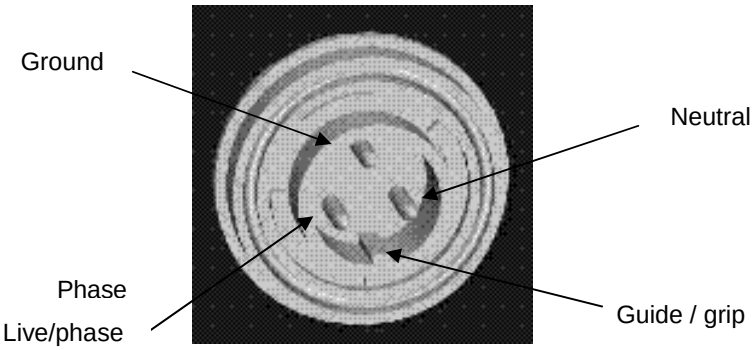


Figure 19 Enlarged view of the pin configuration of the power supply connector (AC) placed at the bottom of the TMB.

Note:	*It is recommended that the power supply cable is properly dimensioned and securely attached to the tower/building.*
Note:	*It is recommended that the main power supply cable from the base/BTS is terminated in a small interconnection box, from which a short jumper is routed to the TMB power inlet connector.*

Note:	*It is recommended that the main power supply cable for the TMB is connected to a separate circuit breaker at the base.*

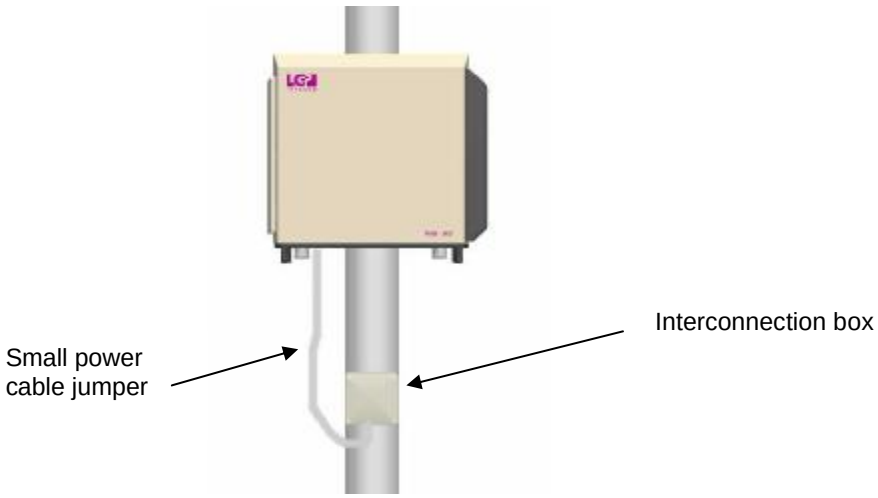


Figure 20 The TMB shown with a small power interconnection box installed right next to the TMB.

4.10.5 Specifications for the AC input voltage

The AC input voltage for the 115V/230V AC version accepts all voltages in the range of 85 V – 265 V AC. However, for power-factor correction to be active the input voltage must be in the range of 85 V – 255 V AC.

The cable must have a maximum resistance of 2.5 ohms (both wires total) between the AC supply and the TMB.

4.10.6 The fuse for TMB-900 and TMB-1800 (AC version)

The AC versions of TMB-900, TMB-1800 has a fuse located at the bottom plate. The fuse is required by regulations.

Fuse type (AC versions): 5 mm, 6.3A slow

Recommended type: Wickmann series 19181, 6.3 A or similar.

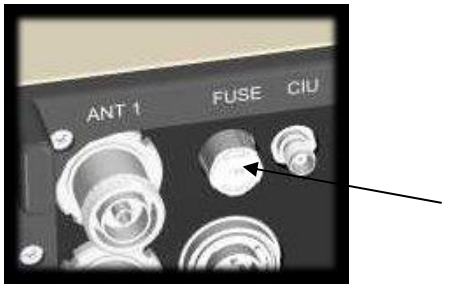


Figure 21a. The fuse on the TMB is located at the bottom of the TMB at the connector plate.

4.10.7 The fuse for TMB-1900 (AC version)

The AC versions of TMB-1900 has a fuse located at the bottom plate. The fuse is required by regulations.

Fuse type:

Recommended type: .

Billede

Figure 21b. The fuse on the TMB is located at the bottom of the TMB at the connector plate.

TMB fuse

4.10.8 The fuse for TMB-1900 (DC version)

The DC versions of TMB-1900 has a fuse located at the bottom plate. The fuse is required by regulations.

Fuse type:

Recommended type: .

Billede

Figure 21c. The fuse on the TMB is located at the bottom of the TMB at the connector plate.

TMB fuse

4.10.9 Configuring a power supply cable for 48V DC versions

The TMB is supplied with a female connector for the power cable fitting.

The type is: Amphenol C016 20E005 103 2

Disassemble the connector as shown below by un-screwing the small front ring.

Un-tighten the cable retaining nut and guide the power cable through.

The maximum outer dimension of the power cable is 13 mm.

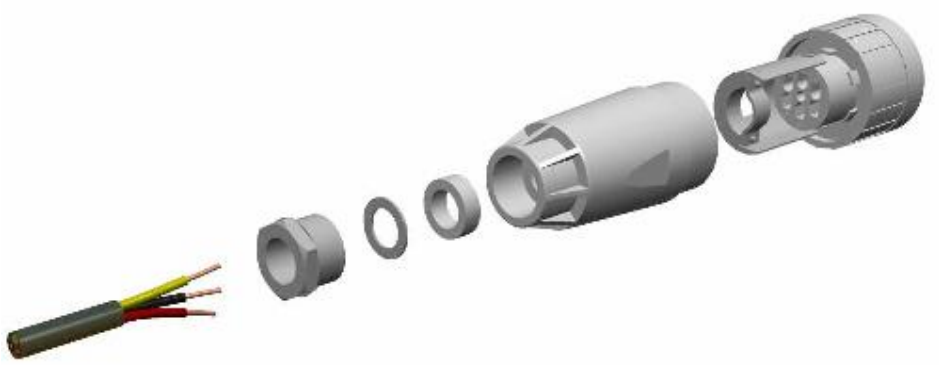


Figure 22 Power supply connector shown disassembled.

The connector has five (5) terminals. The following terminals are used:

Terminal 4 = plus (+), the positive 48V DC

Terminal 5 = minus (-), the negative 48V DC

⏚ = Earth (ground)

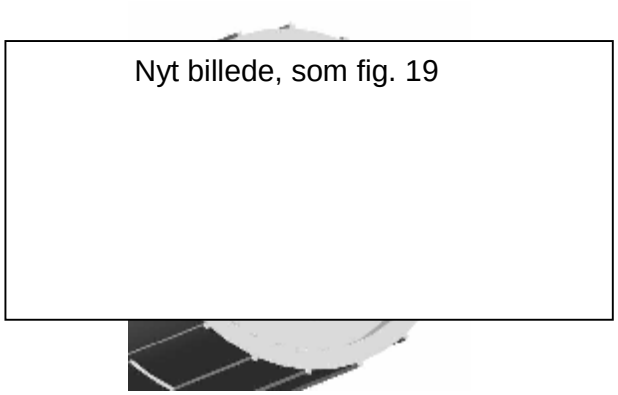
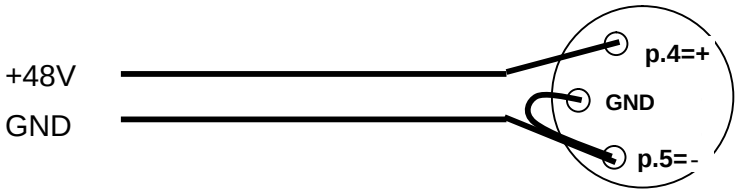


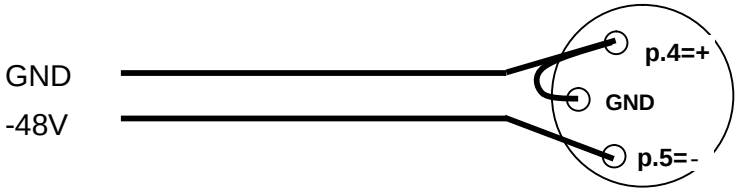
Figure 23 Connections shown from the back of the connector.

Note:	*Inside the TMB, the plus (+) and minus (-) are isolated from ground. This makes it possible to wire the TMB as a +48V DC or a –48V DC.*

To configure the TMB for a positive (+48V) voltage relative to ground, connect like this:



To configure the TMB for a negative (-48V) voltage relative to ground, connect like this:



Note:	*It is VERY IMPORTANT that + and – are connected correctly to the terminals of the power connector. Failure to do so will damage the TMB permanently.*

Cable recommendations:

- UV resistant
- LS0H (Low Smoke, Zero Halogen)
- Outdoor cable
- Extended temperature range

Note:	*It is recommended that the power supply cable is properly dimensioned and securely attached to the tower/building.*

Note:	*It is recommended that the power supply cable from the base/BTS is terminated in a small interconnection box, from which a short jumper is routed to the TMB power inlet connector.*

4.10.10 Specifications for the DC input voltage

The 48 V DC version of the TMB accepts all DC voltages in the range of 36 V to 76 V DC. Be aware that the current will increase for a lower voltage. It is recommended that the DC power cable is chosen so that the input voltage will never be lower than 40 V DC.

The cable must have a maximum resistance of 0.75 ohms (both wires total) between the 48V supply and the TMB. This results in the following recommended wire gauges:

Cable size		**Max. length (between TMB and Power Source)**	
mm2	AWG no.	Meters	feet
1.0	17	20	66
1.5	15	30	98
2.5	13	50	164
4.0	11	80	262
6.0	9	120	394

4.10.11 Connecting the CIU/TMB communication cable

The TMB may be delivered with or without CIU communication cable.

In case the CIU communication cable has been ordered and supplied with the TMB unit, it is already fitted with TNC connectors in both ends. In this case connect it to the clearly marked “CIU” connector at the bottom plate.

In case the TMB is ordered without CIU communication cable, use the two TNC connectors delivered with the TMB with an RG58 cable or use any other shielded 50 ohm cable that meets the requirements, see below.

CIU communication male connector type: TNC. Proposed type is Huber & Suhner type 11 TNC–50-3-6 or equivalent.

Cable recommendations:

UV resistant

LS0H (Low Smoke, Zero Halogen)

Outdoor cable

Extended temperature range

Cable electrical requirements:

Maximum allowed cable attenuation: 20 dB @10 MHz.

Maximum allowed DC resistance: 10 ohms.

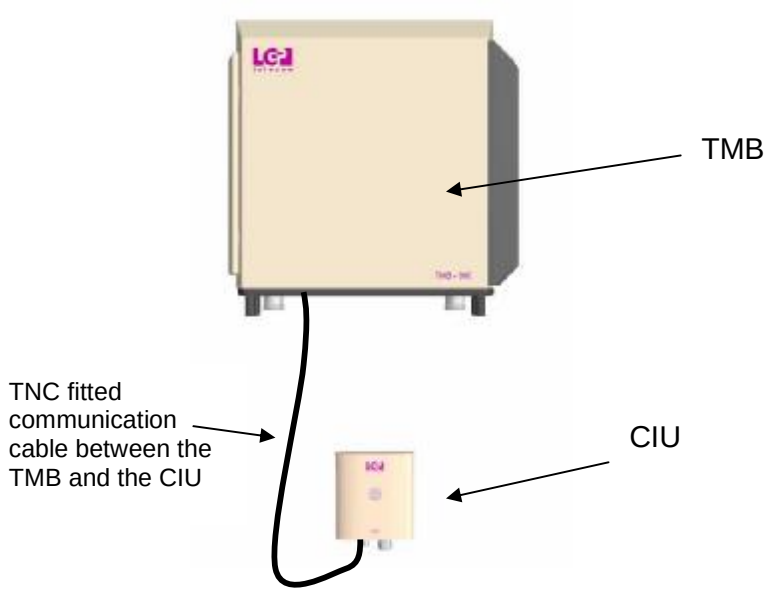


Figure 24 Communication cable connection between the TMB and the CIU.

4.10.12 TMB-1900 with external TMAs

The TMB-1900

The TMA-DD 1900 supported is LGP139..

CIN kit:

Photo.

4.11 Connecting the TMB and CIU using the optional Current Injectors (CIN)

An alternative installation can be made in order to avoid the separate power supply cable and the separate TMB-CIU cable.

This installation uses the CIN option which consists of two Current Injectors.

The first CIN (mounted on the BTS), combines the DC power and the CIU communication and the RF onto the RF feeder. This must be the feeder that is connected to BTS2 on the TMB.

The second CIN (mounted on the TMB, BTS2), separates the DC power and the CIU communication onto separate cables that connect to the normal power and CIU connectors of the TMB.

The TMB itself is the same regardless of using CIN's, the only limitation is that the TMB has to be a 48V DC version. The CIN's cannot be used on AC versions.

Note:	*The CIN option can only be used on DC versions, **NOT on AC versions**.*
Note:	*Make sure the BTS CIN is connected to the correct feeder (BTS2). Connecting it to the feeder connected to BTS1 is harmful to the CIN and the power supply, as BTS1 is DC shorted.*

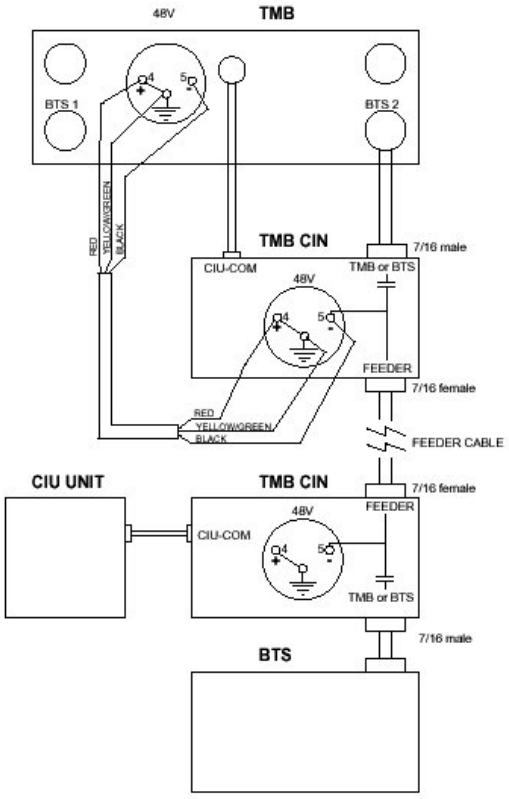


Figure 25a. TMB CIN overview

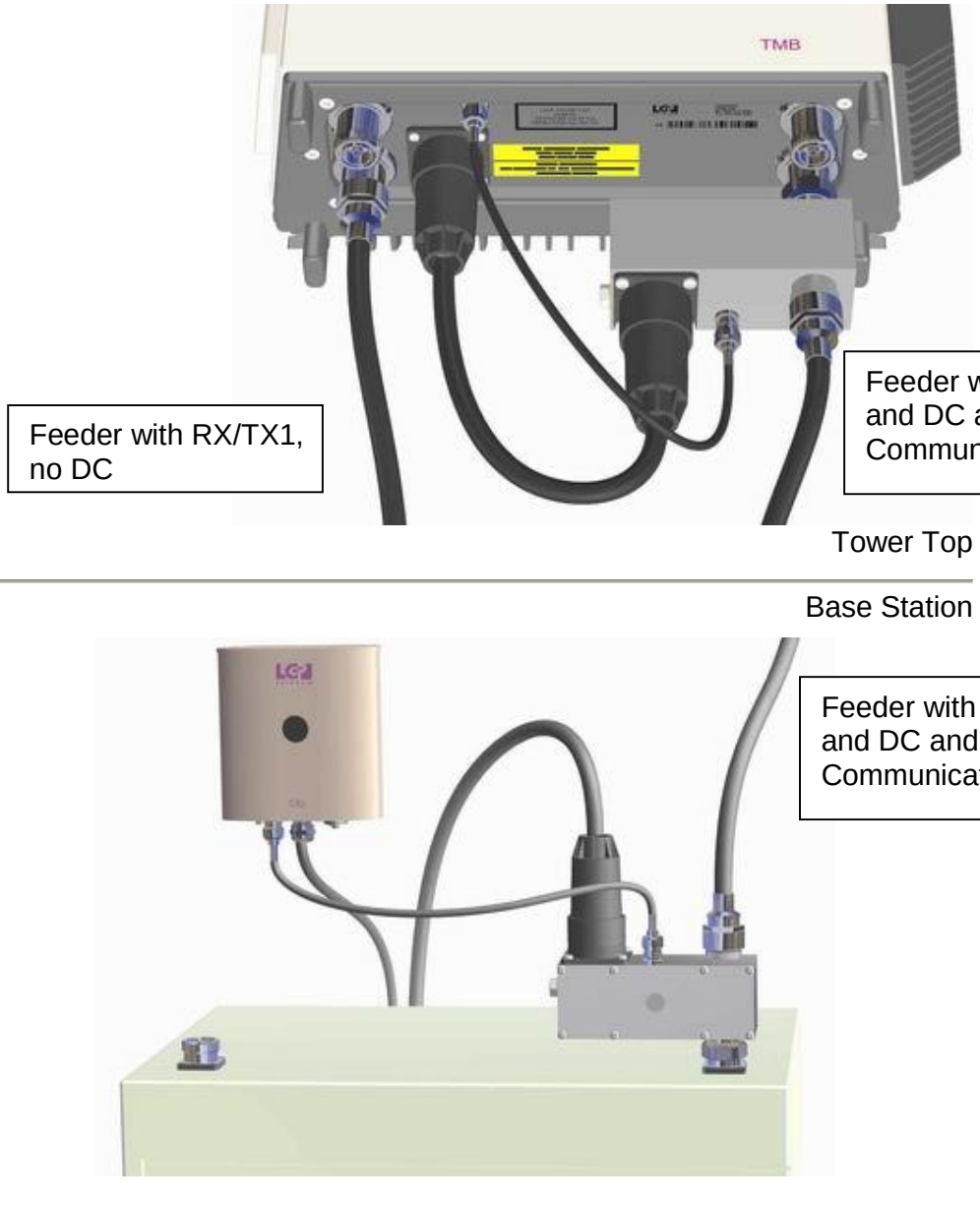


Figure 25b. Installation of the CIN option.

4.12 Connecting the CIU and BTS

The CIU has to be hard wired to the BTS for alarm purposes. An RS232 connection can also be made. The CIU is supplied with a 4 meters multi wire cable, which contains all the wired alarms.

Function	Abbreviation	Connection	Colour
Alarm output Relay # 4	A4-2	NC	Yellow
	A4-1	NO	Violet
	A4-0	Common	Brown
Alarm output Relay # 3	A3-2	NC	Green
	A3-1	NO	White
	A3-0	Common	Black
Alarm output Relay # 2	A2-2	NC	Pink
	A2-1	NO	Grey
	A2-0	Common	Grey/Pink
Alarm output Relay # 1	A1-2	NC	Blue
	A1-1	NO	Red
	A1-0	Common	Red/Blue

Note: *As the alarm relays are wired as 'fail-safe', NC (normally closed) means that the contact set is closed in case of normal operation and the relay is engaged. Power off would then result in an open circuit which should be wired as an alarm.*

4.12.1 Connecting the CIU/BTS alarm interface cable

The port codes are:

Alarm	Connection	Alarm	No alarm
Alarm output # 1	A1-1 to A1-0	Closed	Open
	A1-2 to A1-0	Open	Closed
Alarm output # 2	A2-1 to A2-0	Closed	Open
	A2-2 to A2-0	Open	Closed
Alarm output # 3	A3-1 to A3-0	Closed	Open
	A3-2 to A3-0	Open	Closed
Alarm output # 4	A4-1 to A4-0	Closed	Open
	A4-2 to A4-0	Open	Closed

4.12.2 Connecting the CIU RS232 cable

The CIU has a serial RS232 communication interface. Total control of the TMB system is available on this line.

The RS-232 has its own connector of the type 5S DIN (five pins), connections are shown below. If you have an older CIU, it may be fitted with a 3 pin connector instead.

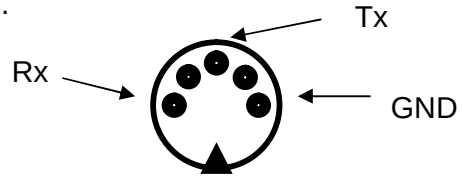


Figure 28 Picture shows the pin configuration of the RS232 DIN connector. Seen from outside of the CIU.

When the configuration of the TMB is completed, and you want to disconnect the computer from the CIU you can either remove the serial cable from the CIU, or leave the cable attached to the CIU. In case you leave the cable attached to the CIU, make sure the PC connector is appropriately weather protected.

4.12.3 Using the RS232 serial interface from a BTS

You can use the RS-232 serial interface to completely control a TMB. This possibility can be used instead of the Windows program to control a TMB from a BTS. Complete information will be available such as

- Information about S/N etc.
- Gain settings
- Performing Autocal
- Alarm settings

If you decide to use this interface, please contact LGP for a description of valid commands to the CIU, and the CIU responses.

4.13 Installation of the Remote Access equipment

It is possible to substitute the RS-232 line between the CIU and the PC with a wireless connection, using a line modem, a radio modem or a GSM modem. This feature is called Remote Access.

Figure 29 Remote Access to TMB/CIU via GSM modem

This feature requires a different cable from the CIU that replaces the normal PC RS-232 cable. The new cable has a male DB-9 connector that will allow connection to most modems.

This feature has to be enabled by an option code, before it can be used. See Chapter 6. The option code has to be purchased separately.

4.13.1 Supported modems

In principle, any data-enabled phone that has an RS-232 interface can be used for this application. However, only a few modems have been tested and can be listed as supported by LGP.

The modem or phone must be equipped with a SIM-card that is enabled for incoming data calls. This means they have a separate GSM number for incoming data calls.

4.13.2 Nokia 6210

Nokia 6210

The Nokia 6210 has been tested, and is well suited for this application. In addition to the phone, a Nokia data cable is necessary, type: DLR-3P. This data-cable converts the proprietary Nokia connector at the bottom of the handset to a normal DB-9 RS-232 connector (female). This connector will fit to the data cable described in section 4.13.

4.13.3 Wavecom WMOD2

Wavecom WMOD2

The Wavecom WMOD2 has been tested, and is well suited for this application. In addition to the modem, an external antenna and a Wavecom data cable is necessary. This data-cable converts the DB-15 (VGA type, 3 rows) connector to a normal DB-9 RS-232 connector (female). This connector will fit to the data cable described in section 4.13.

The use of the Wavecom modem also requires a small antenna, and a power supply.

4.13.4 Remote PC with modem

When using the remote access feature, there must also be a modem at the other end of the line, to be able to dial the TMB's.

This can be any normal modem (Data rate >=9600 baud) for use with a PC and compatible with Microsoft Windows 98/NT/2000. Note that for use with the Remote Access option, Windows 95 is NOT supported.

The use of the Remote Access software is described in chapter 6.

4.13.5 Additional installation information for Remote Access

When setting up the Remote Access option, it must always be verified that the TMB is functioning properly and installed correctly before attempting to make a remote connection. This is done by using a PC and the normal RS-232 cable.

When the TMB is installed properly, simply remove the RS-232 cable between the CIU and the PC, and replace it with the new cable connected to the modem.

Turn the modem on and access a GSM network.

Always leave the power supply or charger connected to the modem or phone to ensure the battery in the phone does not get discharged.

Now try to dial the TMB using a PC with a modem using the Remote Access version of the PC software (TMB manager version X1L or later).

For the communication on the RS-232 line, the CIU is using a proprietary own protocol. If the TMB is being dialled using a text-based modem program (such as Hyperterminal or ProComm), no information of the TMB can be extracted, and no setting can be made. The caller must use the program designed for the TMB.

5 Commissioning

5.1 Prerequisites

Before the TMB can be commissioned, it must be installed correctly, as described in the “Installation” part of this document.

5.2 The commissioning procedure

The LGP TMBs have been carefully designed, manufactured and extensively tested. The commissioning procedure is therefore relatively easy, and can be outlined as follows:

1. Verify that the TMB is correctly and securely installed (see “Installation” section of the manual if needed).
2. Verify that RF feeders, CIU interconnection cable, grounding wire and power supply cables are attached correctly.
3. Check that the power supply voltage is according to the TMB configuration (230 / 115 VAC or 48 VDC).
4. Switch on AC (or DC) power to the TMB unit.
5. Wait a few seconds for the TMB Self Test to finish.
6. Check that the green LED indicator on the CIU is on.
7. Boot your portable PC and open the LGP TMB application.
8. Click on the “Status” menu.
9. Check alarms.
10. Set the desired parameters. Use the Autocal feature to align power levels.
11. The PC does not have to be connected to the CIU at all times. When the configuration is completed, you can close the application and remove the PC.

The commissioning procedure is finished. Consult the “Configuration & Operation” chapter of this manual for further guidance.

Should there be any problems, please consult the “Trouble Shooting” chapter of this manual.

6 Configuration & Operation

The main operation and configuration interface is the RS232. The same control can be obtained using the infrared Laptop interface on the CIU.

This chapter outlines the O&M options in detail.

6.1 Introduction

To simplify the configuration and control of the TMB, LGP has chosen a straightforward interface using a PC program called TMB Manager. The TMB Manager has one Status information window, which contains the current setting and several sub-menu configuration windows for each particular operation.

6.2 Installing TMB Manager

The TMB Manager software is compatible with the following versions of Microsoft Windows®:

- Windows 95 / Windows 98 / Windows 2000 / Windows NT4 / Windows XP

However, for the remote access version, Windows 95 is no longer supported.

6.2.1 Prerequisites

Before you proceed, make sure that the TMB has been commissioned correctly, as described in the “Commissioning” part of this documentation.

6.3 Connecting to the TMB

There are three ways of connecting a computer to the TMB. Choose between:

- Locally, making a direct serial connection to the CIU via the RS232 interface.
- Locally, making an infrared interface connection to the CIU.
- Remotely, using the Remote Access feature and a GSM modem

In all cases the graphical user interface/presentation will be the same.

The infrared and the serial connections operate in parallel. However, a detection of interface will take place automatically and communication will be routed to this interface and locked to it as long as there is active communication.

6.3.1 RS232 connection

The CIU has a serial RS232 communication interface built in. Total control of the TMB system is available on this line. The RS232 interface functions in parallel to the infrared IrDa interface. The CIU will automatically scan the COM ports (infrared or RS232) in a continuous manner.

See chapter “Installation” for interconnection details.

6.3.2 About the wire-less infrared (IrDa) interface

The infrared interface complies to the international IrDa standard:

This interface type avoid using wired connection and hence complications with connectors, adapters, protection, etc.

Stand within one (1) meter from the CIU and point the infrared sensor on the portable Laptop/Palmtop towards the infrared sensor on the CIU, when communicating with the TMB. Note that a green LED will flash inside the window on the CIU and a small transmission indicator will be activated on the PC screen.

In very clear and strong sun light problems can occur. In case of problems try to create shadow on the infrared sensors.

The performance of the Infrared connection is limited by the IrDa standard and by the performance of the Infrared device in the PC you are using. If Infrared performance is not satisfactory, please revert to using the RS-232 interface.

6.4 The TMB Manager (PC program)

6.4.1 TMB Manager program versions

The TMB Manager program is compatible with Microsoft Windows® operating system.

The screenshots shown in this manual is valid for the following version of the program:

`TMB-Manager.exe  2002-06-28`

Earlier versions of the program has been called ‘PCOIU’. The funcionality remains the same.

6.4.2 Computer system requirements

The TMB Manager program is supplied with the TMB. To run it, you will need:

- A 486DX computer or better, running Windows 95/98/NT/2000/XP

- An SVGA monitor
- One megabyte of free hard disk space. The TMB Manager can also run from a diskette.

6.4.3 Installing the TMB Manager on your PC

The TMB Manager consists of a single executable file, and there is therefore no installation procedure.

Copy the program (File: TMB Manager.exe) to the preferred directory on your PC.

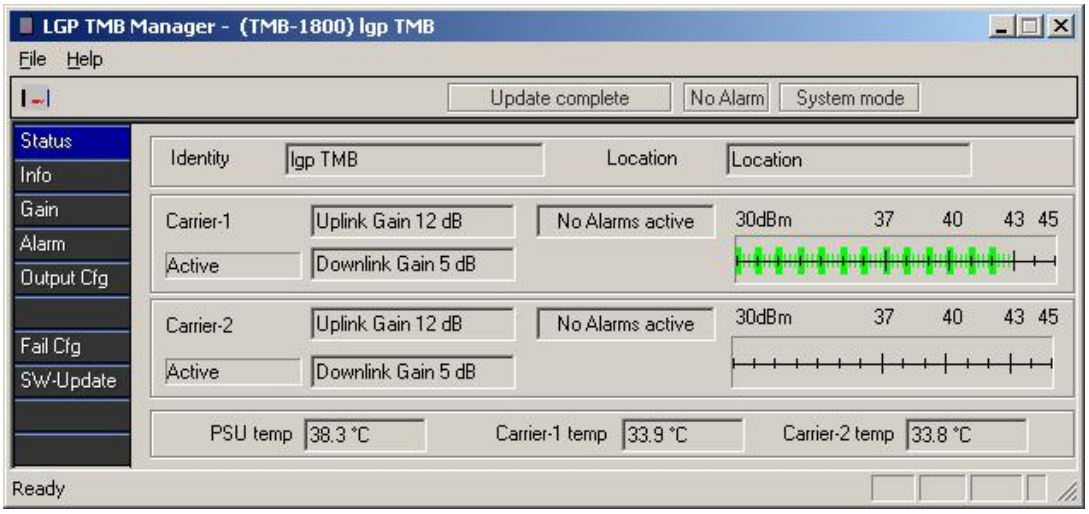
Just double-click the TMB Manager icon to start the program

In case you need to install a new version of the program (distribution file) which you have received from LGP, then copy the distribution file to the same directory as the old program and run the TMB Manager again.

6.5 The TMB Manager menus

Below you will find a description of the various menus.

The main window is showing the possible sub-menus. Click on a sub-menu icon in the left of the picture to access the menu.



6.5.1 Communication port configuration

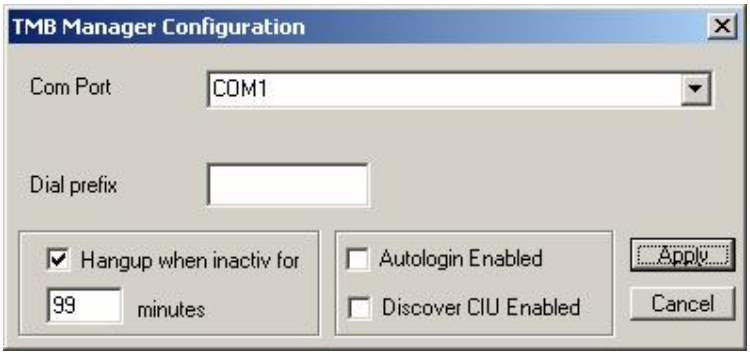
In case there is no communication to the CIU, “Not connected to TMB” will be displayed in the top status bar.

No communication can be caused by:

- The TMB is switched off
- The CIU is not connected to the TMB
- The CIU is not connected to the PC
- The COM port is occupied by an other program. Close the program and re-start the TMB Manager
- A wrong COM port has been selected

To configure the COM port, enter the File menu and click on “Configuration”

Select the appropriate COM port



Refer to the user manual of the PC to select the appropriate communication port as this depends on the hardware configuration of the PC. This particularly applies to the location of the IrDa port.

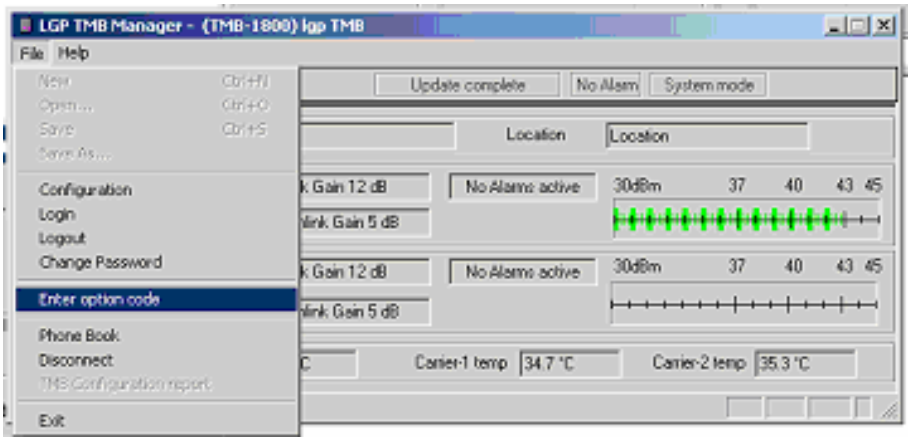
6.5.2 Access TMB options using a code

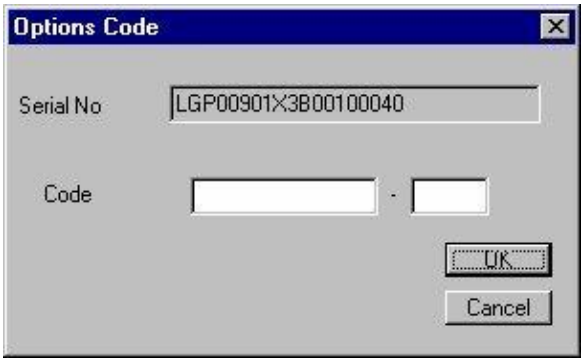
Some features of the TMB are optional. These features require a code, in order to make them available. The codes can be purchased with LGP Telecom Customer Service.

Currently, two options are available:

- Antenna Monitor (VSWR alarm)
- Remote Access

LGP Telecom Customer Service needs the serial numbers of the TMB and will via this number provide the unique password code for the product option. The serial number needed is the exact text string listed in the ‘Serial No’ field in the ‘Info’ menu.





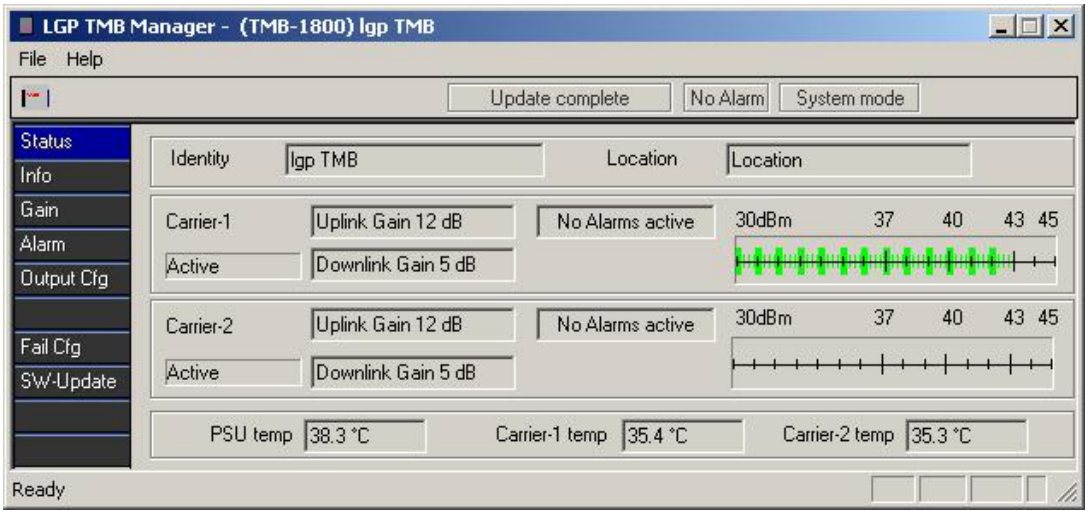
Enter the code which you have received and click OK. The option is now enabled. This can be verified in the Help-About window.

> ***Note:*** *The code for the Antenna Monitoring function (VSWR) is unique for each individual TMB and is derived from the product serial number.*

> ***Note:*** *If Antenna Monitor option isn't accessed, the "VSWR-alarm" menu and LED is not available.*

6.5.3 Status menu

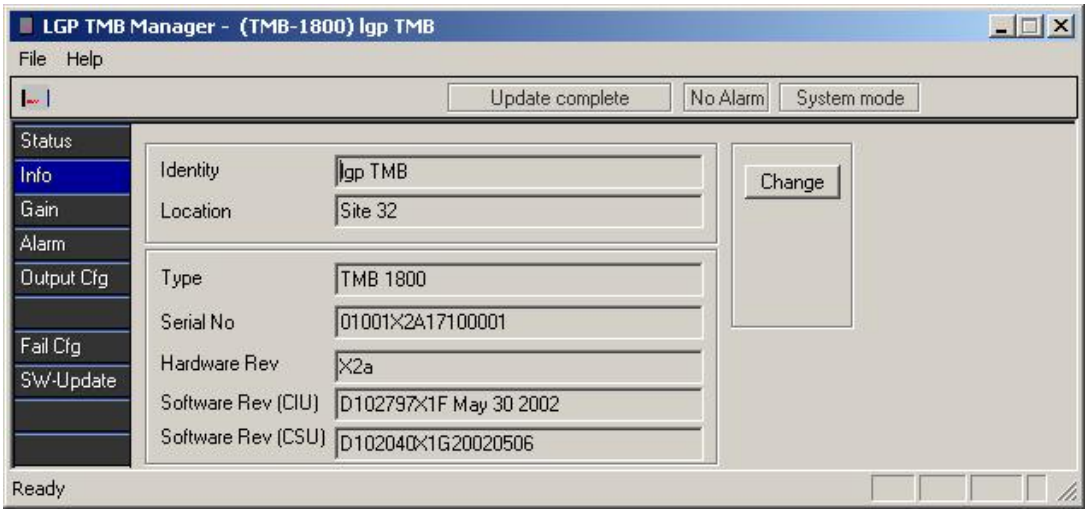
A pure information menu. The current configuration status is shown along with identity and location information.



> ***Note:*** *The power indicators shown for each channel are designed to help you visualise that there is output power from the TMB. It is by no means an exact measurement.*

6.5.4 Information menu

The TMB Info menu contains various information about the TMB and enables entering of user information as well.

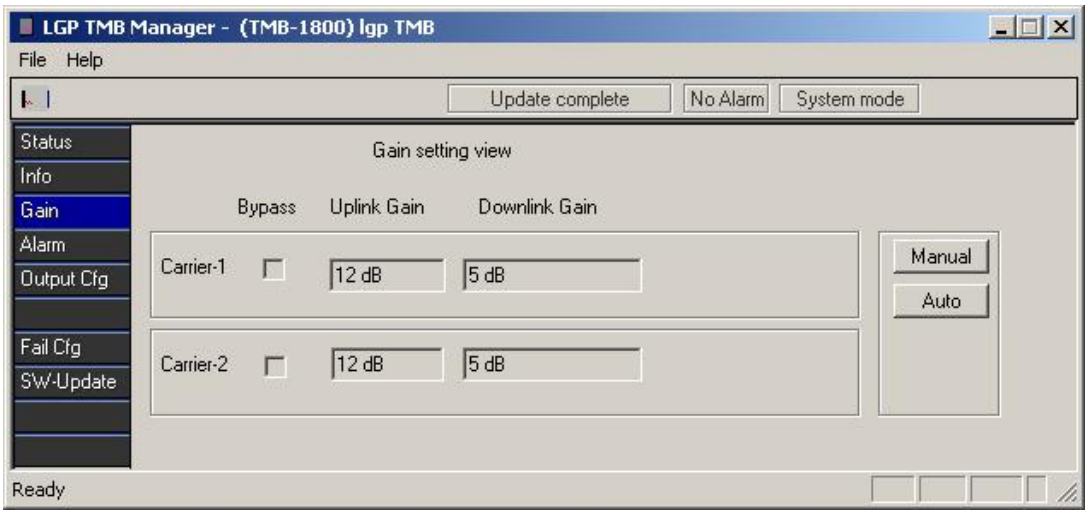


"Identity" and "Location" are text strings that can be entered by the user. The lower fields are information about the product, which can not be modified. The software version is updated when a new software version is installed.

6.5.5 Gain setting menu

In this sub-menu you can enable or disable the amplifiers and set the gain of all four amplifiers.

The first screen picture is only showing the status of the gain setting.



The gain setting of the downlink amplifier (HPA) can either be done manually or automatically. The uplink amplifier (LNA) shall in all cases be set manually.

Manual setting is used where the cable path loss from the BTS to the TMB is known, or if equipment is available to verify the output power of the TMB. Also, if data already exists from field measurements indicating a certain link balance problem of x dB, then the manual gain setting can be used with advantage.

The automatic setting is used where the cable path loss is unknown or unaccurate and only a certain power to the antenna is desired.

Note:	*Due to the tolerances of gain on the TMB, and tolerances of output power from the BTS, the automatic gain setting is very useful to ensure the correct output power.*

Manual Setting

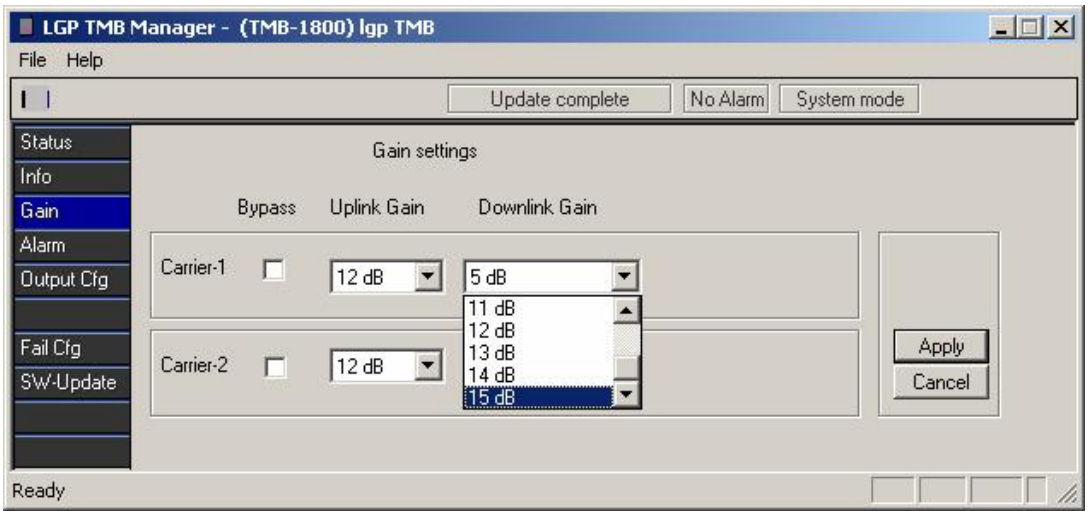
A click on the **Manual** button will allow manual gain setting of four amplifiers individually. Also, it is possible to put a carrier in bypass mode.

If bypass is chosen, both up- and down-link will be bypassed. Please note that in the event of a failure, the bypass switches do function individually, so only the faulty link is bypassed.

Click on the scroll down arrow of each gain setting window and pick the desired gain.

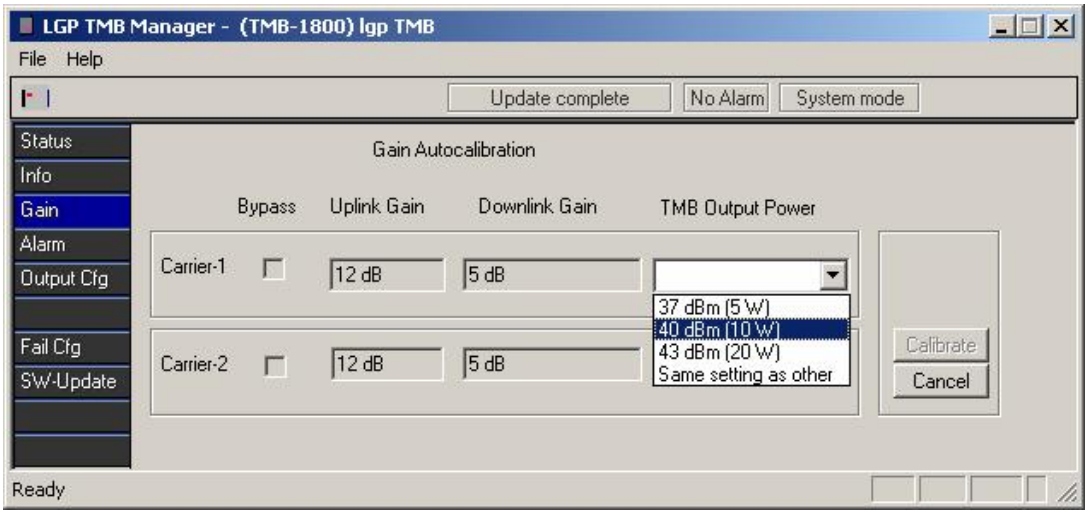
All gain settings can be different as the amplifiers work completely independent.

Having entered the desired gain values click OK and the new setting will be applied, or click Cancel if you do not want to change the current setting.

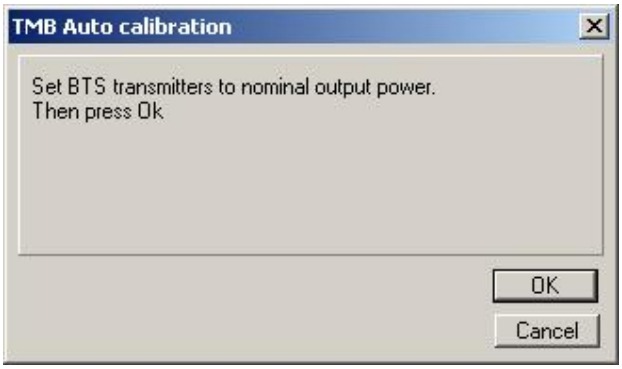


Auto Setting

Automatic calibration of the gain is done by clicking on the **Auto** button. The screen picture will change slightly. The carriers can still be enabled or disabled and the Uplink (LNA) gain can be set. However, the Downlink (HPA) power level must now be set instead of the HPA gain. The indicated power level is pr. carrier and valid at the TMB output antenna connector.



Having entered the desired Uplink gain and Downlink power level, click **Calibrate**.



The TMB will now require that the BTS power is set at its nominal power level. Using this power level as input reference level to the TMB, the Downlink gain resulting in the desired output power can be calculated by the TMB.

Adjust the BTS to the desired nominal power and click **OK**.

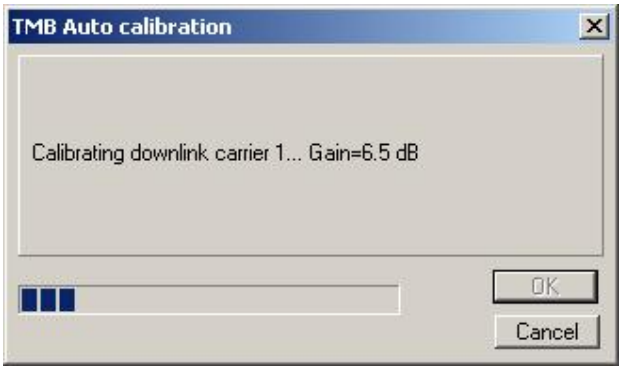
Note 1: *It is preferred to run the TMB at high gain and the BTS at low power due to feeder cable loss.*

Note 2: *Running the BTS at reduced power and the TMB at full power will add some "safety" to the site. In case the downlink amplifier (HPA) in the TMB fails for some reason and by-pass mode is activated, then the BTS can use this alarm signal to increase the BTS output power and thereby compensate for the lost output power.*

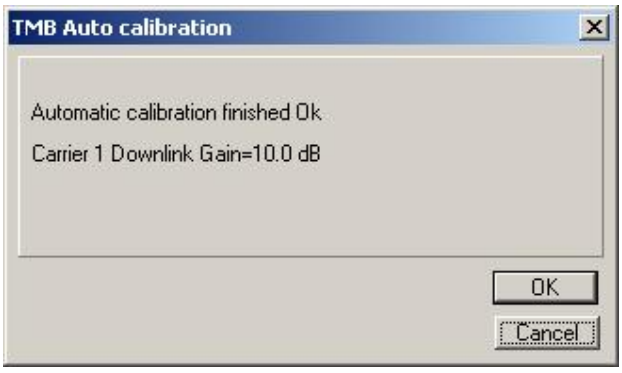
Note 3: *Having only one time slot active during calibration is sufficient.*

Note 4: *Having completed the auto calibration, the gain will remain fixed. Increasing the BTS output power later on without re-calibration may create intermodulation products in the TMB and saturate the amplifiers, but only if it is already running at maximum power (+43 dBm or 20 watt)*

During the calibration a progress indicator will be displayed.



After auto calibration, the TMB will show the calculated gain setting values. Click **OK** to accept them or cancel to retain the previous settings.

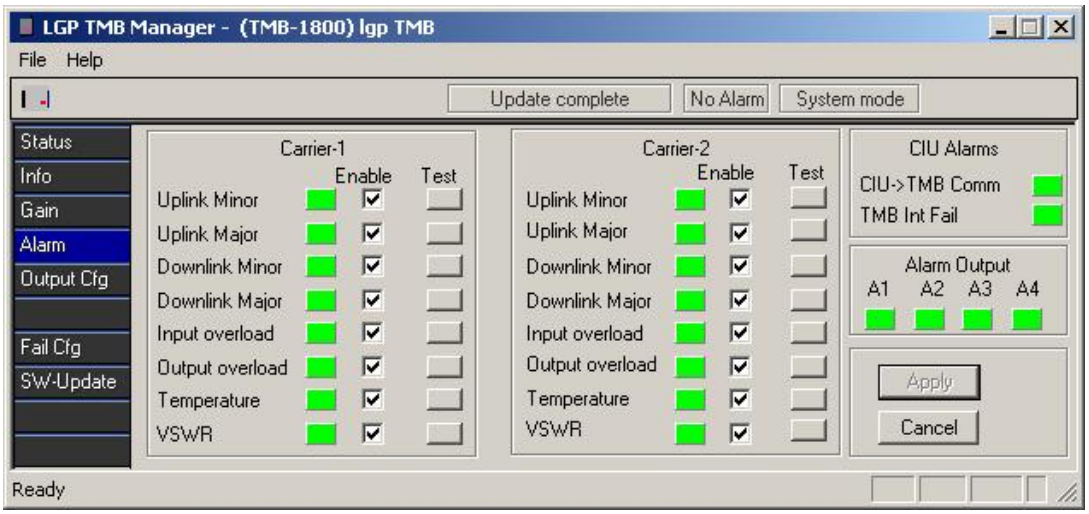


The gain setting window will be updated with the predicted values. Those gain values will be fixed and remain until a new setting is made.

6.5.6 Alarm setting menu

In this sub-menu you can enable or disable the various alarms.

It is possible to monitor all alarm for each carrier/link independently. However, there are 4 relay alarm contacts for the TMB. The relay contacts are normally open (NO) or normally closed (NC), making a total of 12 wires (four times NO-wires, four times NC-wires and four times common wires). In case the RS232 communication and the TMB Manager is used, all alarms can be monitored.



The software LED indicators on the screen will be green or red or grey depending on the alarm status.

Put a checkmark for the types of alarms that you want to monitor.

Your choices will only be activated after you hit **Apply**.

See also “Alarm functions” in the “Functional Description” chapter.

The “Test” buttons can be used to simulate an alarm. Click a button and the corresponding alarm will be activated for 10 seconds. The corresponding relay will also be activated, if configured. In this way you can check that the alarms are correctly connected to the BTS interface.

The “CIU Alarm” is an indicator monitoring the modem communication between the CIU and the TMB. A failure in the communication will change the indicator from green to red.

The “Alarm Output” indicates the status of the four relays. If an alarm is active and routed to a relay output (see next paragraph), you will see an indicator of the given alarm being red as well as the corresponding relay.

> ***Note:*** *The Antenna Monitoring function (VSWR) is a special product option. The menu is accessed as described in above chapter "Access Antenna Monitor (VSWR)". If Antenna Monitor option isn't accessed, the "VSWR" menu and LED is not visible.*

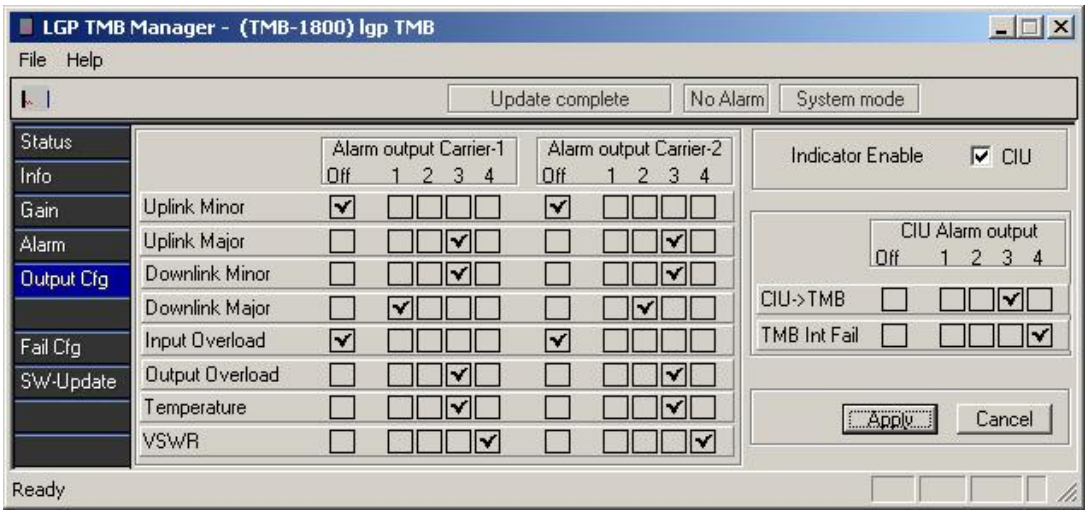
6.5.7 Alarm output configuration menu

In this sub-menu you can configure the wired relay contacts in the CIU. There is a total of 4 relay contacts (open or closed) for the TMB.

More alarms can be routed to the same relay contact giving an "OR" function.

The choice of which alarms to monitor is entirely free, and it is not required that the same alarms are monitored in the two links.

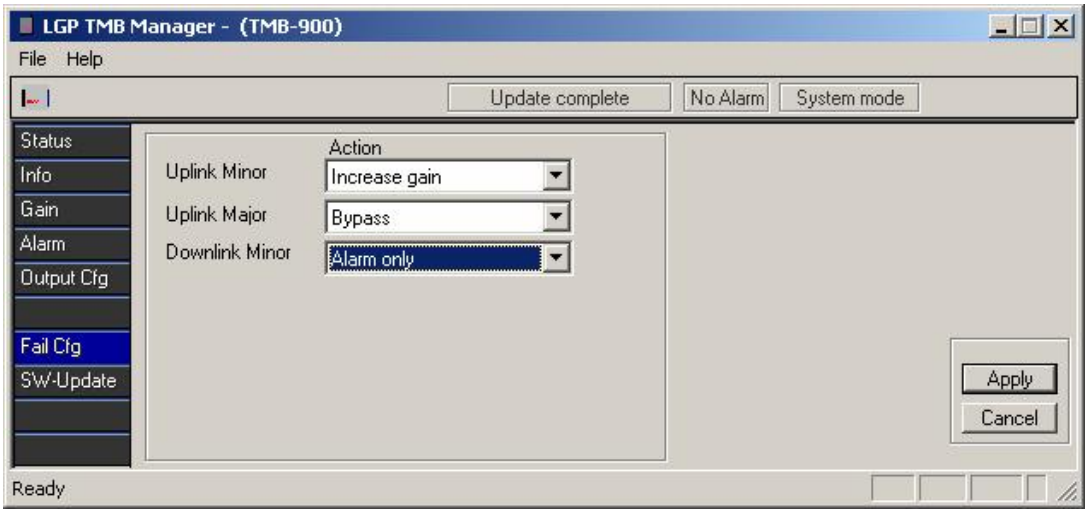
Put a checkmark for the types of alarms that you want on the various outputs.



The LED's on the CIU can be enabled/disabled in this menu as well, in case you do not want them visible. However, the green indicator will always be visible whilst communication to the PC.

6.5.8 Failure Configuration menu

In this sub-menu it is decided which action the TMB shall take upon a failure.



For **TMB-900**, the choices are:

- Uplink Minor: Alarm only or Increase gain (default is Alarm only)
- Uplink Major: Alarm only or by-pass (default is Alarm only)
- Downlink Minor: Alarm only or by-pass (default is Alarm only)

For **TMB-1800**, there are no choices and the settings are:

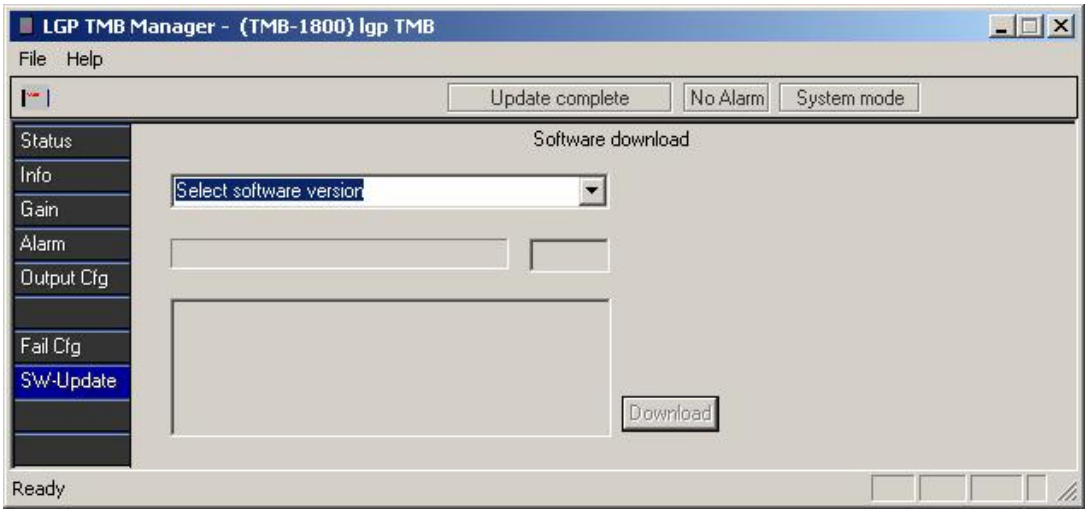
- Uplink Minor: Increase gain
- Uplink Major: By-pass
- Downlink Minor: Alarm only

For each amplifier (uplink and downlink) the actual choice is set simply by scrolling down the window and selecting the desired action.

The By-pass mode is realised as a switch, bypassing the amplifiers only and not the duplex filters. Measuring the antenna return loss (VSWR) via the RF feeder cable and through the TMB in By-pass mode is not recommended.

6.5.9 CIU Software updating menu

The main software controlling the TMB behaviour resides in the CIU. This is not the same as the PC program. The software in the CIU can be changed/updated via a simple download function.

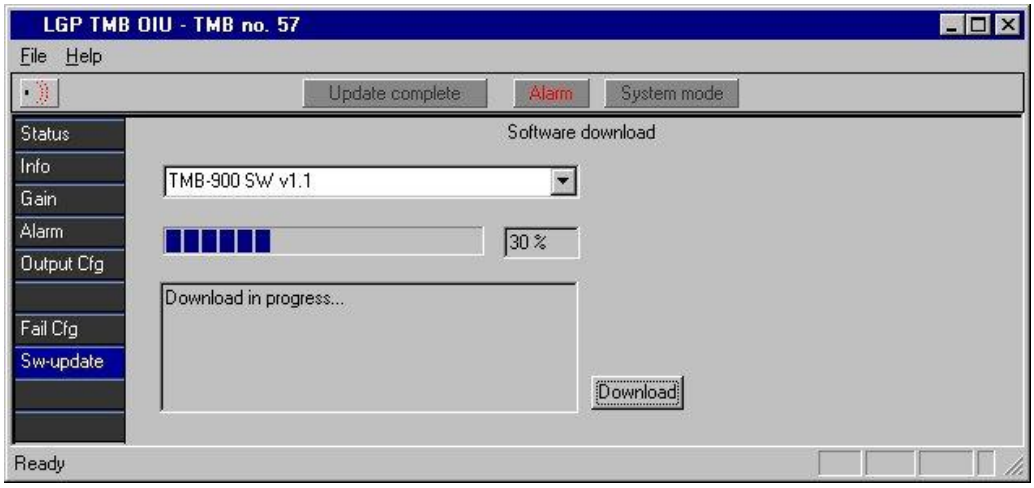


In the software menu you will see the different software versions which currently are stored locally in the PC. The CIU software files (type *.A90) need to be in the same directory as the TMB Manager. To make an update, select the version to download and click the download button.

Note 1: *Download of new CIU software will not interfere with the operation of the TMB, but the alarm relay contact outputs to the BTS will be turned off (if active) during download.'*

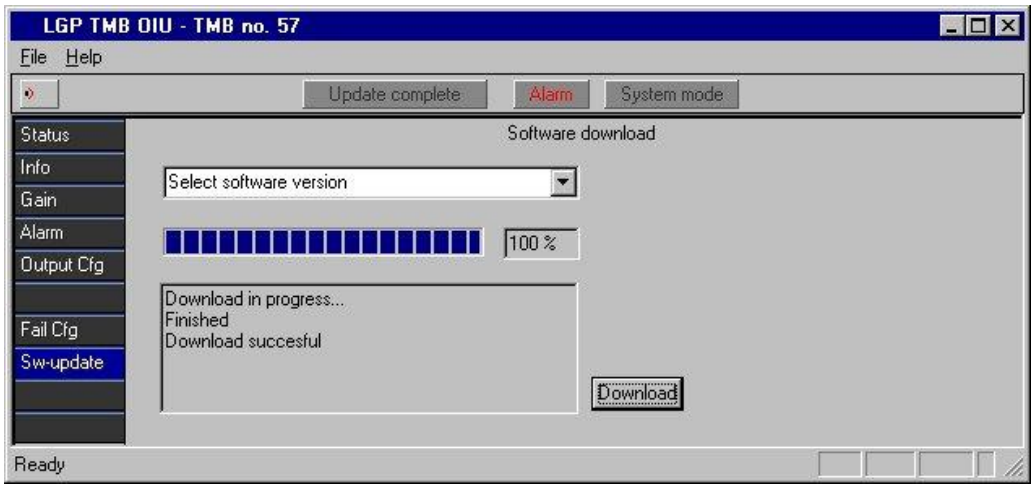
Note 2: *The current setting will be maintained during software updating, i.e. no need to set gain values again.*

A typical download screen will be seen while the downloading is proceeding.



When the download is complete, the result (failure or success) is shown on the download menu.

In case of a failure (most likely if IrDa is used due to interference) the software download has to be repeated until it is successful. This is necessary because of the deletion of the previous software in the CIU.



A normal software download takes approximately 20 minutes.

6.6 Remote Access option to TMB Manager

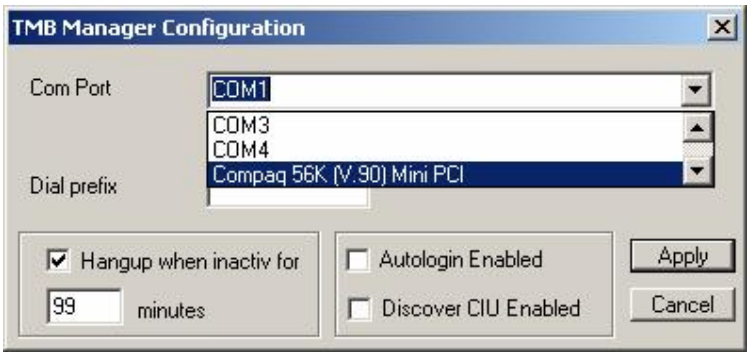
If you have purchased the Remote Access option to the TMB, you can dial the TMB using the TMB Manager. This is described in this paragraph.

6.6.1 Modem installation

The computer being used for remote access needs to have a modem installed. The modem should be installed using normal procedures for installing hardware under Windows. Please consult the manual for your modem.

After the modem has been installed properly, it should be visible under the Windows Control Panel.

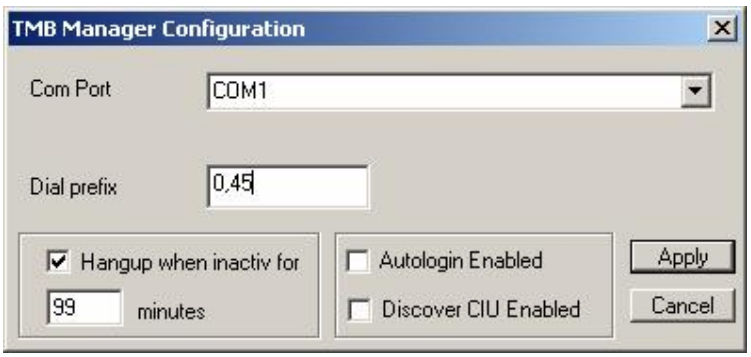
The modem can now be selected under the configuration menu in the TMB Manager. If a COM port is chosen in the configuration menu, the TMB Manager will function normally as previously described. If a modem is chosen instead, the remote access features will appear.



For the selected COM port, it is also possible to enter a dial prefix. The dial prefix is added in front of the telephone number selected in the phone book.

The example below shows:

- 0: to get external line
- , (comma): pause
- 45: country code for Denmark



6.6.2 Phone book (list of TMB's)

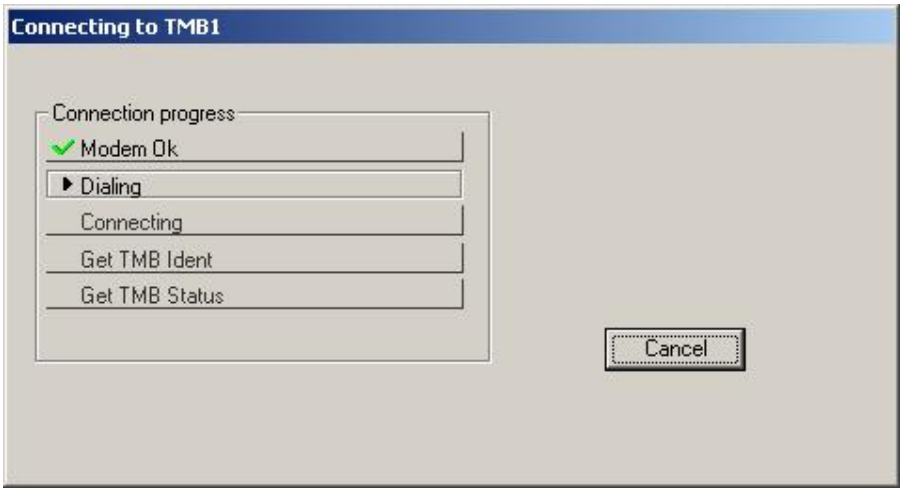
Here you enter the phone numbers for your pool of TMB's. Each one can be given a name, i.e. "Village X, Sector A".

The contents of the Phone book is stored in the Windows Registry, and will automatically be saved. If you need to transfer the phone book to another PC, use the "Export" and "Import" buttons. The contents of the phone book will then be converted to a comma-separated file (phonebook.txt), that you can transfer on a floppy disk or by E-mail.

6.6.3 Dial TMB

After you have selected a TMB from the phone book, press the Dial button, and the number will be dialed using the installed modem.

The Dial screen will show the progress of your call. This is helpful, in case something is not connected right.



After the connection is established, the TMB Manager will look the same as it does when connecting directly to a CIU using the RS-232 cable. The menus described in the previous sections are therefore still valid. Please refer to these sections for monitoring a TMB.

When you are done monitoring the first TMB, you can choose to Disconnect from the File menu. After that another TMB can be called.

If you choose to close the TMB Manager, the present call will also be terminated.

Note that the status bar on top now has an indicator for Online/Offline.

6.6.4 Troubleshooting Remote Access problems

Using Remote Access, there are more possibilities of errors when connecting to a TMB. To avoid these problems, always:

1) Make sure the CIU communicates on the RS-232 with a PC before attempting to use Remote Access.
2) Make sure the data SIM card works by dialling from a modem before installation.
3) Make sure the TMB being dialled is enabled for Remote Access (requires option code from LGP)

When these things are in order, the problems can be located using the status information in the dial window.

There are several possibilities:

1) If the modem is installed properly, a “Modem OK” message should appear in green color quite quickly. If this does not happen, check your modem installation again.
2) If the modem is unable to get a dial tone, a “Dial tone Fail” message will appear. If this is the case, check your cable going from the modem to the phone plug in the wall.
3) If the program fails to complete the call to the listed number, a ……. Will appear. If this is the case, check the number again. Also make sure that the dial prefix has been set properly in the configuration menu. (If you need to dial 0 to get an outside line, the proper setting is “0,”).
4) If the call is completed, but there is apparently no TMB/CIU in the other end, check the cable between the CIU and the remote modem.

7 Maintenance

The TMB system is in principle maintenance free.

7.1 Maintaining the TMB

The unit does not contain any fans or other mechanical moving parts.

The unit contains a fuse (AC versions only), located at the bottom plate of the TMB. The unit shall in addition always be protected by a fuse from the main power supply.

Fuse type in the TMB: 5mm 6.3 A slow (230 VAC)

The two heat sinks on the TMB unit must be kept free from dust and mud. Under normal weather conditions there should not be any need for cleaning the TMB. Mud and dust will under normal conditions be cleaned by natural rain and wind.

7.2 Replacing the TMB

If the TMB has to be replaced, the following procedure is recommended.

1 Switch off the AC or DC supply

2 Disconnect the power plug

3 Switch off the RF carriers from the BTS

4 Disconnect the RF feeder cables and the CIU cable

5 Disconnect the Earth cable

6 Loosen the four screws at the back of the TMB. The screws are “non drop” types

7 Lift the TMB off the mounting plate. If the TMB handle is available attach it and lift the TMB using the handle.

Note: *Be sure to attach the handle correctly, which means that it is securely locked and hereby prevents the TMB from dropping off the handle.*

If the TMB is not replaced immediately by another TMB unit, make sure to weather protect the open-ended cables.

8 Troubleshooting

Note: Service and repair of internal parts of the TMB must only be carried out by qualified, authorised and trained LGP personnel. Exceptions are strictly limited to service and repair that can be carried out on the outside parts of the TMB.

The table below summarises the main trouble shooting measures. In some cases you must send the TMB for factory service, but below table might assist problem solving and trouble diagnostics.

Error	Possible cause	Suggested action
Power indicator LED (green) in CIU is off	- No main voltage	- Check the incoming AC or DC voltage
	- No CIU/TMB connection	- Check the TNC connector on the CIU and the CIU/TMB communication cable
	- LED disabled via software in the setup menu	- Enter the setup menu and enable the LED's
	- Fuse is faulty (AC only)	- Check fuse
Power indicator LED (green) is flashing	- The CIU is in communi-cation mode and being addressed	- No action. Normal mode indicating "busy line" during PC / CIU communication.
No RF or too low output power	- No input power	- Check the RF power out of the BTS
	- Carrier turned off	- Check in the Gain Setting menu to see if the carriers are disabled.
	- Feeder cables wrongly connected.	- Check that BTS input of the TMB is connected to the feeders going to the BTS
	- No main power supply to the TMB	- Check the main power source

No screen picture on PC	- PC not booted correctly - LGP software not installed	- Re-boot PC - Re-load LGP software
No communication to the TMB from the PC	- Infrared interfaces on TMB and PC not aligned - RS232 cable not connected - Wrong COM port selected on PC	- Repoint the infrared interfaces and lower distance to max. 1 mtr. - Look for flashing green LED in the CIU and “signal indicator” on the PC screen, all indicating that communication is ongoing. - Make sure the correct COM port is used on the PC - Try RS232 instead of IrDa
Low downlink gain or output overload alarm	- Check that you are not over loading the TMB.	- Adjust down the transmitter power to a proper level. As low as possible is normally preferable.