BASE STATION SOLUTIONS

TMA

INSTALLATION AND SERVICE MANUAL

044-05214 REV. B | DECEMBER 2009

Powerwave technologies

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This Powerwave product is intended only for installation in a RESTRICTED ACCESS LOCATION and is designed to operate within the Normal Operating (typical operating) ranges or conditions specified in this document. Operation of this equipment beyond the specified ranges in this document may cause:

1. Spurious emissions that violate regulatory requirements.

2. The equipment to be automatically removed from service when maximum thresholds are exceeded.

3. The equipment to not perform in accordance with its specifications.

It is the Operator's responsibility to ensure this equipment is properly installed and operated within Powerwave operating specifications to obtain proper performance from the equipment and to comply with regulatory requirements.

For PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device shall be incorporated in the building installation wiring.

Warnings, Cautions, and Notes

Warnings, Cautions, and Notes are found throughout this manual where applicable. The associated icons are used to quickly identify a potential condition that could result in the consequences described below, if precautions are not taken. Notes clarify and provide additional information to assist the user.

WARNING: This warning symbol means danger. You are in a situation that could cause bodily injury or death. Before you work on any equipment, be aware of the hazards involved with electrical and RF circuitry and be familiar with standard practices for preventing accidents.

CAUTION: This caution symbol means reader be careful. In this situation, the user might do something that could result in equipment damage or loss of data.

NOTE: This note symbol means reader take note. Notes contain helpful suggestions or references to material not covered in the document. Procedures are not contained in notes.

Revision Record

Revision Letter	Date of Change	Reason for Change
Rev A	April 2003	Initial release
Rev B	April 2003	Minor changes
Rev C	September 2003	Updated logo and contact info
Rev D	September 2005	Updated logo and minor content update
Rev A	September 2007	Revisions: Document renumbered from MAN10018 Rev D to 044-05214 Rev A. Page layout format revised from MS Word format and placed into FrameMaker template. Replaced graphic on front cover. Added text mentioning AISG compatibility and reference to RET manuals. Removed text describing VSWR, CIN and GCU. Added graphics showing Multi-Pac Plate mounting, location of drain pipe, and grounding screws.

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Chapter 1
Product Description

Introduction

This manual contains information and procedures for installation, operation, and maintenance of Tower Mounted Amplifier (TMA) systems from Powerwave. Except for the TMA itself, a TMA system consists of accessories for installation, powering and supervision.

Powerwave offers a product range consisting of different types of AISG compatible MCUs, RET units, TMAs, and surrounding equipment for complete system installation.

Scope of Manual

This manual is intended for use by service technicians, customers and Powerwave personnel involved in any phase of TMA utilization who are familiar with similar types of equipment. It contains service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date may be incorporated by a complete manual revision or alternatively as additions. The manual is organized into chapters as follows:

- ❑ Chapter 1 - Product Description
- ❑ Chapter 2 - Mounting and Connecting the TMA
- ❑ Chapter 3 - Commissioning
- ❑ Chapter 4 - Testing and Troubleshooting
- ❑ Chapter 5 - Repair
- ❑ Chapter 6 - Glossary and Abbreviations

Customer documents

The library of user documents for TMA systems consists of the following manuals and technical notes.

Table 1-1 User Documents

Document	Document number	Description
Technical manual - PDU Lite	MAN-10009	Installation, operation and maintenance of the PDU Lite system.
Technical manual – MultiPac	MAN-10015	Installation of TMAs and filters using the Powerwave MultiPac system.
Technical manual - TMA Super-Compact™ systems	MAN-10016	Operation and maintenance of TMA systems and PDU Classic.
Technical manual – TMA 450	MAN-10017	Installation, operation and maintenance of TMA systems for 450 MHz.
GCU Manual	GD-10085	Operation of the old Gain Control Unit.

Technical Notes

Several technical notes on a number of issues are available, a selection is listed here.

Table 1-2 Technical Notes

Document	Document number	Description
Arrival test	TN-1001 1	Hints and guidance on arrival test of TMAs.
Test of TMAs and Bias-tee at installation	TN-10012	Tests that can be carried out on installed TMAs.
Commissioning guidelines	TN-1 0010	Commissioning of a TMA system.
Wind load	TN-10008	Data on wind load for the different TMAs.
Painting of TMAs	TN-1 0035	Instructions for re-painting of TMAs.

General standards

These classification standards are applicable to tower mounted amplifiers from Powerwave.

References

Products comply with the applicable harmonized standards listed below:

Europe

Hereby, Powerwave, declares that the product(s) mentioned below are/is in conformity with the relevant provision(s) of the directives and amendments, as well as the product standards and normative documents, listed on the following page(s) of this document.

Directives

1. (EMC) 89/336/EEG, 92/31/EEG and 93/68/EEG, Electromagnetic Compatibility directive
2. (LVD) 73/23/EEG and 93/68/EEG, Low Voltage Equipment Directive

Standards

1. ETS 300 342-3, EMC GSM
2. ETSI TS 125 113 / 3GPP 25.113,EMC UMTS
3. EN/IEC 60950, Product safety
4. EN/IEC 60529, Ingress protection

North America

Directives

1. FCC CFR 47, Telecommunication; Part 15: EMC emission
2. UL 1950, Product Safety

Environmental Standards

1. ETS 300 019-1-1 & -2-1, Storage
2. ETS 300 019-1-2 & -2-2, Transportation
3. ETS 300 019-1-3 & -2-3, Indoor Operational
4. ETS 300 019-1-4 & -2-4, Outdoor Operational

Lightning/MTBF and Reliability Standards

1. IEC 61312-1, Lightning Protection, General
2. Telcordia TR-332, MTBF / Reliability

Conversions

Conversion factors used in this document:

1 mm = 0.03937 inch	1 inch = 25.4 mm
1 Nm = 0.7376 lbf ft	1 lbf ft = 1.356 Nm

Powerwave Contacts

For further assistance please contact the closest sales office or representative. An updated list of offices and representatives can be found on our homepage. You may also call Powerwave and ask for Technical Support. See back cover.

Disclaimer

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

General Description

The TMA amplifies signals from the antenna, to improve the quality of the base station's communication. The TMA is built around a microwave filter that provides an ideal radio and mechanical environment for the Low Noise Amplifer (LNA), and should be placed as close to the antenna as possible. Connection to the antenna is via a jumper cable, as shown in Figure 1-1. The TMA is also connected to the base transceiver station via the main feeder and – generally – the Current INjector, also called Bias-T.

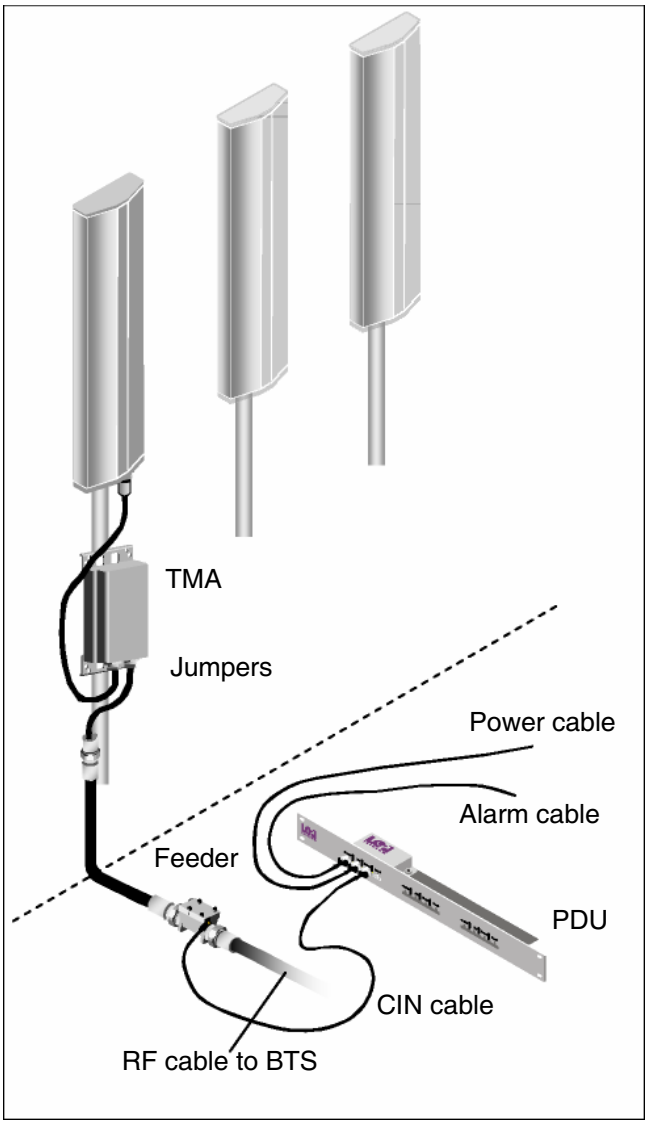

Figure 1-1 System overview

The purpose of the CIN is to supply the TMA with DC power via the antenna feeder, without impeding the communication quality. The CIN receives the DC power from the PDU (Power Distribution and alarm Unit), which, in turn is supplied from the BTS DC rail. One PDU can supply up to six CINs.

An alarm cable is also connected to the PDU for forwarding alarm status to the BTS, or any other equipment requiring an external alarm input. Connection of the alarm is described in the PDU Lite Manual.

Basic TMA function

The signal picked up by the antenna is amplified by the TMA before being connected to the feeder cable where it is attenuated. Therefore, a weak signal picked up by the antenna does not disappear in noise after passing the feeder cable. As a result, the BTS receiver sensitivity is increased and a balance between uplink and downlink is achieved.

The two main building blocks of a TMA are, the filter and the Low Noise Amplifier (LNA). The filter protects the LNA from high power signals. These signals can come from the site itself or from any other close transmitter.

TMA designations

Powerwave TMA designations include one of the prefixes S, D or DD; for example, TMA-DD 900. The prefix reflects the function of the TMA. Irrespective of radio system and frequency, the meaning of prefixes is always the same, see Figures 1-2 and 1-3. These three basic types are used as components, together with filters in various combinations.

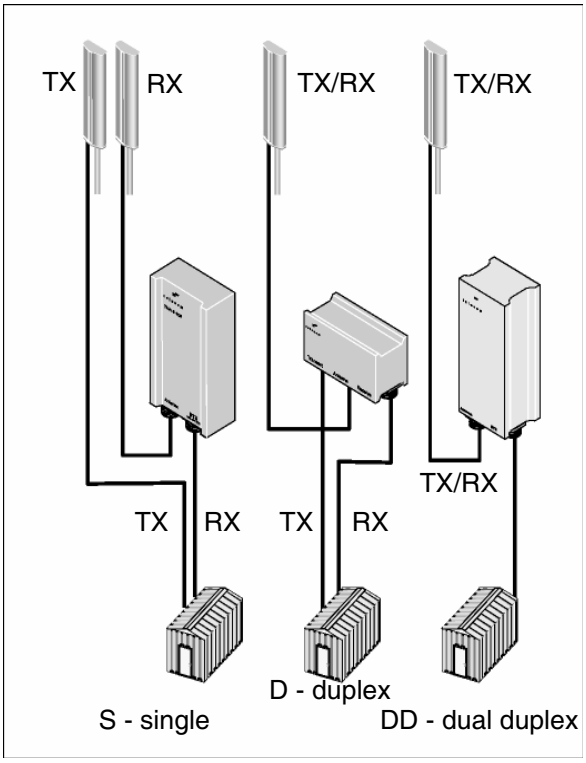

Figure 1-2 Three basic TMA concepts

Table 1-3

Designation	Definition
S	The TMA is the “single” or simplex type and handles only received signals
D	The TMA is the duplex type and can simultaneously handle received and transmitted signals. It is connected to the BTS with one RX cable and one TX cable. A third RF-port connects the antenna.
DD	The TMA is the dual duplex type, can simultaneously handle received and transmitted signals. and is connected to the BTS with a single cable.
Twin	The TMA consists of two branches of the dual duplex type, and can simultaneously handle two branches of received and transmitted signals (main and diversity branches in one unit)> COnnection to the BTS is with two cables. In Powerwave marketing, the acronym DDD is sometimes used meaning Double Dual Duplex.

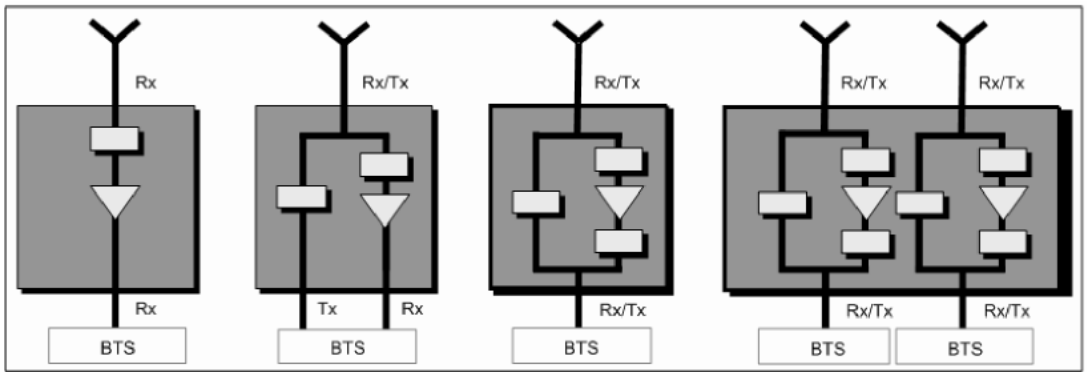

Figure 1-3 Schematics of the four basic TMA types

The product code also defines which mobile system the product is intended for. For instance, the TMA-DD 1800 is intended for use in the 1800 MHz mobile band. TMAs are normally useable for all types of modulation, due to the high linearity of the LNA.

Some models of TMAs also have variable gain. The gain can be varied to better suit the actual installation, depending on the different conditions in the surroundings. To set the gain, a Gain Control Unit (GCU) is available. The GCU is described in Chapter 3.

Current Injector

The current injector shown in Figure 1-4 is installed for injecting DC power into the feeder and distributed up to the TMA. The power is inserted at the end of a quarter wave stub to avoid interfering with the RF-signal. The BTS port is isolated from the DC by means of a capacitor. On the TMA side of the capacitor, the CIN is equipped with a spark gap (gas discharge tube), for lightning protection. Most CINs are equipped with a quarter wave stub on the BTS side, to take care of the last remainder of energy. CINs are available for all major frequency-bands; 800/900 MHz, 1800/1900 MHz and UTMS. Some base stations inject TMA current within the cabinet, to avoid the demand for an external CIN.

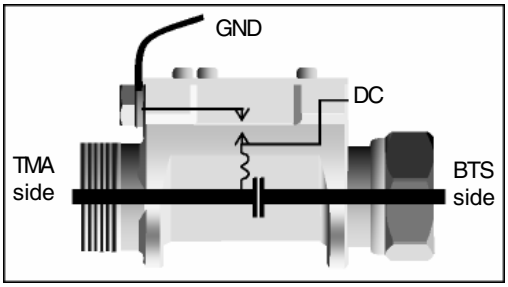

Figure 1-4 Principles of a standard CIN

Outdoor CIN

On this CIN, the RF-connectors can be ordered with 7/16 or N connectors.

For the 7/16, the DC is connected with an SMA connector, which is weatherproofed, and the ground cable is connected with a M8 bolt.

For the N-type, the DC is connected to two M4 screw terminals, which are protected by the bottom cover. The DC-cable is mechanically secured by means of a cable clamp. The ground cable is connected with an M8 bolt.

Indoor CIN

The indoor version of the CIN has 7/16 connectors integrated in the CIN body with a 7/16 male on one side and 7/16 female on the other. However, the straight indoor CIN can be ordered with the connectors reversed. The right-angled version is only available with one connector configuration, male to the BTS side and female on the TMA side.

For connection of input power, an SMB connector is utilized with an M6 grounding bolt.

PDU Power Distribution Unit

The PDU converts BTS voltage to 12 VDC to supply the TMAs with power. In normal operation, the current consumption of a TMA is specified to be within a certain window. An alarm situation can then be signalled from the TMA just by raising the current consumption. Hence, a major task for the PDU is to supervise the current consumption of the TMA. The TMA alarm status can be monitored by means of LEDs on the PDU front. There are different functional versions of the module, however, having the same mechanical configuration.

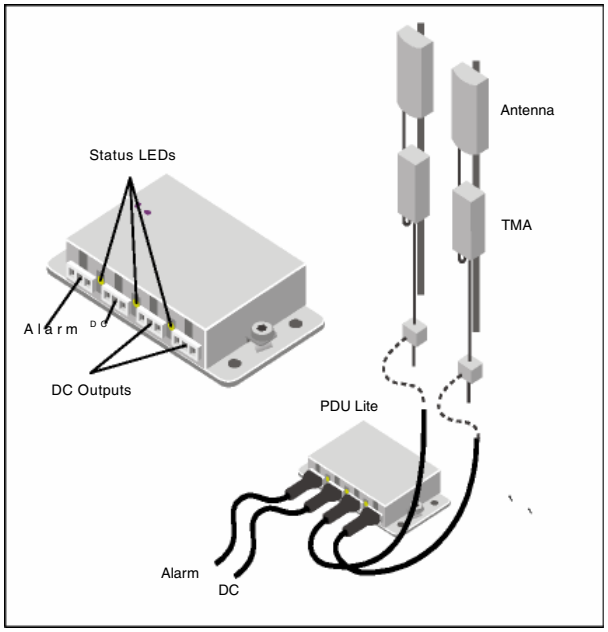

Figure 1-5 Principle connections of PDU Lite modules.

The alarm output port of the PDU should be connected to the external alarm input port of the BTS. This allows the BTS-system OMC to send an alarm signal.

A fully equipped PDU feeds power to and supervises up to six TMAs. The PDU Lite system can be ordered with modules mounted on a 19” shelf or in an outdoor enclosure. Modules are available as stand-alone units as well, intended for wall mounting.

As in the case with CINs, some BTS:s have the PDU functionality included.

PDUs are described in Technical Manual - PDU Lite.

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Chapter 2
Mounting and Connecting the TMA

Introduction

This chapter contains instructions applicable to the mounting of a TMA.

NOTE **For simplicity, only a few TMA types are shown here, but the mounting principles can easily be applied to any of the other TMAs.**
If the feeder is of large diameter, its thermal dimensional changes will cause considerable forces, which may damage the TMA. In such a case, the use of a short jumper between the main feeder and the TMA, as shown in Figure 2-1, is required.

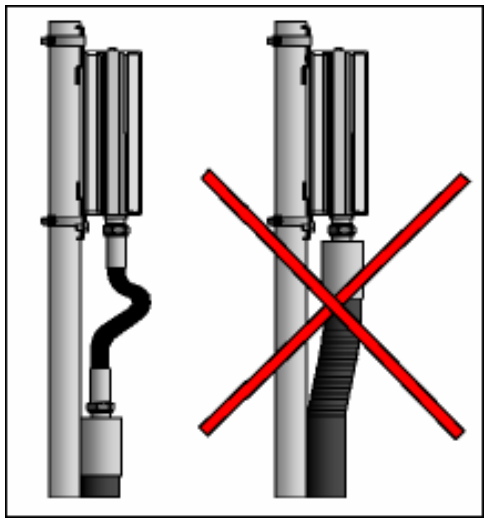

Figure 2-1 Use a jumper cable between feeder and TMA.

The drain pipe

Care must be taken that the drain pipe always points downward. See Figure 2-2.

The drain pipe must never be obstructed in any way that would impede the venting and drain of the housing. The drain pipe should always be the lowest point of the TMA to assure proper draining should any condensation of humid air occur inside the housing.

The drain pipe together with a Gore-Tex® membrane will let the TMA breathe. TMAs with a drain pipe must be mounted vertically, i.e. no mounting on diagonals in a tower.

CAUTION: Maximum tilt angle for the TMA is 5 degrees as shown in Figure 2-3.

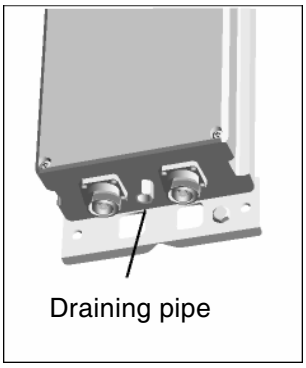

Figure 2-2 Make sure the drain pipe is pointing down.

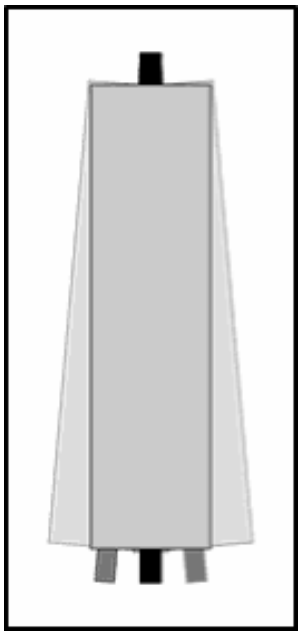

Figure 2-3 Maximum tilt angle 5 degrees

Painting of the TMA housing

In some cases there is a need for painting the TMA housing in a color that blends with the environment at the installation site. Before painting, make sure that the coaxial connectors, the drain pipe and the ventilation opening on the back of the TMA housing are masked so that they never get covered with paint.

A technical note on painting of TMAs is available from Powerwave, please refer to Painting of TMAs.

Preparations

Save time and avoid trouble by making a few preparations before mounting the TMA to a pole / mast:

Since each TMA should be grounded to the pole, make sure a grounding cable is prepared for each TMA. The TMA's mounting plate has a screw with a locking washer attached to it, and a threaded hole for the grounding cable. The TMA clips have threaded holes for mounting. Choose a suitable hole to connect the grounding cable.

The grounding cable's eye must be the right size for the TMA's M8 (diam. 0.31") ground screw or M6 (diam. 0.24") mounting clip. The cable should have an area of at least 16 mm^2 (AWG 5). The other end should be safely connected to a well-grounded point on the mast.

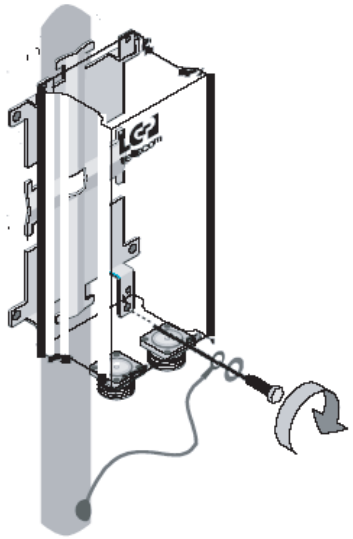

Figure 2-4 Grounding connection

Check that the TMA can be easily connected to the antenna's jumper cable and the BTS feeder.

If the TMAs are to be mounted on MultiPac plates, install the plates first. See Technical Manual – MultiPac for more information.

Mounting the TMA on a vertical pole

Figure 2-4 shows how the hose clamps surround a vertical mast and fit into the corresponding openings of the TMA's mounting plate. The same applies to the clips, except where the hose clamp is fed through the square holes of the clip.

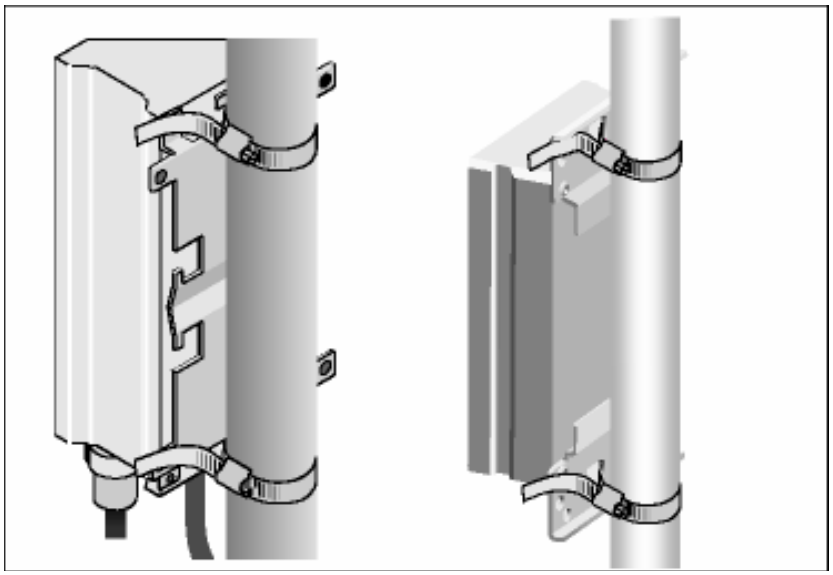

Figure 2-5 Standard hose clamp mounting

The following steps are recommended for mounting.

1. Open hose clamps by unscrewing bolt.
2. Move steel band into openings of TMAs mounting equipment (see Figure 2-4, right unit). For earlier TMA versions, close hose clamps loosely around pole and move steel band of hose clamps gently into openings of TMA's mounting equipment. See Figure 2-4, left unit.
3. Tighten hose clamp screws carefully, but do not over-tighten.
4. Connect jumper cables to TMA RF connectors. The torque value must be 25 Nm - 30 Nm (35 – 40 lbf ft) for 7/16 connectors and 6 Nm (8 lbf ft) for N-type connectors. The use of a power screwdriver is recommended.
5. Connect grounding cable. Check torque value, 5 Nm (3.7 lbf ft).

Use amalgamating tape as environmental protection for of the connectors. Do not cover the drain pipe.

Mounting on MultiPac plates

Mounting the TMA using the MultiPac system requires the TMAs to be fitted with mounting clips. Mounting clips make it possible to hang the TMA in the corresponding apertures on the mounting plate. There are several versions of the MultiPac plate, but all provide apertures for hanging the TMA and threaded holes for fixation.

1. Mount MultiPac plate on vertical rod, either with mounting bracket or with another MultiPac plate on other side of pole.
2. Place TMAs in apertures, and affix it using the bolts.
3. Connect grounding cable. Check torque value, 5 Nm (3.7 lbf ft). 5 Nm corresponds to approximately 2.5 kg (5.5 lbs) force, with a 20 cm (8 inch) long wrench.

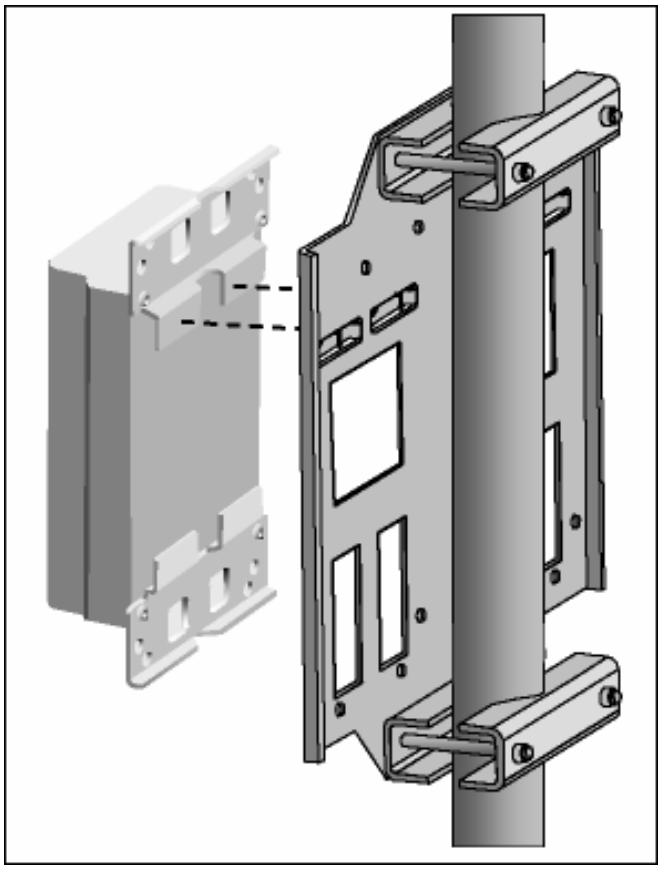

Figure 2-6 MultiPAC plate with apertures for mounting the TMA

Mounting the TMA on a wall

The TMA may also be mounted on a wall, using suitable screws (not supplied with the TMA). The corresponding holes in the mounting plates or MultiPac have a diameter of 9 mm (0.35").

The proper way of mounting the TMA on a wall varies from case to case. Only the installer can decide the best method. Please do not over tighten the bolts, when mounting the TMA on a wall. If the bolts are over tightened, the mounting plate could be bent, damaging the TMA.

CAUTION: It is absolutely mandatory to prepare and connect a grounding cable to the grounding point of the TMA.

Folow these steps for mounting:

1. Make sure no bolts or brackets are attached to mounting plate.
2. Position TMA on wall, and mount it properly.
3. Connect jumper cables to TMA.
4. Connect grounding cable.

Mounting the CIN

The location of the CINs depends on the BTS layout and the specific requirements in each case. Often, the CINs are mounted close to the BTS, where the main feeder is connected to the jumper leading to the BTS.

Since most CINs are light weight, no mechanical fixation is required in most cases. This means the CIN will “hang” on the coaxial cables, or rest on a cable ladder.

It is very important that the CINs are connected to a ground cable. All CINs have an M6 or M8 bolt for this purpose. Cable AWG5 is recommended.

The plug-in connector can be an SMB type for indoor use or an SMA connector for outdoor CINs. For SMA connectors used outdoors, be sure to include a gasket in the male connector side of the cable.

NOTE **There must be no lightning protection devices , such as a shorted λJ4, between the TMA and the CIN, as that would short-circuit the DC from the CIN to the TMA.**

Other types of lightning protectors, such as gas discharge lightning arresters, do not cause any problems. A carefully grounded CIN gives excellent lightning protection, eliminating the need for any other devices for that purpose.

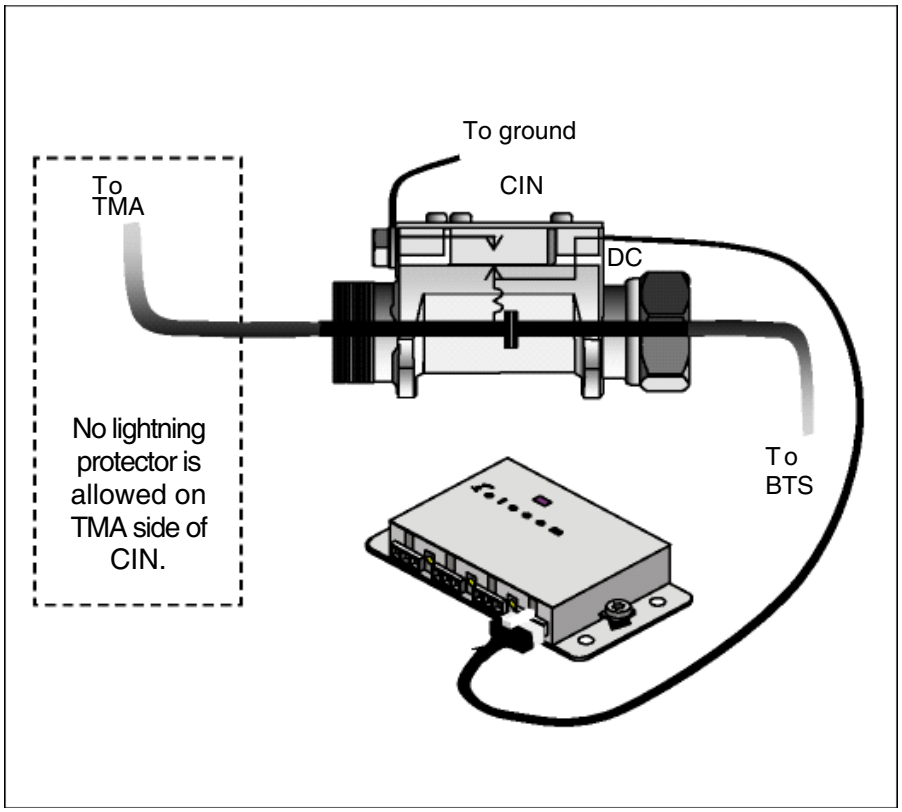

Figure 2-7 Standard EMP protectors are not DC transparent and cannot be used after the CIN.

The N-type version of the outdoor CIN has drain pipes under the bottom cover, and must be mounted horizontally with these drain pipes pointing down. See Figure 2-7.

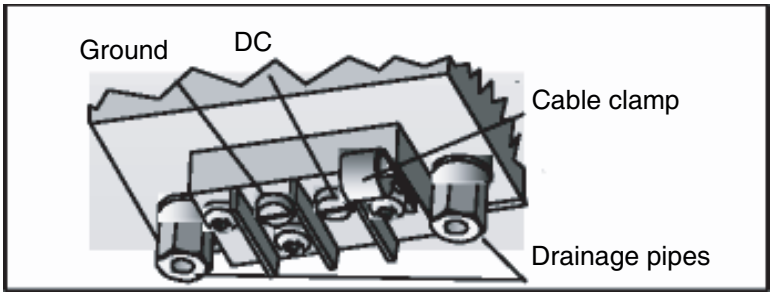

Figure 2-8 DC connection, seen from the bottom with lid removed.

Connect the black conductor of the DC supply cable from the PDUto the ground terminal and the red conductor to the DC terminal. Both connections are under the bottom cover with the terminals labeled.

Since CINs have different RF-connector configurations, please note:

WARNING: Make sure the BTS terminal of the CIN is connected towards the BTS, and the TMA terminal to the feeder/TMA.

Chapter 3
Commissioning

Introduction

After installation, a simple procedure is required to commission the TMA system, Check the DC and RF performance of the feeder line, and adjust the gain of the TMA system if needed. For further information, please refer to Commissioning guidelines.

DC check

Check that all LEDs on the front of the PDU Lite modules show a steady green light. Observe the LEDs for at least 20 seconds to be sure they are steady. For further information, please refer to Technical Manual – PDU Lite.

Check of VSWR (Return loss)

Measure the return loss by means of a network analyzer or equivalent antenna line tester. Note that the filter characteristics of the TMA will be seen on the display of the analyzer. The return loss should be read in the TX-band. The result in the RX band depends on the LNA itself, and the TMA must be powered up to give a correct reading. For further information please refer to Test of TMAs and Bias-T installation.

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Chapter 4
Testing and Troubleshooting

Acceptance Test

- ❑ Install the TMAs in accordance with Chapter 2.
- ❑ Install the CINs in accordance with Chapter 2.
- ❑ Install the PDU in accordance with Technical Manual - PDU Lite.
- ❑ At power-on the PDU conducts a self-test and start-up routine for 1 - 2 seconds. Provided there are no alarms, the alarm relay will change to a non-alarm state within approximately 17 seconds.
- ❑ The test is okay if all LEDs (3 per module) are green. If a Vout (designation on the PDU) LED is flashing, a fault is indicated in the corresponding branch.
- ❑ To verify the TMA installation RF with a VSWR measurement. Allow for a slightly higher VSWR after installation of a TMA.

Troubleshooting

The TMA, CIN, and PDU are internally protected for connections to DC supply with wrong polarity, so there are no fuses to replace. The PDU Lite has been designed to accept any polarity on the input.

In case of a short circuit, the DC-DC converter limits the PDU DC-supply output current. After correcting the cause of the short circuit, the output will be switched on again.

TMA

Gheck the DC performance.

The current consumption of the TMA can be checked with a multimeter. The normal operating current for a TMA is listed in the Product Specification or the Test Report delivered with the TMA.

Check the RF performance

To check the RF performance, a complete production test of the unit should be performed. This means that all tests in the test report (delivered with the TMA from the factory) should be performed again. However, a simple function check can be carried out with a SiteMaster or similar instrument. For further information, see Arrival Test.

DC cabling mix-up

If any LED on the PDU front is not lit, it might indicate a mix-up of DC-cables. Gheck the connections to make sure they are correct. The CIN, PDU and TMA are designed to handle DC cable mix-ups. No TMA testing is necessary after correcting this.

RF cabling mix-up

A mix-up of the RF-connections to/from the TMA can lead to the same problems as if an antenna falls off the main feeder. This means that a total reflection of the BTS transmitted power can occur, leading to BTS damages.

Another result of the cabling mix-up could be that the low noise amplifier inside the TMA-S and TMA-D versions is permanently damaged due to high transmitter power on the TMA receiver-port. TMA-S and TMA-D versions should always be replaced or checked after a mix-up of the cable installation.

This cannot damage the TMA-DD versions, and they do not have to be checked. However, the DC running on the feeder might have been short-circuited.

Installation of wrong TMA type

If the wrong type (S, D, DD) is installed at a site, the TMAs should always be checked if they are to be used again.

CIN

Check the DC performance

The DC performance of a CIN is easily checked with an ordinary multimeter.

If the resistance between the positive DC port and the center conductor of the coaxial TMA connector is greater than 10 ohms, the CIN is considered broken.

The resistance between the positive DC port and the coaxial BTS connector should be in the range of mega ohms. If the resistance is lower than 100 kilo ohms, the CIN is considered broken. The same is valid for the resistance between the positive and the grounded port of the DC connector.

NOTE: Since the SMB-connector is fragile, be careful with center conductor..

To protect the sensitive SMB-male DC-connector on the CINs, please use a test lead (Art. Nr: D100623) available from Powerwave.

Check the RF performance

To check the RF performance, a complete production test of the unit should be performed. This means that all tests in the test report (delivered with the CIN from the factory) should be performed again.

However, a simple function check can be carried out by means of a SiteMaster or similar instrument. Please note that the DC current capacity delivered from a SiteMaster normally is too low to deliver power to the TMA. Use the PDU instead.

DC cabling mix-up

If any LED on the PDU front is not lit, it might indicate a mix-up of DC-cables. Check the connections to make sure they are correct. The CIN, PDU and TMA are designed to handle DC cable mix-ups. Check the CIN according to Chapter 2 after correcting this.

RF cabling mix-up

If the RF cables are connected to the wrong ports of the CIN, the CIN and the RX-port of the BTS might be damaged. In this case the DC and RF-performance of the BTS must be checked, as DC power has been fed into the BTS terminal.

Contact Powerwave

If problems still remain, please contact Powerwave Technical Support.

Chapter 5
Repair

TMA

In case of failure, the TMAs will be swapped with a new unit . The customer shall do no repairs of the TMAs.

1. If the TMA is a D- or a DD-, the BTS RF output power should be switched off.
2. Disconnect and loosen the TMA.
3. Replace the TMA.
4. Connect the cables again and tighten the bolts and connectors.
5. Switch the BTS transmitters back on.
6. If the PDU Classic is in use, the “Sum alarm reset” button must be pushed.

CIN

In case of failure, the CINs will be swapped with a new unit in case. The customer shall do no repair of the CINs. Follow the same procedure as for the TMA.

PDU

In case of failure, the PDUs will be swapped with a new unit. The customer shall do no repair of the PDUs.

1. Disconnect all cables and loosen the PDU
2. Replace the PDU
3. Tighten the bolts and connect the cables again..
4. In case the PDU Classic is in use, the “PDU Reset” button must be pushed.

Obtaining an RMA

A Return Material Authorization must be obtained prior to returning equipment and to reduce delays in receiving repair service. Please contact our Repair Department at (714) 466-1000 to obtain an RMA number, or fax your request to (714) 466-5816.

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Chapter 6
Glossary and Abbreviations

ANT

Short for antenna.

BP-filter

BandPass filter. Filter that only lets specified frequencies pass.

BSC

Base Station Controller. A function in a mobile telephony network that controls a number of Base Stations.

Bias-T

Also called a CIN (see CIN), the Bias-T is more like a technique that the CIN is based on. The Bias-Ts injects a DC-current to the center conductor of a coaxial cable.

BTS

Base Transceiver Station, or just Base Station. Sometimes refers to the cabinet with radio equipment, and sometimes for a complete Site, including Tower and equipment room.

BW

Band Width. In this document band refers to frequency and width for an interval of frequencies that will be treated somehow, e.g., passed through a filter.

CIN

Current INjector. A unit that Bias-T, capacitor and lightning protection circuitry. With the Bias-T part, a DC current is injected into a coaxial cable.

D

Duplex. For example, in the TMA D-1800, D indicates that the TMA comprises a duplex-filter.

DC

Direct Current. Electrical power such as the current produced by a battery.

DD

Dual Duplex. For example, in the TMA DD-1800, DD indicates two duplex filters. TX and RX signals will have separate paths through the TMA.

DL

Down Link. The signal path that starts in the mobile telephony network and terminates in the mobile telephone. In the areas covered by this manual the BTS transmitter and the mobile telephone receiver are the “big players”.

LED

Light Emitting Diode. The optical indicators on the PDU.

LNA

Low Noise Amplifier. An amplifier designed for the purpose of reducing the noise in receiver systems. The LNA is the active part of the TMA.

M6, M8

Screws or bolts having a diameter of 6 or 8 millimeters. The threads correspond to the metric standards.

MHA

Mast Head Amplifier. Alternative name for TMA.

MS

Mobile Station. The mobile telephone.

Multi Pac

A versatile mounting system for TMAs.

NOC

Network Operations Center. See OMC.

OMC

Operation & Maintenance Center. The central, from which the entire system is being supervised, operated and maintained.

PDU

Power Distribution Unit. Converts BTS voltage (+24 V or –48 V) to 12 V for feeding the TMAs. The currents consumed by the TMAs are supervised and any alarms are reported by an alarm relay.

RF

Radio Frequency. Commonly used acronym for the frequency band covering the mobile telephony bands.

RL

Return Loss, see VSWR.

RX

Radio receiver.

TMA

Tower Mounted Amplifier.

TX

Radio transmitter

UL

Up Link. The signal path that starts in the mobile telephone and terminates in the mobile telephony network. In the areas covered by this manual the BTS receiver and the mobile telephone transmitter are the “big players”.

UMTS

Universal Mobile Telephony System. The 3rd generation mobile telephone system.

VG

Variable Gain.

VSWR

Voltage Standing Wave Ratio. This ratio gives a picture of how well various radio equipment matches the 50 ohm transmission system. The feeder line and antenna system should be tested on VSWR.

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