UmSITE-TM5 Quick Start Manual

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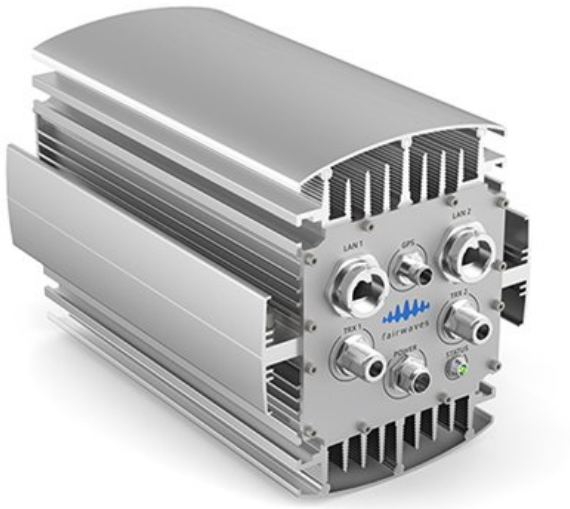
1. UmSITE-TM5



The UmSITE-TM5 is an IP-backhaul GSM Base Station, seamlessly integrating functionality that is usually provided by GSM components such as BSC, MSC, VLR, HLR and SMSC. Its software-centric design enables unprecedented flexibility, supporting remote configuration,

maintenance and upgrade, and covering everything from transmit power control to end user features.

1.1 Mechanical specification

Enclosure

- Dimensions: 300 mm x 176 mm x 190 mm (210 mm with mounting brackets)
- Weight: 8.5 kg

Environmental conditions

- Outdoor, IP65 (IP67 on special request)
- -40 °C to +55 °C ambient temperature
- Works at direct sunlight
- Wind load (at 150 km/h): frontal / lateral 55 / 50 N

RF Input/Output

- GSM 850/900/1800/1900 band (chosen at order time)
- 2 independent TRX
- 5W per channel (2x5W)
- Real time power control via VTY

Reference Clock

- GPS (default)
- OCXO (optional)

CPU

- Intel Atom

Input Voltage and Power

- Power consumption:
    - 55W peak,
    - 48-53W typical
- Input Voltage:
    - +21V to +30V DC for full RF output power,
    - +12V to +21V DC with accordingly reduced RF output power (0.5W-5W).
- Warning: Input voltage above 36V DC can cause permanent damage. Input voltage below 10V DC can cause malfunction.

Backhaul Interface

- RJ45 Ethernet (100/1000Mbit)

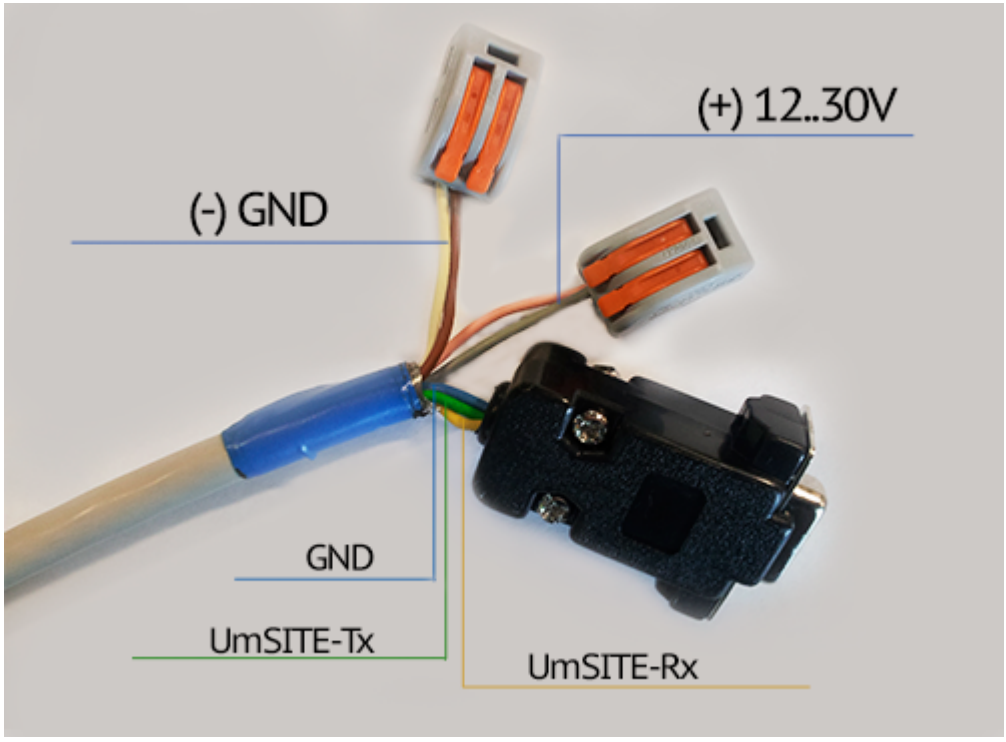
Power supply

Fairwaves does not provide the power supply by reason of various places use different power sources. Fairwaves products are compatible with any power sources, including solar panels, as well.

List of the power supplies:

- Outdoor IP65 power supply: Mean Well HLG-60H-15A
- Indoor power supply: Any basic laptop charger can be used

Power/COM-port wires connection schema



Antenna

UmSITE-TM5 can be supplied without GSM antennas. In this case you can use any antennas suitable for 850/900/1800/1900 GSM frequency band with N-male connectors

Warning!

The antenna gain **must not exceed 20 dBi**.

Exception: for those systems operating in areas more than 72 km (45 miles) from international borders that: (1) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of

the Census; or, (2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in Title 47, CFR §22.949 (Code of Federal Regulations), the antenna gain **must not exceed 23 dBi**.

1.2 Software specification

Number of Transceivers

- 2 TRX / 16 timeslots @ full rate

Supported timeslot configurations

- CCCH, CCCH+SDCCH/4, SDCCH/8, TCH/F, TCH/H

Voice codecs

- FR/HR/EFR/AMR; RTP stream

Ciphering

- A5/0, A5/1, A5/2 and A5/3

GPRS/EDGE

- GPRS
- EDGE - planned

Operating System

Embedded Linux

Capacity

- maximum concurrent calls (Full/Half) Rate 15/30
- maximum simultaneous SMS 124 (15*SDCCH/8* + *1*SDCCH/4)

1.3 Hardware options

- Clocking: OCXO / GPS disciplined

2. Installation

NOTE: UmSITE-TM5 base station comes with pre-installed and pre-configured software; you just need to attach GPS antenna, GSM antennas and power supply unit.

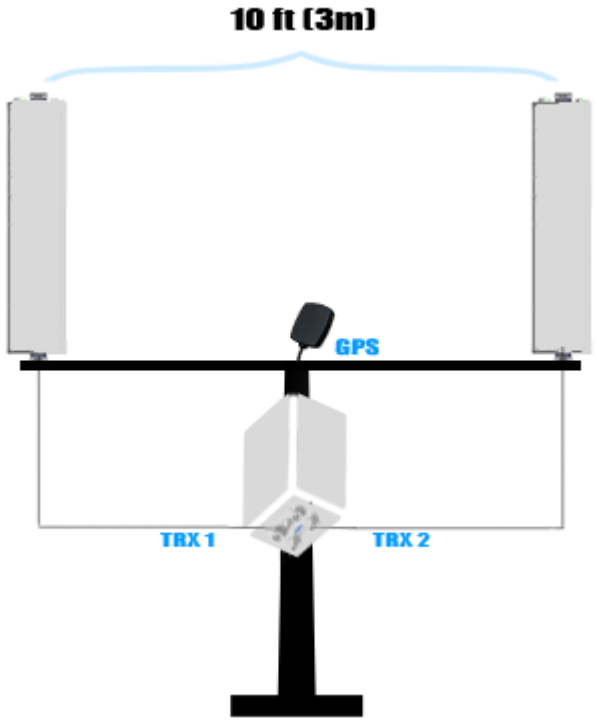
Steps:

1. Mount the base station to a mast vertically. The panel with the connectors should be at the bottom.
2. Attach GSM antennas. We recommend having at least 10 feet (3m) between them.
3. Attach GPS antenna. A good antenna placed with a clear line of sight to the sky is required.
4. Turn on the UmSITE-TM5.

NOTE: GSM antennas are not included in a standard package. We do not recommend to operate the base station without antennas.

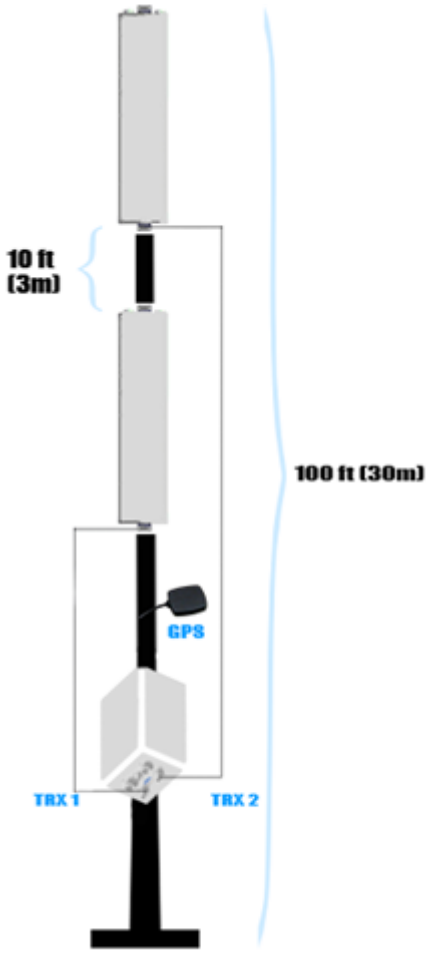
2.1 Antennas installation

Each of the antennas complement each other. The second antenna must have the same position as the first antenna on a mast, as well as the same direction and incline angle to the ground.
For the GPS antenna, there are no strict requirements, except a clear line of sight to the sky.



For the mast at least of 100 feet (30m) in height, antennas can be mounted upright within the 10 foot (3m) distance between each other.

Cellular Radiotelephone Service (subpart H of part 22)	Non-building-mounted antennas: height above ground level to lowest point of antenna <10 m and total power of all channels >1000 W ERP (1640 W EIRP).
	Building-mounted antennas: total power of all channels >1000 W ERP (1640 W EIRP).



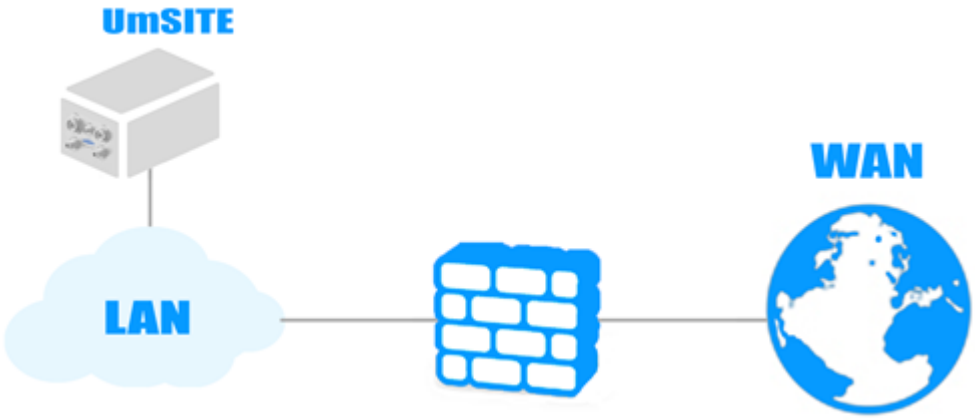
NOTE: Every cell is configured with a BCCH carrier. Generally, the TRX ID of BCCH is fixed to be the smallest TRX ID in the cell.

Therefore, TRX1 antenna has to be situated below the TRX2 antenna. For example, if the connection would be established when the TRX1 antenna is higher and then it has been assigned to a timeslot of the lower antenna TRX2, call connection could be lost.
The antenna attached to the TRX1 should not have an advantage by height in that particular case.

2.2 Getting started

1. Connect to the power source and turn it on. LED on the front panel will begin flashing in one to two minutes after being turned on.
2. Make sure that the Ethernet cable is connected.

NOTE: We strongly recommend not putting UmSITE-TM5 on a public network. Connect it to your local network where there is access to the Internet through NAT or Firewall. Keep UDP port 1195 open on your server for Fairwaves VPN in case of technical support.

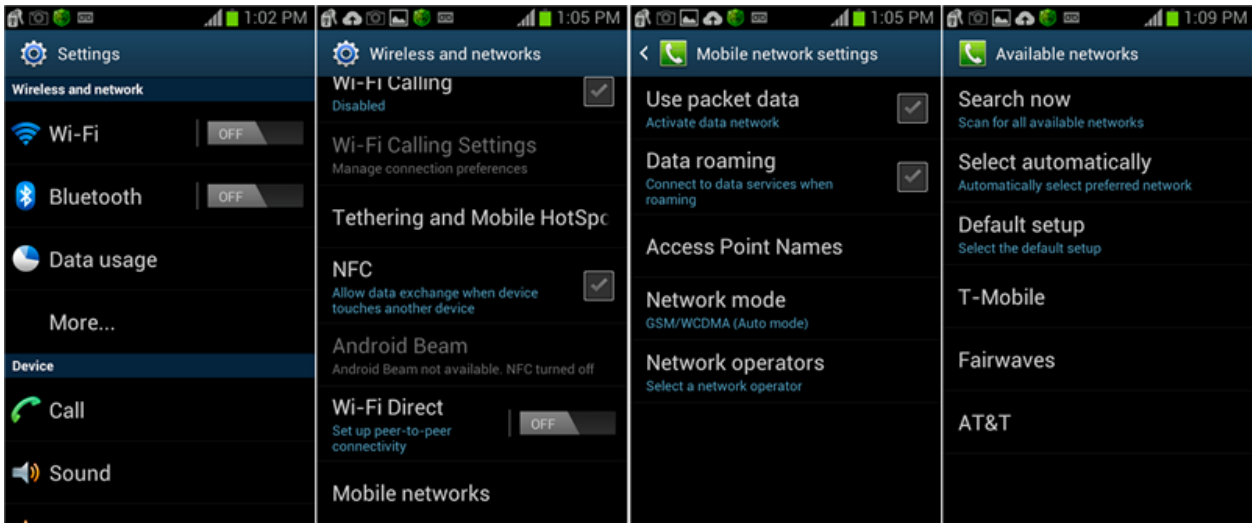


Take any GSM phone with any SIM card and try to search the network. The network might have a different name, such as Fairwaves, 1011, Test, etc.

2.3 Test call

Searching for the Network

1. Launch the Settings from the menu system.
2. 1. Select More
3. 2. Select Mobile networks
4. 3. Select Network operators
5. 4. Select Search networks



Options:

- 1002 - echo call (listen yourself)
- *#100# - to figure out the number that was assigned to your phone.

2.4 Log in

In order to configure **UmSITE-TM5**, you have to login into device remotely over SSH. The Interface configured to obtain IP address via DHCP and also has a static 192.168.50.100

Connect laptop to the UmSITE-TM5 via Ethernet cable.

NOTE: Make sure your interface in the same subnet as the UmSITE-TM5 and has IP like 192.168.50.101

1. Run PuTTY
2. Type IP address: 192.168.50.100
   Login: fairwaves
   Password: fairwaves

You may use a defferent client software for remote access, but we recommend **PuTTY** (you can download it at **www.putty.org**). PuTTY is an open source SSH and telnet client, for the Windows platform.

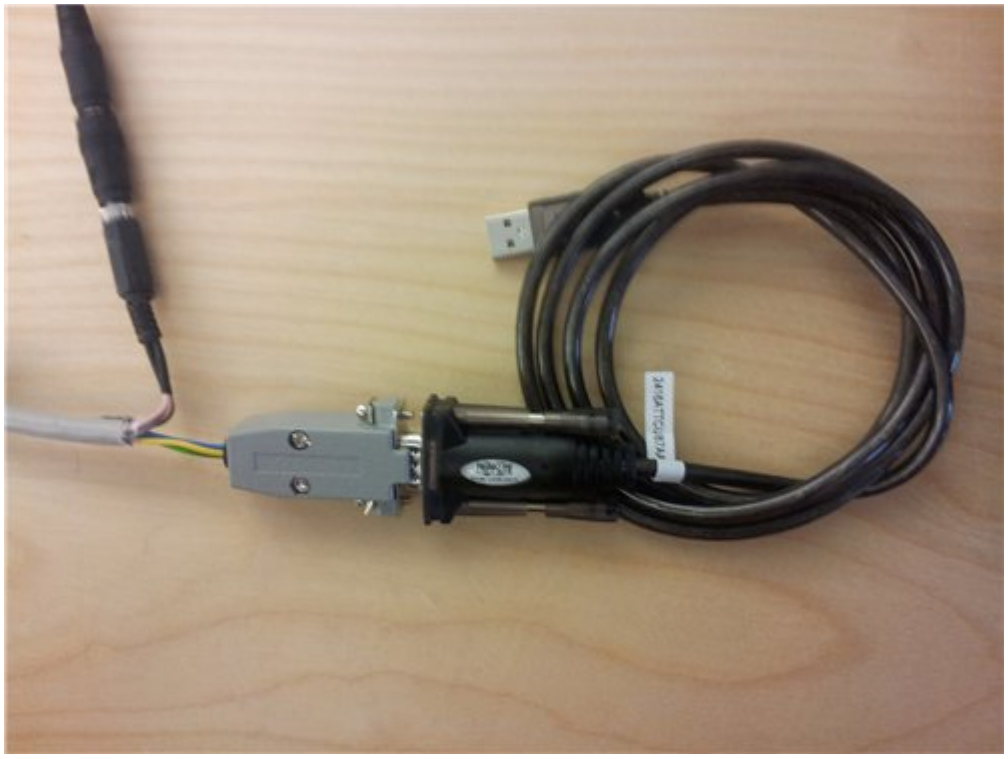
Login over Serial cable (Only for UmSITE-TM5)

Serial connection allows you to choose boot options and log into the system if network connection is not available.

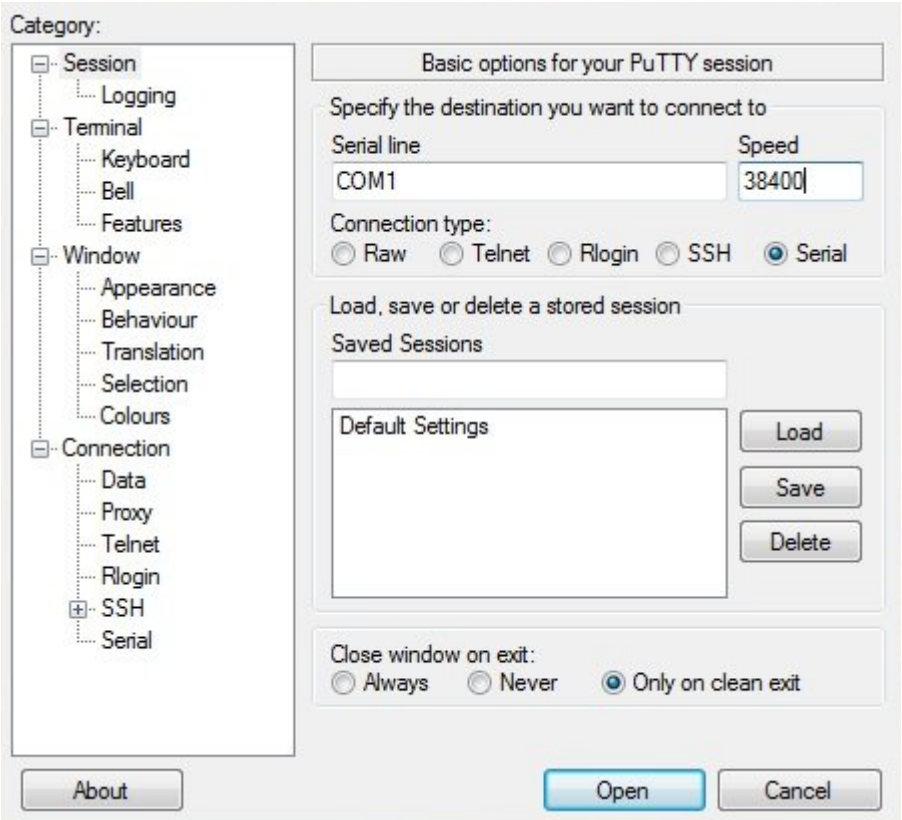
You'll get options like:

1. Advanced options for Ubuntu
2. Test RAM memory

First of all, you have to use USB Serial Adapter for the connection (which is not included in a standard UmSITE-TM5 package).



For the Windows user **putty**



You can find a number of the COM port at the Desktop manager.

For the Linux user **minicom**

```
shell> minicom -D/dev/ttyUSB0 -b38400 -o
```

2.5 IP and network configuration

eth0 - 192.168.10.10 This is internal interface linked to the UmTRX. **Do not edit this**
eth1 - Configured to obtain IP address through DHCP. In case of recovery, it also has a static IP 192.168.50.100
Edit eth1 in /etc/network/interfaces.d/ In order to change network configuration

```
Shell> sudo nano /etc/network/interfaces.d/eth1
```

Refer to **Ubuntu** documentation for details
NOTE: The base station is configured to get an IP address through DHCP. We also recommend to keeping the configuration for the eth1:1 (192.168.50.50/24) because it's used to as a backup IP address. If you want to configure a static IP address, change eth1 configuration.

2.6 Base station sensors

In order to obtain insights of temperature, voltage and TRX power of the base station you can run:

```
Shell> umtrx_query_sensors
```

The output is:

```
Shell> Sensors:
            TempA = 34.312500 C
            TempB = 35.187500 C
       VoltagePR1 =  2.580000 V
       VoltagePF1 =  3.280000 V
       VoltagePR2 =  0.760000 V
       VoltagePF2 =  0.000000 V
      Voltagezero =  0.000000 V
       VoltageVin = 23.620000 V
     VoltageVinPA = 23.640000 V
     VoltageDCOUT = 21.640000 V
TRX 1 power detector:
              VPF =   3.26  V
               PF =  65.2   dBm
              VPR =   2.58  V
               PR =  51.6   dBm
             VSWR =   1.53
            Gamma =   0.209
      Return Loss =  13.6   dB
    Mismatch Loss =   0.194 dB
    Through power =  95.63  %
  Reflected power =   4.37  %
TRX 2 power detector:
              VPF =   0.00  V
               PF =   0.0   dBm
              VPR =   0.76  V
               PR =  15.2   dBm
             VSWR =    nan
            Gamma =   5.754
      Return Loss = -15.2   dB
    Mismatch Loss =     nan dB
    Through power =    nan  %
  Reflected power =    nan  %
```

NOTE: If 'Return Loss' value:
< 6dB = major alarm state (100% malfunction)
< 10db = minor alarm state (Check antenna for water subject)

> 10dB = partly good (probably bad antenna or water in cable/connector)
> 12dB = good
> 15dB = excellent