MALÅ GeoScience

RAMAC X3M
and
EasyLocator

Hardware Manual

Important note:

In the US this unit operates under FCC rules Part 15. According to these rules a GPR system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator.

Therefore all units sold after July 15 2002, in the US, will have this functionality and also be delivered with a kill switch.

Units sold outside the US will have a plug attached to the kill switch connector. Removing this plug causes the unit to cease functioning. No kill switch will be delivered to destinations outside US.

The kill switch and how it's to be handled is further explained in this manual.

Table of Contents

1 Introduction

Thank you for purchasing the RAMAC X3M/EasyLocator. We at Mala GeoScience welcome comments from you concerning the use and experience of this equipment, as well as the contents and usefulness of this manual. Please take the time to read through the assembling instructions carefully and address any questions or suggestions to the following:

MALÅ GeoScience postal address is:

Main Office:
Malå GeoScience
Skolgatan 11
S-930 70 Malå
Sweden
Phone: +46 953 345 50
Fax: +46 953 345 67

Subsidiary:
Malå GeoScience USA, Inc.
P.O. Box 80430
Charleston, SC 29416
USA
Phone: +1-843 852 5021
Fax: +1-843 769 7397

E-Mail: sales@malags.se
sales.usa@malags.se
rental@malags.se
support@malags.se

Information about MALÅ Geoscience's products is also available on Internet: www.malags.com

(Be sure to include instrument type and serial numbers)

1.1 Unpacking and Inspection

Great care should be taken when unpacking the equipment. Be sure to verify the contents shown on the packing list and inspect the equipment for any loose parts or other damage. All packing material should be preserved in the event that any damage occurred during shipping. Any claims for shipping damage should be filed to the carrier. Any claims for missing equipment or parts should be filed with Mala GeoScience.

1.2 Repacking and Shipping

If original packing materials are unavailable, the equipment should be packed with at least 80 mm of absorbing material. Do not use shredded fibers, paper wood, or wool, as these materials tend to get compacted during shipment and permit the instruments to move around inside the package.

2 Start up and Hardware Description

The RAMAC X3M/EasyLocator is an integrated radar control unit, mounted directly on the shielded antennas and powered externally. X3M is compatible with the RAMAC/GPR shielded antennas 100, 250, 500 and 800MHz. EasyLocator has it own family of shielded antennas; DEEP, MID and SHALLOW. The built-in electronic design makes it a low weight and compact size system, easier to assemble and operate. No fiber optic cables are required since the unit communicates directly with the laptop. Based on the flexibility and the modularity of the RAMAC/GPR, the RAMAC X3M is fully compatible with the Windows based acquisition software Ground Vision, while the EsayLocator has it own acquisition software: EasyVision. The built-in default autostacking function secures the best data quality at maximum survey speed, in both units.

This section will give a short overview of how the GPR (Ground Penetrating Radar) systems work.

2.1 Layout of the RAMAC X3M /EasyLocator

Figure 2.1a. Layout of the X3M

The different number in Figure 2.1 corresponds to the following:

1: Connector for kill switch
2: Power button
3: Connector for encoder, 9 pin d-sub (wheel or hip chain)
4: Connector for parallel cable to a PC, 25 pin d-sub
5: Securing screws for mounting on antennas
6: Power cable connection

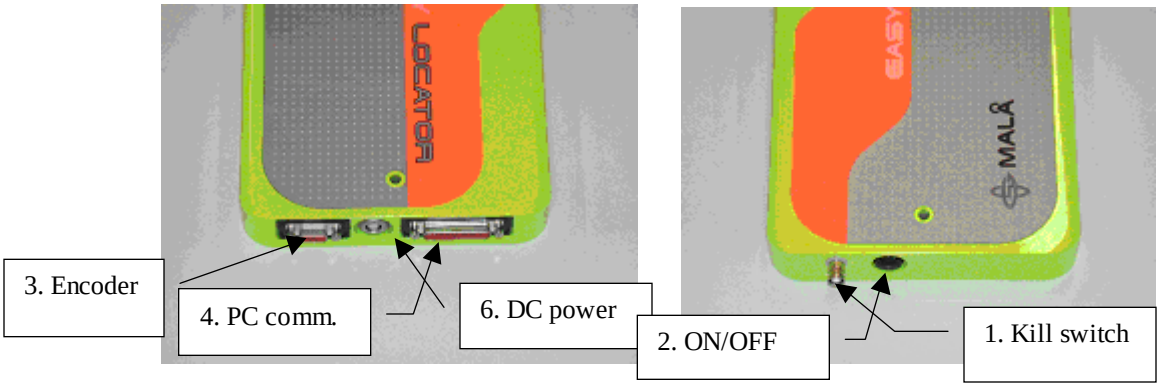

Figure 2.1 b. The same connectors as in figure 2.1a showed on an EasyLocator.

2.2 Mounting on the shielded antennas

Start by placing the X3M/EasyLocator on the antenna that you are going to use for your measurement. The Parallel port and the Power connection should point forward according to the picture (Figure 2.2).
Fasten the unit on the antenna by tighten the securing screws.

Figure 2.2 Mounting on the antenna

2.3 Power cable

When the X3M/EasyLocator is mounted on the antenna connect the Power cable from your battery.

Look for the countersink and place it towards the mark on the connection. Push lightly. If you have it in the correct position it should connect smoothly.
To disconnect: Pull out, holding the milled part of the connection.

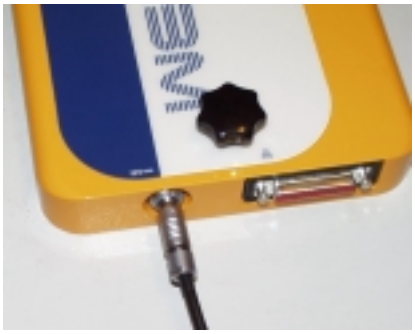

Figure 2.3. Power cable

2.4 Distance measuring devices

The X3M/EasyLocator can be used together with the standard MALÅ GeoScience distance measuring devices (hip-chain and measuring wheels). The encoder cable is connected as shown below (Figure 2.4)

Figure 2.4. Encoder

2.5 Connection to computer

Add the computer to the system by connecting the parallel port cable between the computer and the X3M/EasyLocator (Figure 2.5).

Use an IEEE 1284 compatible parallel cable that is less than or equal to three meters long.

Figure 2.5. Parallel port

2.6 Kill switch

The kill switch is attached to a handle that can either be handheld or snapped onto a RAMAC/GPR Cart (Figure 2.6 top).

The X3M/EasyLocator will not be operational without the kill switch. The button has to be pushed down at all times during measurements. If the button is released the transmitter will stop transmitting.

Connect the kill switch to the bayonet holder on the X3M/EasyLocator by pushing lightly and turning the bayonet socket clockwise (Figure 2.6 bottom).
To disconnect: Turn the bayonet socket counterclockwise and pull out.

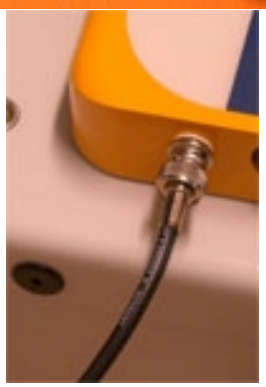

Figure 2.6. Kill switch

2.7 Start up and power button

To start the X3M/EasyLocator press and hold the start button for approximately two seconds. The light in the center of the button will start to flash (Figure 2.7).

Next start the acquisition software, GroundVision or EasyVision, in your computer. During the measurement the button will have a steady light.
The X3M/EasyLocator has autostacking as a default setting. More information about autostacking and how to operate the software will be found in their respective manuals

If you need to reset the X3M/EasyLocator press the power button for at least three seconds. When the light starts to flash again the X3M is ready for new measurements.

To turn the X3M/EasyLocator off, push the button and release quickly. The red light will then stop flashing; the unit is now off.

If the power cable is accidentally pulled out, the X3M/EasyLocator will start automatically when the cable is inserted again.

3 Batteries and charging

3.1 Batteries

The battery belt is the standard power supply for the RAMAC X3M/EasyLocator.
Capacity of the battery is 12V/9 Ah. This gives an operation time of 6-8 hours. When the battery voltage has dropped down to 10V the X3M/EasyLocator will automatically turn itself off. The battery should always be stored fully charged to maximize the lifetime of the battery. The X3M/EasyLocator can also be supplied by any other external 12V DC power source.

The EasyLocator can also be purchased with a specially designed trolley system. This trolley has a special battery box, designed for Li-Ion batteries. These are more lightweight while giving the same operation time.

3.2 Charging

The battery charger is an automatic quick charger designed for lead acid batteries. The recharge up to about 80% of the full capacity goes very quickly. However, it is recommended to keep the battery charging until it is fully charged. The battery charger can be left on after the battery has been fully charged. It then automatically turns into maintenance charging.

The indicator lamp on the charger gives you the following information:

Red = Charged < 80%
Yellow = Charged 80-100%
Green = Maintenance charging

Output 2.7 A, equals charging time between 3-5 hours (80%-100%)

4 Software

The RAMAC X3M is designed to operate best with the data acquisition software, GroundVision. The software is compatible with Windows 9x/ Me/ NT/ W2000 and XP. GroundVision is designed for a quick setup and storage of default settings in the X3M. All data is stored in its original format (raw data) on the hard drive of the computer for further post processing, if

required. Please refer to the GroundVision software manual for further information on the acquisition software.

The EasyLocator is operated with the software EasyVision, designed for optimal user friendliness. Please refer to the EasyVision software manual for further information.

5 Using the RAMAC X3M/EasyLocator

There are many applications where you can use the RAMAC X3M/EasyLocator. A variety of different accessories that will make the measurement easier are available for the X3M/EasyLocator.

Figure 5.1 RAMAC X3M with 500MHz antenna

The X3M/EasyLocator can be used together with the RAMAC/GPR Cart. The Cart is designed for surveys on a flat surface (Figure 5.1)

Figure 5.2. RAMAC/GPR Cart with X3M and 250MHz antenna.

If the RAMAC/GPR Cart is not suitable the system can also be towed by using the pulling handle and the X3M PC holder. (Figure 5.2)

Note: All measurements should be performed with the antenna close to ground, for best results.

6 RAMAC X3M Specifications

Pulse repetition frequency	100 kHz
Data bits	16
Nr of samples/trace	128-8192 (1024 with autostacking)
Nr of stacks	Autostacking in the range 1-32768 for optimized speed performance
Signal stability	< 100ps
Communication interface	IEEE 1284 (ECP)
Communication speed	>700 kb/s
Data transfer rate	40-400 kb/s at 4 Mbit/s
Acquisition mode[1]	Distance/time/manual
Power supply[2]	External 12V DC battery (Pb)
Operating time	6-8 hours with standard battery belt
Charger	Quick charger, automatic charge cycle 100 40VAC input
Charge time	3-5h (80-100%)
Measuring wheel	Standard RAMAC/GPR trigger device
Software[3]	Compatible with GroundVision
Antennas[4]	Shielded antennas 100, 250, 500 and 800 MHz.
Dimensions	310 x 180 x 30 mm (12.2 x 7 x 1.2 in)
Weight	1.7 kg (3.7 lb)
Operating temperature	-20°C to +50°C (-4°F to +122°F)
Environmental	IP 67

Notes:

[1] EasyLocator does not have manual mode.
[2] EasyLocator also has an Li-ion option.
[3] EasyLocator only operates with the EasyVision software
[4] EasyLocator is compatible with the DEEP, MID AND SHALLOW antennas.