Golden River
Traffic Management Systems

Marksman 680

Traffic Counter and Classifier

User Manual

GR560543 Issue 3.0

Marksman 680 User Manual

Release Notes

Manual Issue Date	Status	Applies to MLink / PCFrontEnd software release
1.0 June 2007	First issue	PC-FE 1.3
1.1 July 2007	Minor revisions and corrections	PC-FE 1.3
1.2 October 2007	Minor revisions and corrections	PC-FE 1.4
1.3 February 2008	Updates for remote access by GRNet and GSM or serial modem	PC-FE 1.5
2.0	Addition of Real-Time Data Reporting and connection via Bluetooth. Change to Daylight Saving Time & Timezone settings.	PC-FE 2.0
3.0 Sept 2010	Removed all reference to *PCFrontEnd* software	MLink 1.2 (Build 160)

CAUTION and WARNING notices

CAUTION

This CAUTION symbol appears against notes that will help you to avoid damage to equipment, or errors or accidental loss of data.

WARNING

This WARNING symbol appears against notes that warn against risk of personal injury.

Regardless of the specific locations of CAUTION and WARNING notes in this User Manual, all such notes apply whenever they are relevant.

Introduction

This Manual explains how to use Golden River's *Marksman 680* series of traffic counters and classifiers. In line with Golden Rivers policy of continual product innovation and improvement, features and software options may not be exactly as shown in this manual.

If you cannot find the information you need in this Manual, or one of the others listed above, please contact us for assistance, asking for the Technical Support Department.

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CE Marking of Golden River Products

European Union legislation requires that products must comply with certain directives, to give assurance that the product is amongst other things safe to operate and will not malfunction when subjected to defined levels of electromagnetic radiation or cause malfunctions in other equipment by emission of excessive levels of electromagnetic radiation.

Production models of the *Marksman* series bear the CE mark, attesting to compliance with the relevant Directives. The Directives most commonly applicable to Golden River products are:

- *The Low Voltage Directive* — *73/23/EEC as amended by 93/68/EEC*
- *The CE Marking Directive* — *93/68/EEC*
- *The Electromagnetic Compatibility Directive* — *89/336/EEC*

A Declaration of Conformity for any individual Golden River product stating the exact scope of compliance is available on request.

To ensure compliance, a *Marksman* instrument bearing the CE mark must be used with the correct Golden River accessories and cables.

Please contact Golden River Technical Support if you require further information.

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1 The *Marksman 680*

The *Marksman 680* is an 8/16 Loop Vehicle Count and Classifier.

Building on the success of the established Golden River *Marksman* range, the *Marksman 680* provides unsurpassed accuracy, improved data download rates, and faster response times.

1.1 Features

The *Marksman 680*

The *Marksman 680* is supplied in a range of models with differing capabilities, and additional options are also available.

- All models of *Marksman 680* are capable of Interval recording of vehicle Count, Speed, Length, Gap and Headway.
- All except the entry-level model are capable of vehicle Classification
- The models equipped for Vehicle-By-Vehicle (VBV) recording can store up to 10 million fully detailed vehicle records in non-volatile SD memory.
- Advanced signal processing algorithms. Features include:
  - detection of stopped or straddling vehicles from simple loop layouts (e.g. **LL**, two loops in each lane)
  - no further need for more complex loop layouts (although existing layouts can still be used)

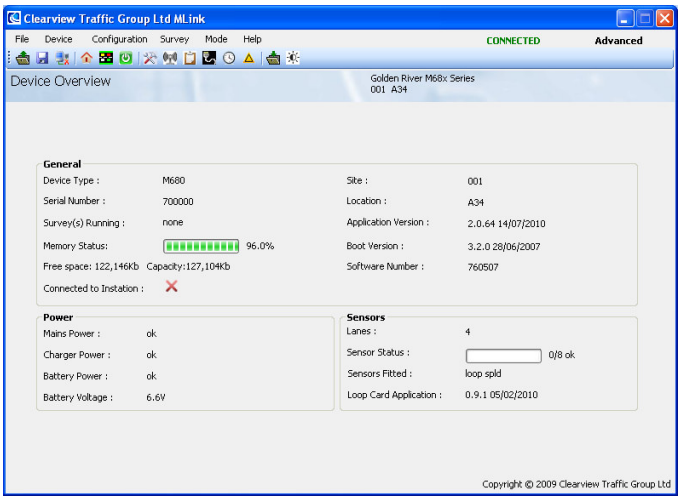
- automatic length adjustment for vehicle chassis height or lane position
- motor cycle detection from standard loops without affecting accuracy of other traffic
- no 'cross talk' between multiple loops on the same machine.

- Options include the High Performance Loop Detector with enhanced accuracy and tolerance of long loop feeders; and a modem interface for remote telemetry.

Further details of *Marksman 680* model and options are given on the next page.

MLink User Interface

Golden River's MLink software is a simple but powerful user interface for the *Marksman* range.



Beginning with the *Marksman 680*, and the current release of *MLink*, important new features are:

- Much faster communication between the host computer and the *Marksman* using binary protocols.
- Downloading of survey configurations and uploading of data take place through *MLink*.
- Comprehensive facilities for programming and interacting with the *Marksman 680*. MLink is now the only user interface.

1.2 Marksman 680 Options

The *Marksman 680* may be supplied with any of the following factory-fitted options. The capabilities of an individual instrument can be identified from the Golden River Product Number on the rear of the case.

1.3 Delivery Checks

When the package is delivered, check the packaging for any signs of transit damage or poor handling, and declare any such signs to the delivery courier.

On opening the package, remove the *Marksman 680* from its packaging cradle. Also remove and identify the other accessories.

Examine the *Marksman 680* for any visible signs of damage. Shake and rotate it gently, and listen for any sounds of loose components inside. (It is normal to feel slight movement of the heavy battery beneath the hinged lid; but nothing more.)

CAUTION

If you do hear or see any signs of potential damage, **DO NOT USE THE *Marksman 680* UNIT***. Doing so may cause further damage if internal connections and/or sub-assemblies are broken.*

Every Marksman 680 was checked, intact and functional before despatch from the factory, so any damage must have occurred in transit and you should report it to the carrier. Then advise Golden River Traffic or your supplier, and discuss the options for repair or replacement.

Replace the packaging cradle in the outer cardboard box, and retain all this packaging in case the equipment needs to be returned for repair or maintenance.

1.4 First Battery Charge

Begin charging the internal battery of the *Marksman 680* while you are installing the software (see next chapter). The unit is shipped with a charged battery (disconnected), so a brief top-up charge should normally ensure that the unit will respond to external commands as soon as needed. In exceptional circumstances you may need to leave the battery on charge a little longer.

Connect the 2-pole power connector to either the ***POWER-1*** or the ***POWER-2*** socket of the *Marksman 680* (these two inputs are completely interchangeable).

If you are not familiar with the military-style locking connectors used on the *Marksman 680*, follow these instructions (from Section 4.2.2):

1. Hold the body of the cable connector and offer it up to the socket on the *Marksman 680*. Rotate the connector body until it will slide a little way into the socket (there is only one angle where this is possible, so you may need to rotate the body by anything up to 360°).
2. Keeping the connector body engaged in the socket, rotate the locking ring clockwise until the body is pulled fully in, and the ring clicks into the locked position.
3. Gently pull the connector **body** to confirm it is correctly positioned and locked.

CAUTION

Never use excessive force on these connectors – when correctly aligned, they will always connect and disconnect easily.

Never pull on the cable! *Only handle the connector* **body***.*

CAUTION

Before placing a Marksman 680 into field service, always charge the battery until the green LED lights on the Battery Charger

2 MLink User Interface

MLink is a dedicated user interface for control, configuration and monitoring of *Marksman* instruments.

This section gives instructions for installing the MLink software, and for an initial check that it will communicate with the *Marksman 680*.

2.1 Software Installation

1. Insert the software CD-ROM into a CD/DVD drive on the PC.
2. If your *Windows* installation has 'auto-run' enabled, the MLink installer will start automatically after a short pause. If auto-run is not enabled, open *Windows Explorer* to view a directory listing of the CD-ROM, and then double-click MLink_xxx.msi (where xxx is the release version of the software)
3. Follow the instructions in the Installer, until the MLink software installation has completed and you are returned to the *Windows* Desktop.
4. A shortcut to start MLink has been placed on the Desktop screen. You can click-and-drag this icon to reposition it.

2.2 Functional Checks

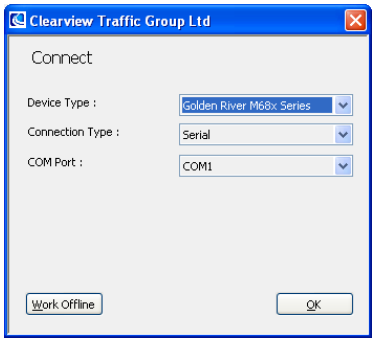
1. Using the PC connection lead GR006640, connect the 9-pin D connector to a serial port on the PC.
   a. Connect the 4-pole serial data connector to the ***TERMINAL*** socket of the *Marksman 680*. A brief outline of these military-style locking connectors was given in the previous chapter.
2. Double-click the MLink startup icon (see above) to open the MLink **Welcome Page** window.

CAUTION

You are only making a connection check. Do not click any buttons in MLink *or change any settings unless specifically instructed below.*

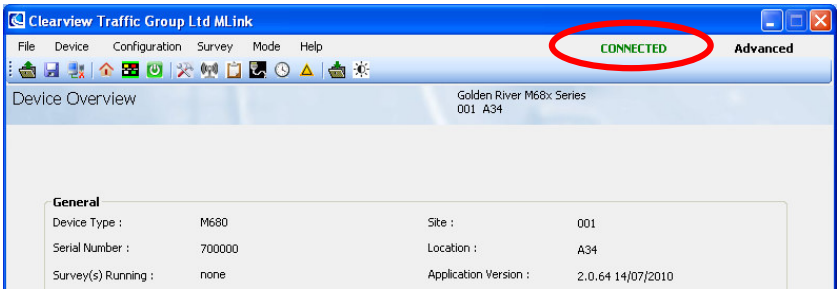
3. As the application starts up, you will be presented with the Welcome Screen. This will allow you to choose if you want to connect to a device or not. Select "Connect to Device"

4. If the *Marksman 680* is connected to a PC serial port other than COM1, you may need to choose the correct setting on the relevant drop down list. Also check that the model number presently displayed in the **Device Type** list begins with **M68** (MLink will fail to connect if the present setting begins with **M66**).



5. Now click **OK**. A progress bar may briefly flash, and then MLink will be connected to the *Marksman 680*.

When the *Marksman 680* is **CONNECTED**, you will see the word **CONNECTED** at the top of the Device Overview screen.



If the connection failed, you will see the word OFFLINE at the top of the screen

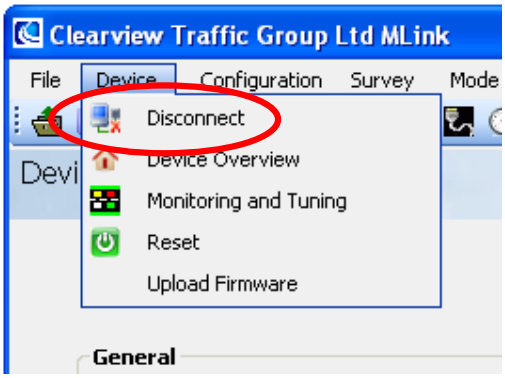
The Device Overview Screen shows a lot of basic information relating to the *Marksman 680* including: battery voltage, memory used, software version installed, site name, unit serial number etc.

CAUTION

Before removing the **Terminal** *connector, and before shutting down the* MLink *software, it is always good practice to close the link with the Marksman 680.*

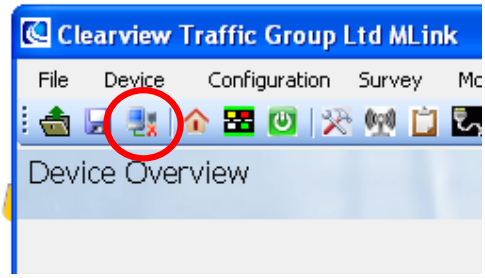
To close the link between MLink and the *Marksman 680 either*

1. Select the "Device" menu at the top of the screen, and then choose "Disconnect"



or

2. Select the Disconnect icon on the tool bar at the top part of the screen.



You have now completed a basic functional check of MLink and its data connection to the *Marksman 680*.

CAUTION

Before placing a Marksman 680 into field service, always charge the battery until the green LED lights on the Battery Charger

Your *Marksman 680* and its MLink user interface are now ready for use.

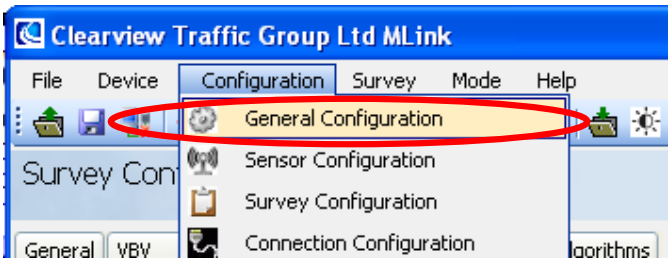
3 Quick Start Guide

The following steps are what is typically needed to set up an *Marksman M680* so that it accurately collects traffic data.

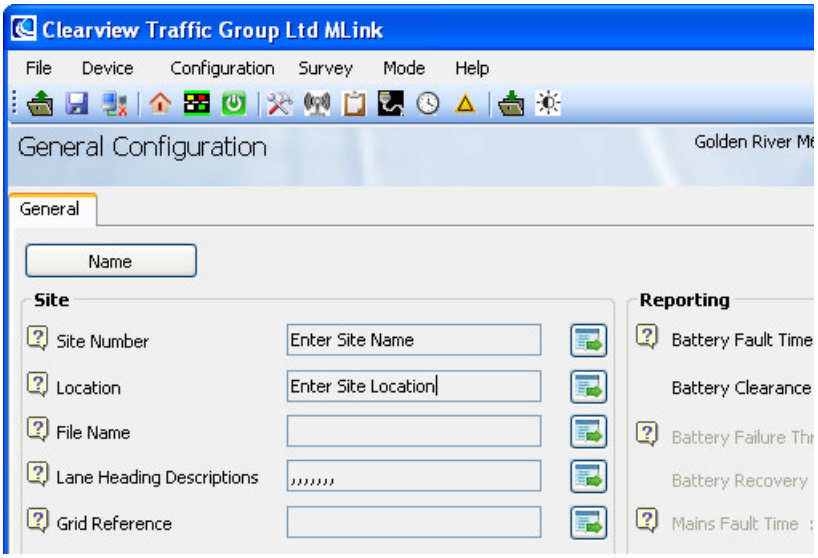
3.1 General Configuration

Select the General Configuration option on the tool bar as shown below

or by choosing <Configuration><General Configuration> from the menu bar.



The key information to be inserted here is the site name and location information (as shown below) This information will help you to identify this counter and the data it produces in the future.



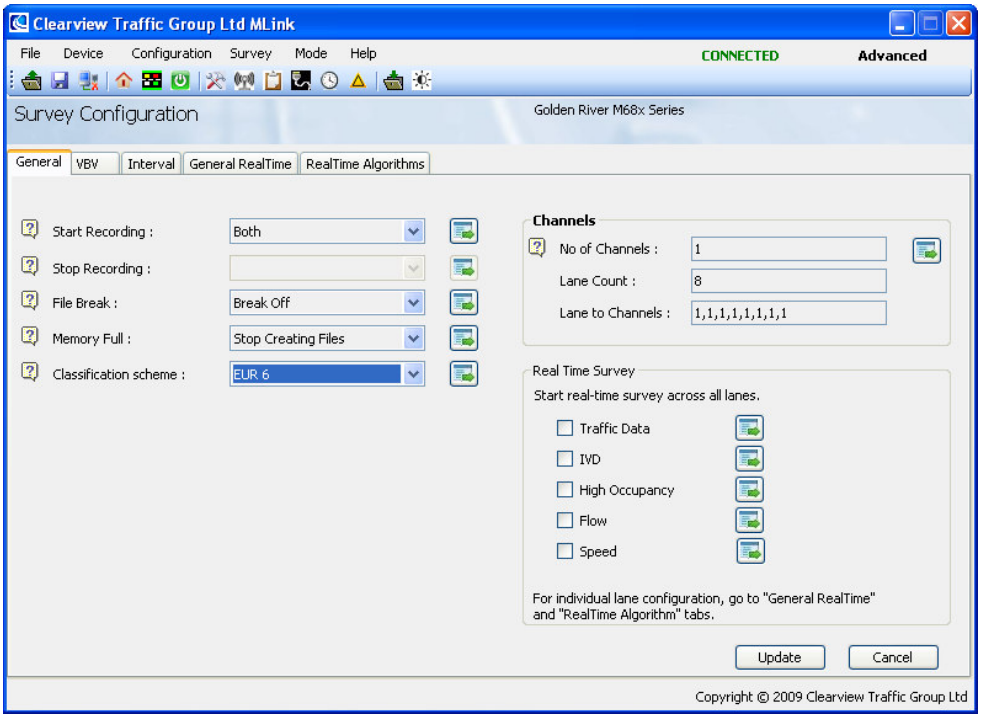
3.2 Survey Configuration

On this screen there are several tabs that provide access to the various different elements associated with configuring a survey.

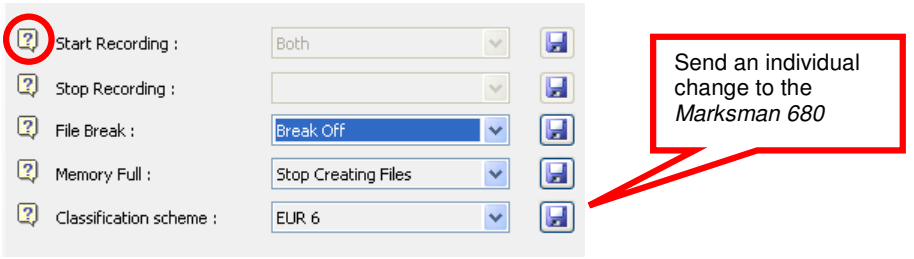
These areas are:

- General
- VBV
- Interval
- General RealTime
- RealTime Algorithms

Below is an example of the General tab, and on here is information related to the type of surveys to be started or stopped as well as what file breaks will be used, what class scheme is in use, and what to do if the counter runs out of memory.



Help on each of the individual features can be found by “hovering” the mouse cursor over the small question mark icons next to the name of the field as highlighted below.



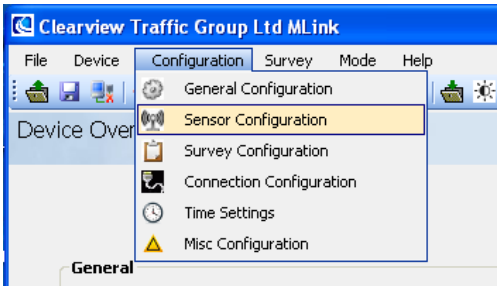
When a change is made to a field in MLink, there are two ways to implement the change in the counter.

The first is to click on the “Update” button at the lower right hand corner of the screen, the other option is to click on the small blue floppy disk icon associated with the specific item that has been changed (as shown above)

3.3 Loop Configuration

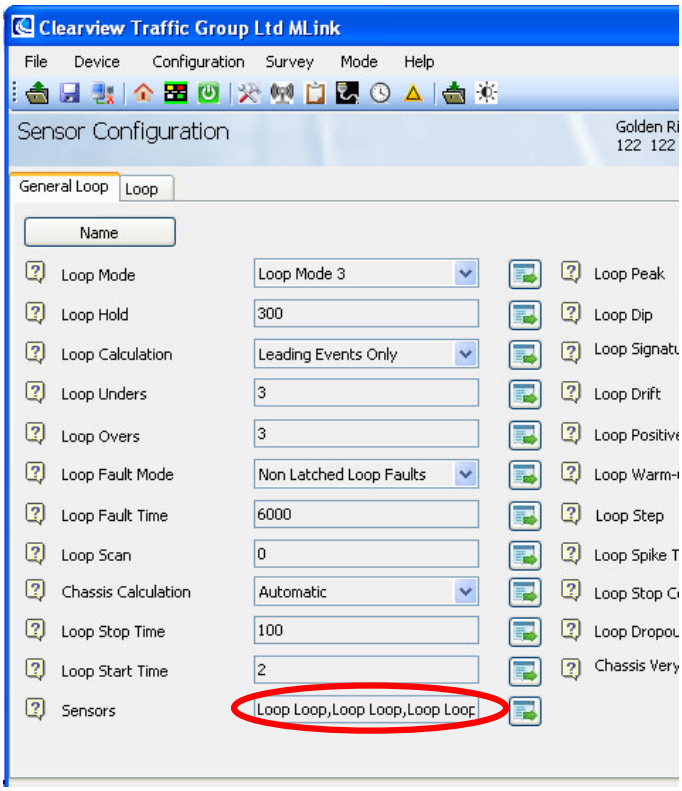
Before starting a survey, there are a small number of settings that need to be checked.

The first of these is the loop configuration options. These are accessed from the <Configuration><Sensor Configuration> menu as shown below:

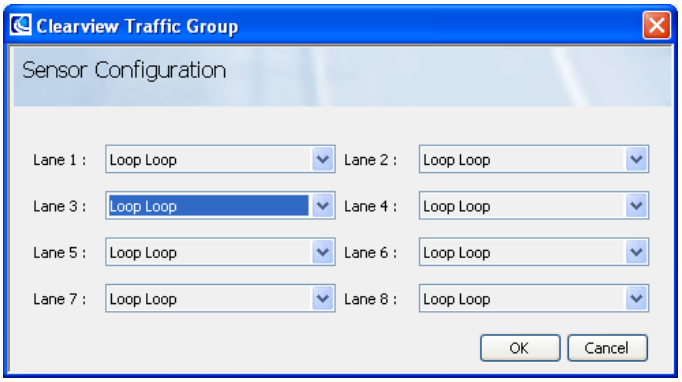


In loop configuration, there are a number of settings that need to be checked.

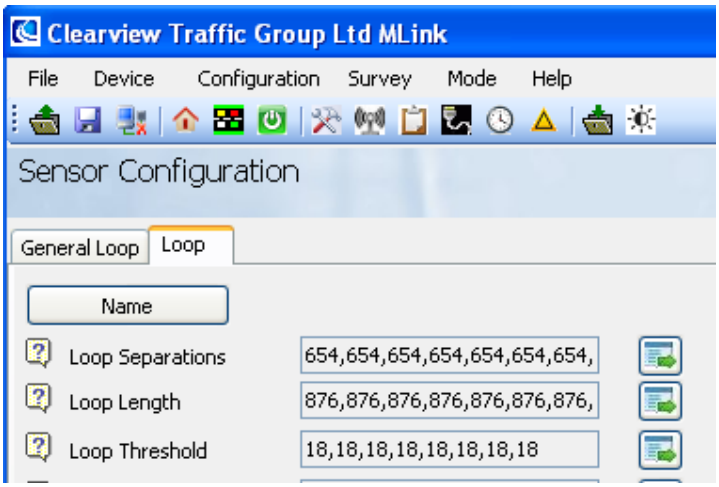
The first is on the General Loop tab, and is highlighted on the following screen shot. The most likely setting here is Loop-Loop as this is now the standard loop configuration used at the majority of sites, but the *Marksman 680* can be configured to support a wide range of legacy loop configurations including “Loop over two lanes” and “NPlusOnOverTwoLanes”



By clicking on the identified field, the following screen will open, and allow configuration of the sensors on a lane-by-lane basis.

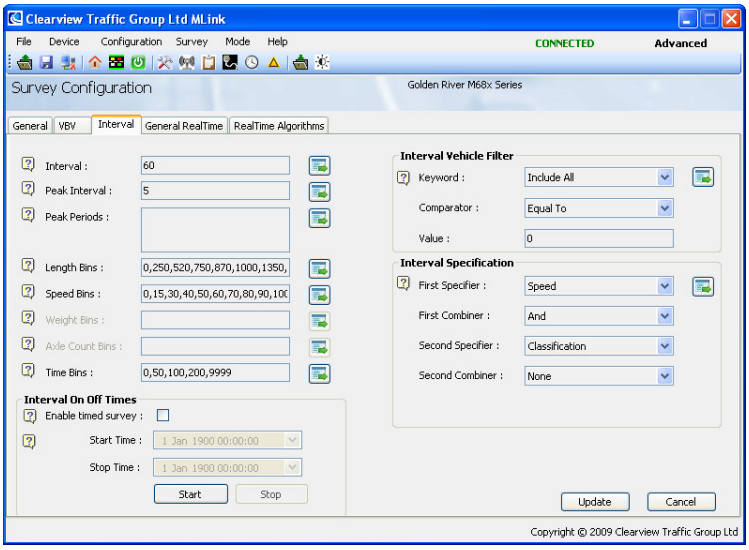


Once the appropriate loop configuration has been set, the length and separation of the loops can be input via the Loop tab on the Sensor Configuration screen as shown below:



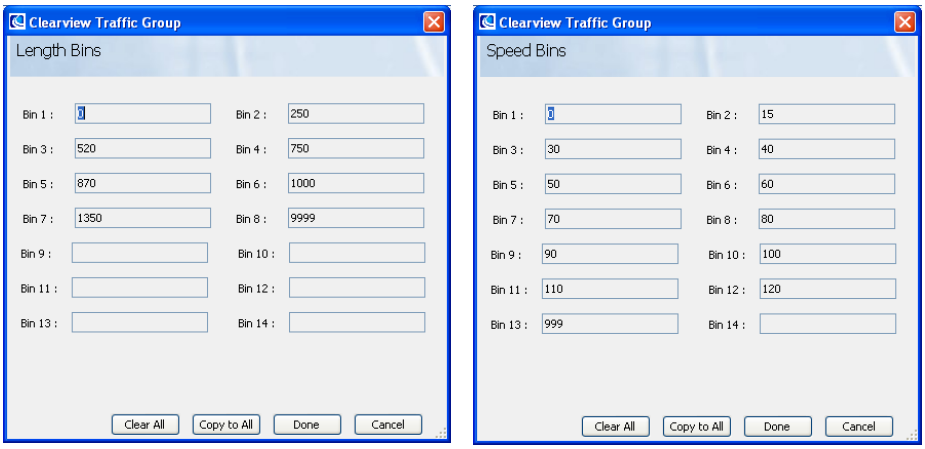
3.3.1 Interval Survey Configuration

By clicking on the “Interval” tab, you get access to the options for Interval Surveys (Binned Survey).



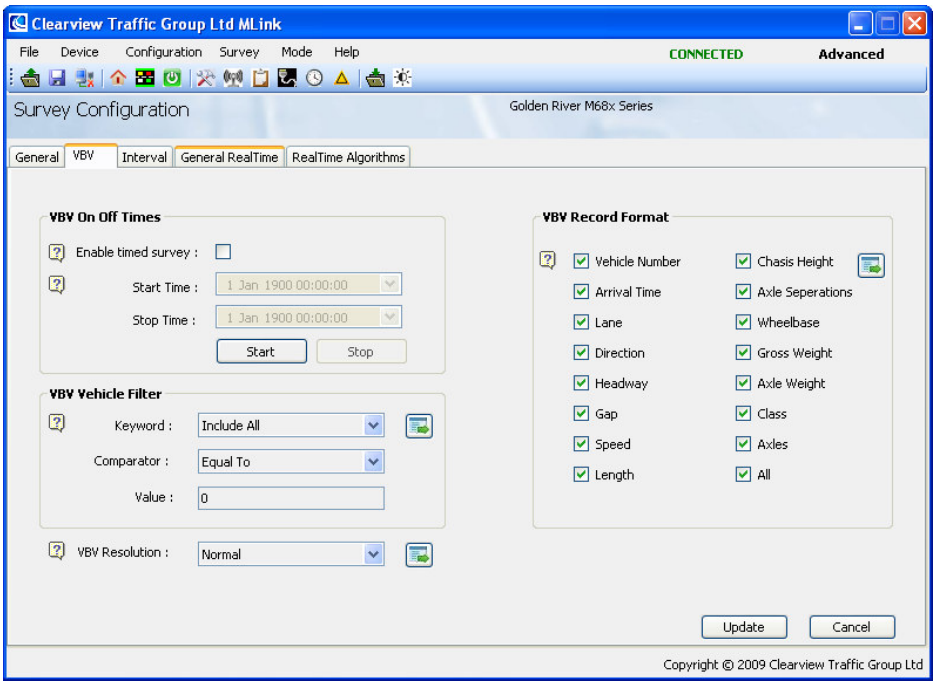
These include the “bins” for both speed and length as well as the “Interval” to be used and options to configure the structure of the survey e.g. Speed by class or speed and length by direction etc.

Some of the fields on the MLink screens have many entries (and are shown on the overview screen as a series of numbers separated by commas) but if you click on the relevant field, a new window will open to allow simple entry of multiple values (see below)



3.3.2 Vehicle by Vehicle (VBV) Survey Configuration

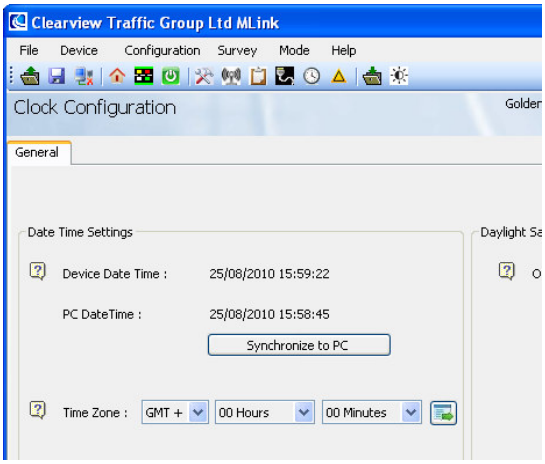
As previously for the Interval survey, the VBV tab provides access to the parameters that need to set for a VBV survey including start and stop time, as well as the fields that are to be included in the output file e.g. Lane, Direction, Class and speed



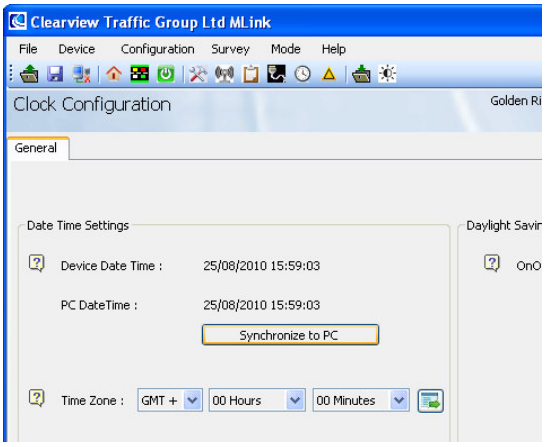
3.4 Clock setting

The *Marksman 680* contains a highly accurate internal clock that will remain accurate for many months; however it is good practice to synchronise the time of the *Marksman 680* to the same time as the PC whenever you connect to a counter. This is easily carried out by selecting the “Clock Configuration” menu as shown below.

As can be seen, this *Marksman 680*'s internal clock is slightly different to the time set on the PC,



by pressing the "Synchronize to PC" button, the 2 clocks are immediately bought into synchronisation.

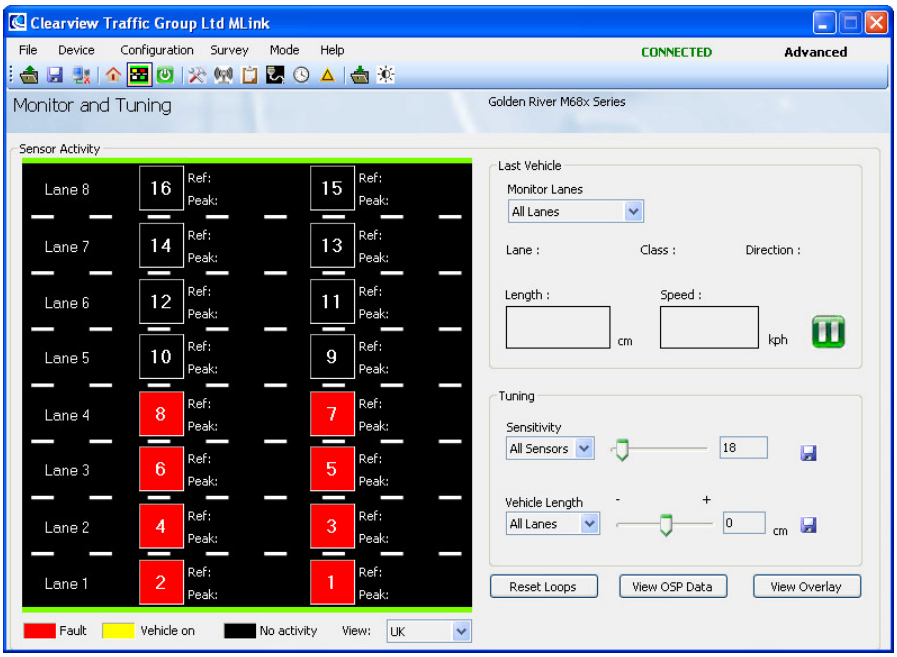


3.5 Loop sensitivity setting

As a final step before starting a survey, the loop sensitivity should be set by using the "Monitor and Tuning" screen.

This screen shows an overview of the site, and any loop activity will be shown on the screen. As vehicles pass over the loops, it is possible to ensure that the loops are accurately detecting the vehicles. If vehicles are not being detected, sensitivity of the loops can be increased by moving the slider to the left (a lower figure equates to a higher sensitivity), however if "ghost" vehicles are being detected, the sensitivity can be reduced by moving the slider to the right. A good default value to use to start any testing is 20.

In a similar way that the sensitivity can be adjusted, the length of vehicles can be adjusted to compensate for any inaccuracy at a specific site (or with specific loops)



Once all of the above steps have been completed, the Marksman 680 is set up, and ready to provide accurate traffic data.

Part 2 – The *Marksman 680* Hardware

Because there are several different options within the *Marksman 680* range (Section 1.2), some details may not apply to your particular unit.

4 Case, Connectors and Cables

4.1 Case

The *Marksman 680* is housed in a glass reinforced plastic case, intended for permanent on-site use inside a secured equipment cabinet.

CAUTION

The Marksman 680 is not designed for prolonged outdoor exposure. The electronics are sealed to IP67 standard (apart from the ventilated main battery compartment) but the assembly is not designed to be totally weatherproof in the long term. The Marksman 680 may suffer damage if it is left exposed outdoors.

Also, the Marksman 680 is not designed to be totally vandal-proof, and is unsuitable for use without external protection such as a locked equipment cabinet.

The *Marksman 680* can be carried and transported in any orientation, but for the longer term it is designed to be operated and stored on its base, as shown in the photograph above. This gives convenient access to all the external connections, which are located on the connector panel that forms one end of the unit.

The carrying handle forms part of the hinged lid of the unit, which is normally screwed down to the rest of the case.

WARNING

Danger of injury –

Do not attempt to use the carrying handle of the Marksman 680 while the lid is unscrewed. The lid hinges may break, allowing the whole unit and/or the heavy battery to fall, and also tearing off the battery leads.

CAUTION

Danger of severe equipment damage –

The only reason for opening the hinged lid is to replace the battery (Section 5.6) or to carry out a power-down reset or to fit a SIM card.

4.2 Connectors

4.2.1 Connector Panel

All the external connections for the *Marksman 680* are on the connector panel that forms one end of the case.

The number of connectors on your *Marksman 680* will depend on the options selected when the unit was ordered (the list of factory-fitted options is given in Section 1.2). Not all models will have as many connectors as shown above.

All models will have the following four connectors, to fit the cables identified in Section 4.3.1:

- ***TERMINAL*** – for the serial interface to the PC
- ***POWER-1*** and ***POWER-2***
- ***Loops 1-8***

Some options will have one or more additional connectors:

- ***Loops 9-16*** (16-loop option only)

- ***SERIAL PORT***
- **Arial:** Units fitted with a GSM modem have an aerial fitted in place of the serial port.

4.2.2 Twist-lock Connectors

All the electrical connectors on the *Marksman* are of the 'military' twist-lock pattern. They are waterproof and rugged, with strong cable clamping and a positive twist-lock. This helps to ensure reliability in field applications.

Connecting

1. The multi-pole connectors will only mate in one orientation. Hold the body of the cable connector (not the loose outer ring) and offer it up the fixed socket on the *Marksman 680*.
2. Rotate the connector body until it will slide a little way into the socket (there is only one angle where this is possible, so you may need to rotate the body by anything up to 360°).
3. Keeping the connector body engaged in the socket, rotate the locking ring clockwise until the body is pulled fully in, and the ring clicks into the locked position.
4. Gently pull the connector **body** to confirm it is correctly positioned and locked.

CAUTION

Never use excessive force on these connectors – when correctly aligned, they will always connect and disconnect easily.

Never pull on the cable! *Only handle the connector* **body**.

Disconnecting

1. Grasp the locking ring, push it gently forwards toward the *Marksman 680*, and rotate the ring anticlockwise until it clicks loose.
2. Holding the connector **body**, pull the connector out of its socket.

CAUTION

The connector should come out very easily. If it won't, that can only mean the locking ring has not been properly released.

To repeat – **never use excessive force***, and* **never pull on the cable!** *Only handle the connector* **body**.

4.3 Connecting Cables

According to the type of system you ordered, ready-made connecting cables will be supplied. Each lead will have the appropriate kind of twist-lock connector to connect to the *Marksman 680*, and an appropriate termination at the other end.

To avoid the risk of incorrect connections at the *Marksman 680* itself, all the different kinds of ports use incompatible connectors.

4.3.1 Identifying Connecting Cables

The following table shows the range of connecting leads that are available; the Golden River part numbers are clearly marked on the cables.

Purpose	Connector(s) M680	End 2	Part No.
TERMINAL to PC serial port	4-pole twist-lock connector	DB9 socket	GR006640
POWER-1 or ***POWER-2*** to Battery Charger	2-pole twist-lock connector	Directly wired to Battery Charger	(Part of Battery Chargers GR006830 and GR006831)
Loops 1-8 to 8 loops or ***Loops 9-16*** to 8 loops	19-pole twist-lock connector	8 pairs of terminal pins (labelled **A**–**H**) + ground	GR006660-001 (1.0m) or GR006660-000 (2.0m)
SERIAL PORT to Jekyll Telemodem2 Mobile	10-pole twist-lock connector	DB25	GR006880
SERIAL PORT to PSTN Robotics Modem	10-pole twist-lock connector	DB25	GR006881

CAUTION

Risk of equipment damage:

Do not connect any inappropriate lead or termination to any port of the Marksman 680.

Do not connect any battery charger or other power source, except one supplied by Golden River.

4.3.2 Hints on Connectors and Cables

Loose Front Panel Connectors

If a connector on the front panel of the *Marksman 680* becomes loose, there is a danger of water and moisture entry. The connector may be re-secured without opening the case.

Loosely slide a cable connector on, to engage with the connector on the case. Hold this firmly, and use an open-ended adjustable wrench to tighten the ring nut around the fixed connector. Turn the nut clockwise until it is quite tight and compresses the internal sealing ring, but do not over-tighten.

CAUTION

Do not allow the whole connector to rotate – this will twist and pull on the internal connecting wires, and may cause damage.

4.4 Loop Connection Details

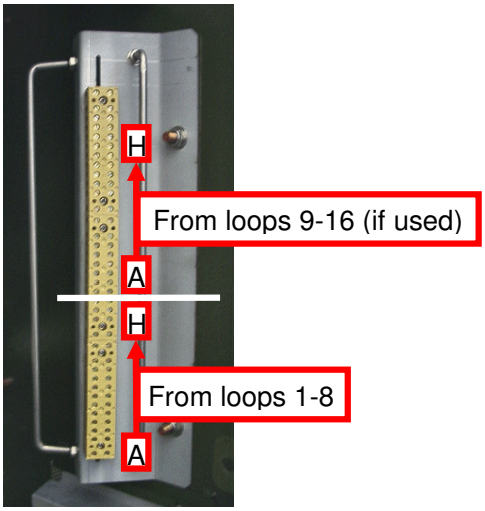
It is clear that to ensure accurate results, it is important to connect loop cables to the *Marksman 680* in a strict sequence.

Use a terminal block to connect the incoming loop feeder to the leads provided. The mechanical details will depend on the type of cabinet, and on the contract specification for installation of the feeder cable from the loops in the road. In general you can expect to find the incoming feeder separated into twisted pairs, with each pair labelled in sequence by the installation contractor.

CAUTION

Take care not to disturb or damage the labelling of the incoming loop wires. Do not attempt to connect cables that have not been correctly labelled in sequence. No damage will normally result from incorrect connections, but the system will not function correctly.

Connect each pair of loop wires in sequence, starting with the pair marked **A** as shown in this example. The two wires in each pair can be connected either way around, but pairs that belong together must be kept together.



WARNING

Danger of electric shock –

The Marksman 680 is appropriately protected and insulated, but it is connected to external equipment (some of which is mains powered), in an uncontrolled outdoor environment.

*The green/yellow earth (ground) lead on each GR 006660 Loop Cable **must** be securely connected to the cabinet frame. Do not attempt to earth the Marksman 680 in any other way.*

5 Battery Care & Accessories

5.1 Introduction

The *Marksman 680* has two batteries: the main rechargeable battery and an internal backup battery.

Main Battery

The compartment beneath the lid of the case holds a rechargeable 6-volt lead gel battery with a capacity of 12 ampere-hours.

When the *Marksman 680* is installed in an equipment cabinet, mains power will usually be available to keep the main battery fully charged, using the Battery Charger GR006830/6831 (Section 5.4). In such an installation, the only purpose of the main battery is to ensure continuity of data collection during mains outages (which are expected to be repaired long before the capacity of the battery has been exhausted).

In remote locations, installations may be powered by a solar panel supplied by Golden River. Averaged over a period of several days, the solar panel is expected to supply more than sufficient power to keep up with demand. The main purpose of the battery is to provide continuity through the hours of darkness, and also during periods of very low sunlight (e.g. storms or extreme overcast). Even if the solar power fails completely, due to damage or breakdown, the *Marksman 680* main battery will provide continuity of data collection for several days.

Where guaranteed continuity is required for longer periods, Golden River can provide a higher-capacity external battery pack (Section 5.7).

Data Backup

If the main battery has discharged to the point where it can no longer support data collection, the *Marksman 680* will shut down those functions and use the remaining capacity of the main battery to preserve the data already collected. This requires only a very small current, so the main battery will provide at least 1-2 weeks of data backup (limited mainly by self-discharge within the battery itself).

All models of *Marksman 680* use MMC or SD memory which will maintain data and configuration settings indefinitely without any power.

The *Marksman 680* also contains a small internal backup battery, but its main purpose is to maintain the stored data and configuration for brief periods while the main battery is being changed.

CAUTION

Always keep the main battery well charged. If the terminal voltage is allowed to sink so low that the internal battery is forced to take over, the main battery will be permanently damaged and will require replacement.

Do not rely on the internal battery to preserve the data and configuration for long periods.

5.2 Care of the Main Battery

The rechargeable main battery is a sealed gel-cell unit which requires no servicing, other than correct charging.

Unlike the rest of the *Marksman 680*, which is environmentally sealed to IP67 standards, the main battery compartment beneath the lid is left open to the outside air because charging of the battery may generate a small amount of gas.

WARNING

Danger of explosion – do not attempt to seal the cover of the main battery compartment. The gaps around the cover are essential to prevent formation of an explosive hydrogen-air mixture inside. Also ensure that the equipment cabinet or any other enclosure within which the Marksman 680 is placed has adequate ventilation.

WARNING

Risk of acid leakage – although the gel battery is nominally sealed, do not store or operate the Marksman 680 upside-down for long periods. Always leave the unit flat on its base, so that the battery is the right way up.

When it eventually becomes necessary to replace the main battery, see Section 5.6 for instructions.

5.3 Main Battery Endurance

5.3.1 Operating Endurance

Starting from a fully-charged main battery, the operating endurance of a *Marksman 680* varies according to the number of loop detectors that are active, and the volume of traffic data being collected. Use of the external communications interfaces will also have a small effect.

The endurance figures quoted below are guidelines for a new battery at 20°C. They will decrease by about 10% per year for an older battery, and also for higher operating temperatures.

Endurance Guidelines for 12Ah Main Battery

Counting and Vehicle Classification	Days
8 Loops	40
16 Loops	30

CAUTION

The figures given above are **guidelines** *only. If battery life is critical (e.g. because a survey cannot be repeated) ensure that a mains-powered battery charger is always connected, and/or connect an additional battery pack. If this is not possible, confirm the actual battery endurance by testing that particular configuration beforehand.*

5.3.2 Memory Backup Endurance

The normal output voltage of the main battery during discharge is 6.4V but this will fall as its storage capacity is used. When the voltage reaches 5.7V the *Marksman 680* will stop collecting traffic data, close all open files and enter 'sleep' mode. It then uses the remaining capacity of the main battery to provide memory backup for as long as possible, until either the internal non-rechargeable backup battery is forced to take over, or external power is restored.

Endurance in 'sleep' mode is difficult to estimate, because the main current drain will be the battery's own internal self-discharge. This can vary considerably, depending on the individual battery and its operating history, but the main battery can normally be expected to preserve stored data for at least 1-2 weeks. As all models of *Marksman 680* use either MMC or SD memory, they will all maintain data and configuration settings indefinitely without any power.

While 'asleep', the *Marksman 680* will ignore all external inputs and will appear to be completely dead. This can easily be mistaken for a more serious fault condition, but the *Marksman* will recover as soon as external power is restored and the battery voltage has risen above the shutdown value.

CAUTION

Always keep the main battery well charged. If the terminal voltage is allowed to sink so low that the internal battery is forced to take over, the main battery will be permanently damaged and will require replacement.

Do not rely on the internal battery to preserve the data and configuration for long periods.

5.4 Battery Charging

The Battery Charger for the main battery is a dedicated unit provided by the battery manufacturer. Golden River supply the Battery Charger ready fitted with a twist-lock connector for the ***POWER-1*** or ***POWER-2*** inputs on the *Marksman 680*.

WARNING

Danger of injury or death –

- **Do not connect any unauthorised power supply to the *Marksman 680*.** *The only authorised power supplies are those provided by Golden River specifically for the Marksman 680.*
- **Do not connect the *Marksman 680* directly to the AC mains.**

CAUTION

Danger of severe equipment damage –

At present the following models of Battery Charger are available:

Countries	Mains voltage and frequency	Plug type	Part No.
United Kingdom	230V ±10%, 50Hz	UK 13A 3-pin	GR006830

Other EU countries	230V ±10%, 50Hz	European 2-pin	GR006831

This Battery Charger is designed to be permanently powered and connected to the battery. Either the ***POWER-1*** or the ***POWER-2*** connector can be used, as these two inputs are completely interchangeable.

According to the needs of the battery, the Battery Charger will switch automatically between fast charging (at a current up to 1A) and float charging at only sufficient current to keep the battery fully charged. Two coloured LEDs on the Battery Charger indicate its status:

- Both LEDs off – no mains
- Steady red (green LED off) – fast charging
- Steady green (red LED off) – float charging
- Steady red and green – charger disconnected from *Marksman 680*

CAUTION

At power-on, the Charger will always appear to be in float charging mode (steady green LED) while carrying out its startup checks. After a short time, the true status will be displayed.

If the Marksman 680 becomes disconnected while the Charger is in use, there will be no change in the LED status.

To confirm the charging status, always switch the mains supply off and on again, and then check the LEDs after a short time.

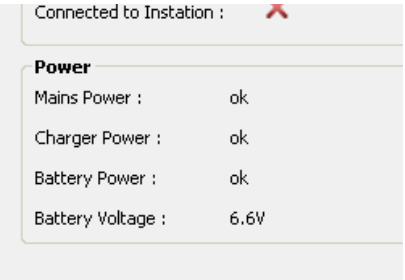
For reference, other LED indications that would indicate more serious faults are:

- Flashing red (green off) – reversed battery polarity
- Red and green flashing simultaneously – high temperature in Charger
- Red and green flashing alternately – short-circuit.

Monitoring Battery Voltage

The battery voltage can be monitored using *MLink*.

Following the information shown in Chapter 2, connect the PC to the *Marksman 680*. The lower half of the **Device Overview Page** will now indicate the *Marksman 680*'s battery voltage



When the Battery Charger is operating on float charge (steady green LED), the battery voltage will normally be maintained close to 6.4V. If the battery is partly discharged, the voltage may initially be quite low, but that should trigger the Battery Charger into fast charge mode (steady red LED). The voltage should then increase rapidly towards about 7.0V, where it should remain for the duration of fast charging. When float charging resumes, the voltage should gradually fall back to about 6.4V and remain there.

An almost discharged main battery will typically take about 10 hours to re-charge.

5.5 Main Battery Lifetime

A main battery that is regularly charged will normally have a useful working lifetime of 3–4 years. Given the value of reliable data collection compared with the cost of a new battery, it is recommended that you replace the main battery routinely every 2–3 years.

Battery replacement can be postponed if the *Marksman 680* is permanently connected to mains power.

CAUTION

If a lead-gel battery is left in a discharged state for a long period, it will suffer a permanent loss of capacity. **Never** *attempt to re-charge such a battery while it is still connected to the Marksman 680 – the rise in terminal voltage could cause permanent damage.*

CAUTION

Although it may be possible to "recover" a long-discharged battery by re-charging it outside of the Marksman*, and the terminal voltage may then appear correct, the capacity of the battery still remains uncertain. Whenever in doubt, replace the battery and ensure that the new battery is never left for long periods in a discharged state.*

5.6 Replacing the Main Battery

The previous section identified when the main battery may need to be replaced. To do so, follow these instructions.

1. Obtain the correct replacement battery from Golden River (GR220009) which is supplied with the necessary foam pads to hold it snugly in the battery compartment.

2. Stand the *Marksman 680* on its base as shown above, and unfasten the two screws in the lid (arrowed in red) until the lid can be lifted. The lid will then hinge backwards to reveal the battery.

WARNING

Danger of injury –

CAUTION

Danger of severe equipment damage –

Do not attempt to use the carrying handle of the Marksman 680 while the lid is unscrewed. The lid hinges may break, allowing the whole unit and/or the heavy battery to fall, and also tearing off the battery leads.

3. Gently pull the blade connectors from the blade terminals on the battery.

CAUTION

When removing the blade connector from the battery terminal, never pull on the wire, or pull sideways on the fixed blade – they may break. Always hold the body of the connector itself, and pull it straight off in line with the blade.

4. Lift out the old battery, and set it aside.

5. Insert the replacement battery in the orientation shown above: terminals toward the rear, with the positive (red marked) terminal to the right.
6. Re-connect the blade connectors as they were before:
   - Red wire to the right, on the positive (red marked) terminal
   - Black wire to the left, on the negative (unmarked) terminal.

CAUTION

Ensure correct polarity of the battery and connecting leads. Neither the Marksman 680 nor the battery should be damaged by incorrect connection, but the instrument will not function.

7. Lower the lid until it presses onto the foam pad on the top of the battery, and taking care not to trap any wires. Re-fasten the two securing screws.
8. Before using the *Marksman 680* for a survey, always place it on charge until the Battery Charger indicates that it has switched to float charging (steady green LED).

5.7 Connecting an External Battery Pack

If the internal battery does not have sufficient capacity for your survey period, you can use the GR007250 Battery Pack (36 ampere-hour nominal) which will increase the total battery capacity by a factor of 4. Connect the Battery Pack to the *Marksman* using the GR006641 connecting lead.

The GR007250 Battery Pack has its own charger connector, and may be charged using the normal Battery Charger. However, the internal and external batteries together will take 4 times longer than normal to re-charge.

5.8 Available Accessories

Below is a list of available accessories for use with the *Marksman 680*. Contact Golden River Technical Support for further details.

Product Number	Product	
GR006839	M680 User CD (Manual & Frontend)	
GR006830	Battery Charger with UK 13A plug, (lead and 2-pole connector for ***POWER-1/2*** port of *Marksman 680)*	
GR006831	Battery Charger for European 2-pin plug, (lead and 2-pole connector for ***POWER-1/2*** port of *Marksman 680)*	
GR006640	Lead TMU/M680 Engineers Terminal (DB9 to ***TERMINAL*** port of *Marksman 680*	
GR006641	Lead TMU/M680 Power, External (2-pole connector for **Power-1/2 port** to Battery Pack GR007250)	
GR007250	TMU/M680 Battery Pack	
GR006840	Jekyll Telemodem2 Mobile Kit	Modem communication requires ***SERIAL PORT*** option GR006835/36
GR006880	Lead for Jekyll Telemodem2 Mobile	
GR260229	PSTN Robotics Modem	
GR006881	Lead for PSTN Robotics Modem	
GR006660-000	**2.0m** Loop cable with 8 twisted pairs and earth (blade terminals) and connector for *LOOPS* port of *Marksman 680*	Two off Loop cables required for 16-loop models
GR006660-001	**1.0m** Loop cable, as above	
GR006841	Bluetooth adapter (dongle)	

5.9 Solar Panels

Solar panel battery charging options are available for the *Marksman 680*. Contact Golden River Technical Support for further details.

6 Hardware Specification

Approvals	• CE marking. EMC Directive (2004/108/E), EMC – Road Traffic Signal Systems EN 50293:2000, ETSI EN 300 330-2. • Low Voltage Directive (2006/95/EC)
Physical	• Dimensions: width 220mm, depth 315mm (including handle), height 140mm. • Weight 4.4kg.
Environmental	• Operating temperature: –15 to +70°C. • Ingress protection: IP67 (not including battery compartment).
Power Supply	• Main battery: 6V 12Ah rechargeable (field replaceable). • Two connectors to allow the connection of a battery charger, battery pack etc. Each one is connected to the main battery via a self-resetting PTC current limiter. • Internal backup battery: 3.6V 70mAh rechargeable (factory replaceable only).
Communications	• ***TERMINAL*** port to PC: RS232 115200,8, n, 0. • Optional ***SERIAL PORT*** for external modem: RS232 115200,8, n, 0. • Optional **Internal modem**, TC63 GPRS/GSM module
Data Memory	• Models with internal MicroMedia Card memory: at least 128MB.
Loop Detector	• Number of Loop turns: 3 minimum, conforming to MCH1540 (4 turns recommended by Golden River). • Inductance range: 80µH to 300µH. • Frequency range: 60 – 90kHz.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