STORM Guardian
Operator's Handbook

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Solutions for Risk Reduction

Contents

1. Introduction

Casella Tipping Bucket Rain Gauges are reliable and extremely robust devices. When paired with a Casella LOG 8 telemetry data logger they have the ability to take measurements from a single or a multi-parameter sensor at regular intervals, and stores this data in internal memory. This instrument will from here on in be referred to as STORM Guardian

The STORM Guardian with the outer cover removed.

Using GPRS or GSM telemetry, the STORM Guardian contacts a data collection system, typically once per day, and transfers data to the data collector.

The STORM Guardian can also be configured for alarms with user-specified set points. When a measurement exceeds a set point, the STORM Guardian contacts the data collector and transfers data along with an alarm message. The alarm message is typically forwarded by the data collector as an email or an SMS message.

The STORM Guardian manages power to both the modem and sensors. An external battery is needed, in the range of 3.6V to 20V. This battery charges and internal rechargeable cell (an HLC) which will run the system for a short period during battery changing.

The battery and sensor connect via 4.8 * 0.8 mm spade lugs.

The LOG 8 Telemetry Data Logger

2. Principle of Operation

The rain gauges comprise a light weight injection moulded plastic divided tipping bucket assembly with stainless steel pivot pins that rest upon stainless steel pins in the support assembly. The use of pins produces a rolling rather than pivoting motion when the bucket tips, which reduces the likelihood of friction.

Rain collects in one side of the bucket, which tips once a predetermined volume of water has been collected. The tipping action discharges the collected water and positions the other side of the bucket under the discharge nozzle ready for filling.

Each time the bucket is tipped, a magnet within the bucket moulding closes a reed switch in the support assembly. The use of a sealed reed switch, capable of indefinite operation, ensures the instrument has a long working life. Each contact closure pulse represents a discrete amount of rainfall appropriate to the instrument's calibration. These tipping pulses may be counted or recorded using a variety of methods, as described in Chapter 5.1

The tipping bucket mechanism is mounted inside the body on a cast aluminium-alloy base, incorporating a built-in spirit level to facilitate correct positioning. Both body and funnel are manufactured from aluminium alloy, with an accurately machined septum ring with an aperture of 400 cm². (200cm² version is now also available) The measurement accuracy for the various tip sizes is shown in Figure 2.

Tipping Bucket Rain Gauge
Accuracy / 100 Tips
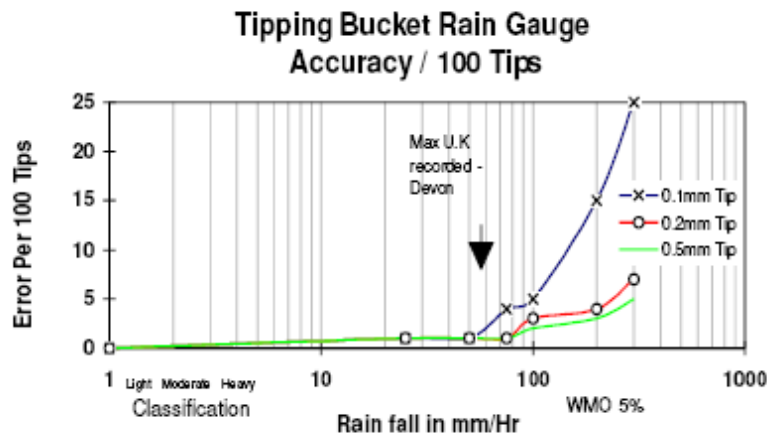
Accuracy of 0.1 mm, 0.2 mm and 0.5 mm tip versions

3. Construction

The rain gauge is manufactured entirely from non-corrosive materials. The base and septum ring are cast in Aluminium Alloy LM25, heat treated and protectively coated.

The outer ring and funnel are fabricated from aluminium alloy sheet and again protectively coated.

Stainless steel mesh is employed to protect the inlet and outlet ports from the ingress of foreign bodies.

4. Preparation for use

Each instrument is delivered ready calibrated to indicate 0.1 mm, 0.2 mm or 0.5 mm of rainfall each time the bucket tips.

It is also recommended that the rain gauge be installed in a location or enclosed compound away from access by the general public.

Prepare a reasonably level site for the rain gauge paying due regard to the following points:
- No object should be nearer than four times its own height from the bucket.
- Do not locate the rain gauge in a hollow or on top of a hill.
- Tall buildings or belts of trees can cause turbulence and gusts which can increase or decrease the rain collected.
- The surrounding soil should be capable of allowing the discharged water to drain away freely.

Warning!
The septum ring has a sharp edge and should be treated with care whenever handling the instrument.

4.1. Standard Single Output Non-Heated Version

1. Release the two catches securing the outer cover to the base and then carefully lift off the cover.

2. Feed a suitable length of 2 A, 2-core cable, through the grommet.
3. Connect the instrument end of this cable to the terminal block provided on the underside of the base unit for the output signal.
4. Connect the free end to the counting device.
5. Go to Section 4.3.

4.2. Standard Dual Output Non-Heated Version

1. Release the two catches securing the outer cover to the base and then carefully lift off the cover.
2. Feed a suitable length of 2 A, 4-core cable, through the grommet.
3. Connect the instrument ends of two of the cores to adjacent terminals connected to the white leads on the block provided on the underside of the base unit for the output signals.
4. Connect the free ends of these cores to the first counting device
5. Connect the instrument ends of the other two cores to the other adjacent terminals connected to the white leads on the block.
6. Connect the free ends of these cores to the second counting device
7. Go to Section 4.3.

4.3. General

1. Seal all weather connections using a silicone rubber compound.
2. With the base plate mounted in its correct location on site, adjust the three levelling screws until the built-in spirit level indicates that the unit is level.
3. Once the unit is level secure the locknuts.
4. It is advisable to secure the base unit permanently to a firm foundation using the two holding lugs provided.

   These accept either 9.5 mm or 3/8" rawl bolts.

   Do not over tighten the fixings.

   A restriction, such as an elastic band, may have been fitted to prevent the bucket from moving during transit.
5. Carefully remove any restriction and check that the bucket pivots freely.
6. Replace the outer cover of standard versions, with the catches engaged in the cutouts in the base plate.
7. Replace the outer cover of versions that meet the Environmental Agency Framework Directive, and then use the Allen Key to lock the three catches to secure the cover to the base.

5. Maintenance

Warning !

The septum ring has a sharp edge and should be treated with care whenever cleaning or handling the instrument.

Periodically check for debris in the funnel and blockage of the inlet and outlet ports. Remove any debris present and clean the meshes.

The water outlet on the underside of the funnel can be unscrewed allowing the inlet mesh to be removed and cleaned.

If necessary, bucket surfaces can be cleaned using a mild detergent solution.

5.1.   Counting the bucket tips

A variety of devices may be used to count the bucket tips, these include:
- Data Loggers (with contact closure input capability),
- Event counter (a simple LCD counter to indicate bucket tips)

Consideration should be given to ensure that the counting/logging device used can accept a contact closure input.

For fast counter inputs, some form of capacitor-resistor filtering may be necessary to reduce bounce effects in the contact signal.

6. Quick Start

Please ensure these procedures are followed before visiting site.

6.1. Harvest software

Harvest Software is needed in order to read and configure the STORM Guardian.
The software can be installed from the CD supplied with the logger.

6.2. STORM Guardian System components

The STORM Guardian requires GSM antenna connected to the SMA connector on the end cap. To read and configure the STORM Guardian locally, one of these communications cables will be required:

- local serial cable (RS232) –CMC93
- local serial cable (USB) –CMC94

6.3. SIM fitting

Fit a SIM by loosening the two screws securing the SIM cap and draw the cap away.
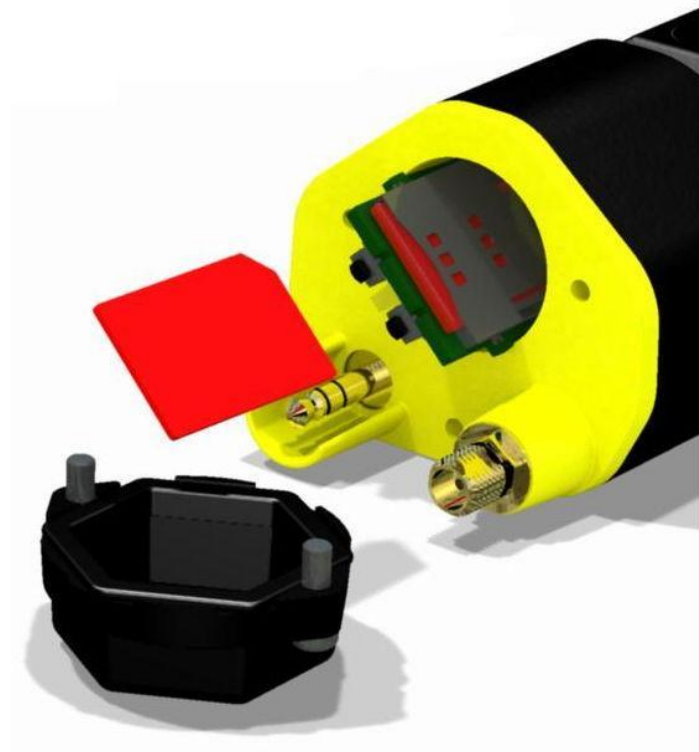
SIM Fitting

Insert the SIM oriented as shown. The SIM holder is a push-push type. Press the SIM in and it should click into place provided it is correctly oriented.
Push again if you need to remove it, and it will pop out. Replace the SIM cap and tighten the two screws to secure it, ensuring the cap seal is in place.

6.4. Sensor wiring

Wiring for some sample applications is shown below. More examples are given in the Applications section of the User Guide

.
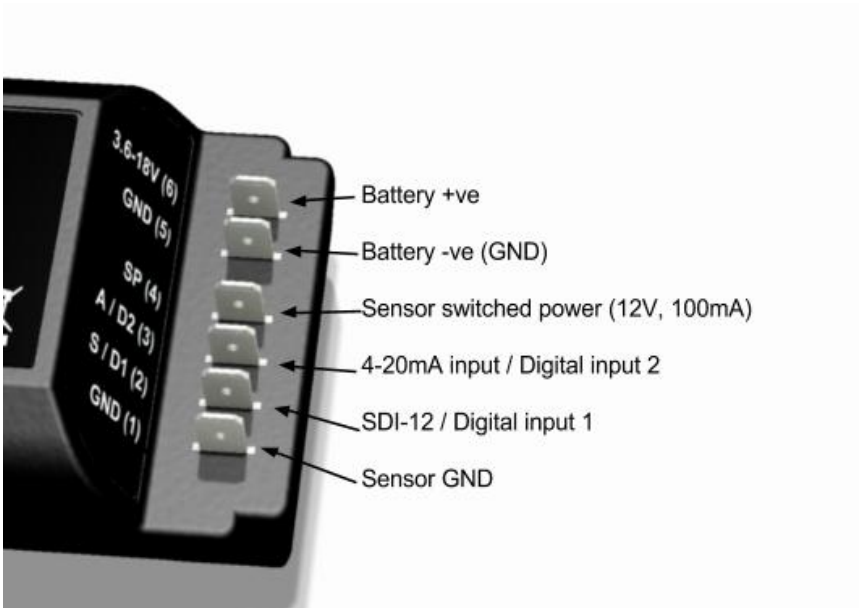
STORM Guardian sensor and battery connection

Tipping bucket rain gauge
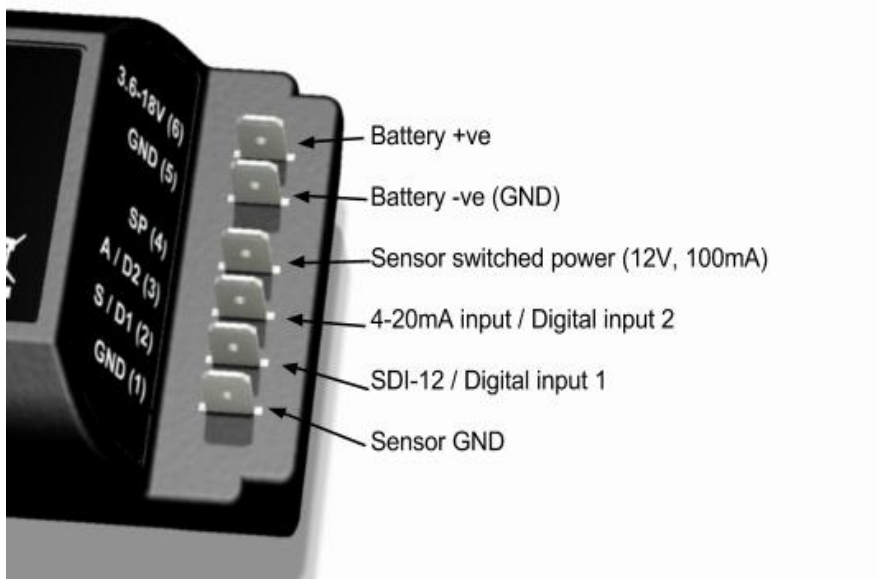
6.5. STORM Guardian

configuration with Harvest

The logger can be switched on by holding the power button down until a green flash is seen. Connect a local comms cable to the logger and run Harvest. Select "**Read Logger**" and follow the default options.

Select the COM port that matches the local cable currently connected. After the logger has been successfully read, right-click on the plot and select Configure.
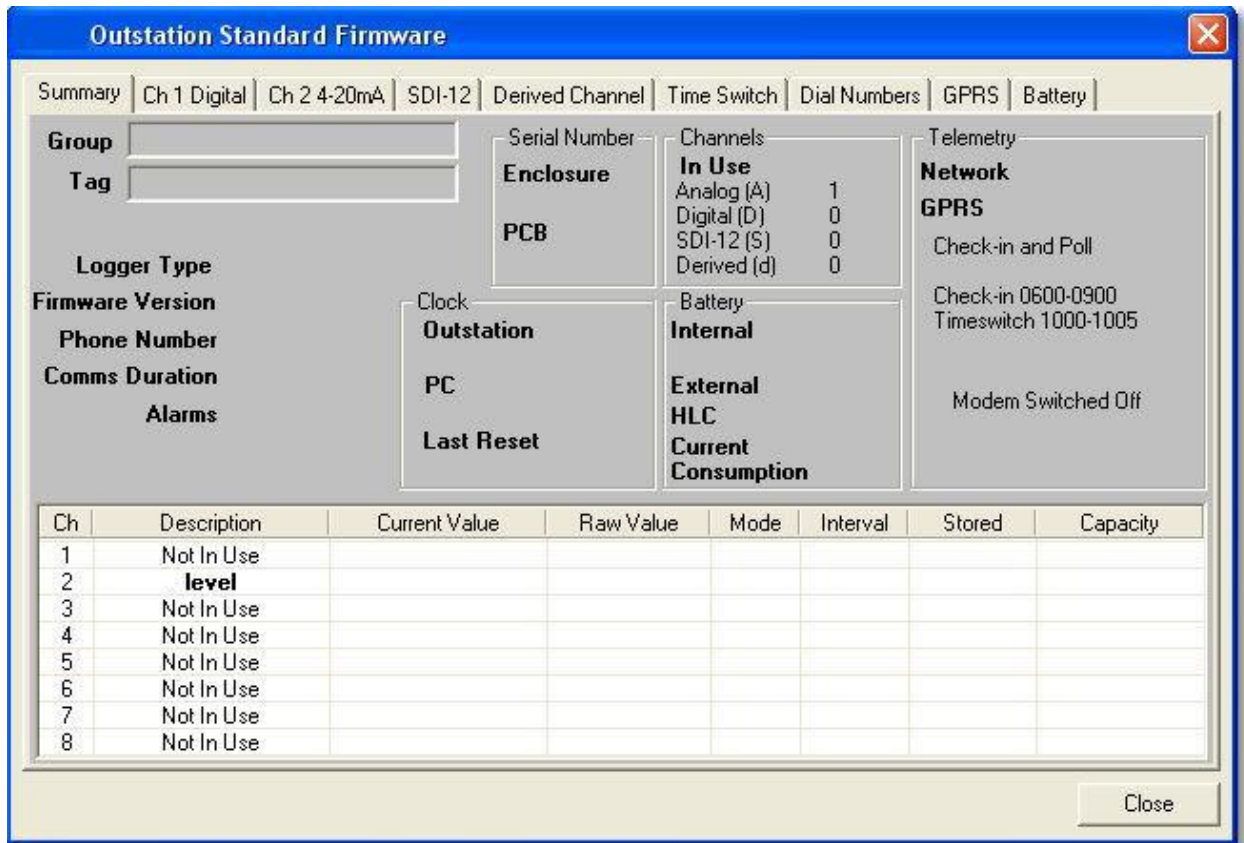
Harvest summary display.
(Fields will be populated with information when the logger has been read)

Check the Summary screen carefully - any problems with the logger are often highlighted here. The Summary tab can be used to set the logger Group, Tag and Description to match the site. The Digital, 4-20mA and SDI-12 inputs are configured via the Change Sensor box on these tabs.
Be sure to disable any unused channels.

The Time Switch tab configures when the logger modem is turned on, and when it attempts to check in.

A time switch window of about 5 minutes per day should be set so that the logger can be contacted for remote maintenance.
The Dial Numbers tab must be set correctly so the logger can call a telemetry server for alarms and check-in.

The GPRS tab must be configured to match the SIM and telemetry server in use. After these tabs have been completed, transfer the changes to the logger by selecting Next and following the default options.

See section 6 for more information about Harvest.

6.6. Before leaving site

Once the STORM Guardian has been configured, press and hold the Dial Out button until you see a yellow flash. The logger will attempt to contact the telemetry server that has been configured. Once a connection is successfully made, the logger will begin to send data packets to the telemetry server. Check to see that this data has been received.

6.7. Technical support

If you have questions regarding setup of this unit, please contact

techsupport@casellameasurement.com

7. Telemetry setup

This section describes how to set up the logger for use with Timeview Telemetry, the web-based data collection and alarm forwarding service operated by Isodaq Technology.

Note that if you have ordered your Storm Guardian with a Timeview Telemetry package, it will most likely be already configured correctly and tested. However, it is strongly advised that the user still confirm that the system is correctly configured and communicating properly before leaving to go site.

7.1. Access to Timeview

Before starting, an account on www.timeview2.net is required. A logger profile is also needed on the account for every logger connected to Timeview.

Accounts and logger profiles are created by the Timeview administrators, once the service has been ordered. The user will not be able to see data or receive alarms from a logger until these steps have been completed. Once the user can log-in to Timeview and see the logger profile, they can configure the logger to connect to it.

If Timeview Telemetry is being ordered for a logger you already have, please ensure that the following information is specified with the order

1. Account name
2. Logger serial number
3. Group and Tag from logger configuration

If you are ordering a new logger for use with Timeview, you can omit the logger serial number from the above list.

7.2. SIM requirements

Clients within the UK may arrange SIMs to be supplied with part of the Timeview package. This will ensure they are correctly configured to access the data collection server.

If you are supplying your own SIM, please ensure that the SIM meets these requirements:

The SIM must be

- GPRS enabled, with internet connectivity. A monthly usage of 1MB is sufficient for most sites with daily data check-in. Fixed-IP SIMs are generally not necessary.
- Data Enabled - it must support GSM CSD data. This is important even if the site to be used with GPRS. Record both the voice and data numbers of the SIM – they are usually different.
- SMS enabled, especially for incoming messages. Outgoing message are sometimes useful but not essential.
- Free from password protection. Test the SIM in a normal phone to ensure there is no password request, and if necessary disable the password via the phone's security settings.

7.3. SIM installation
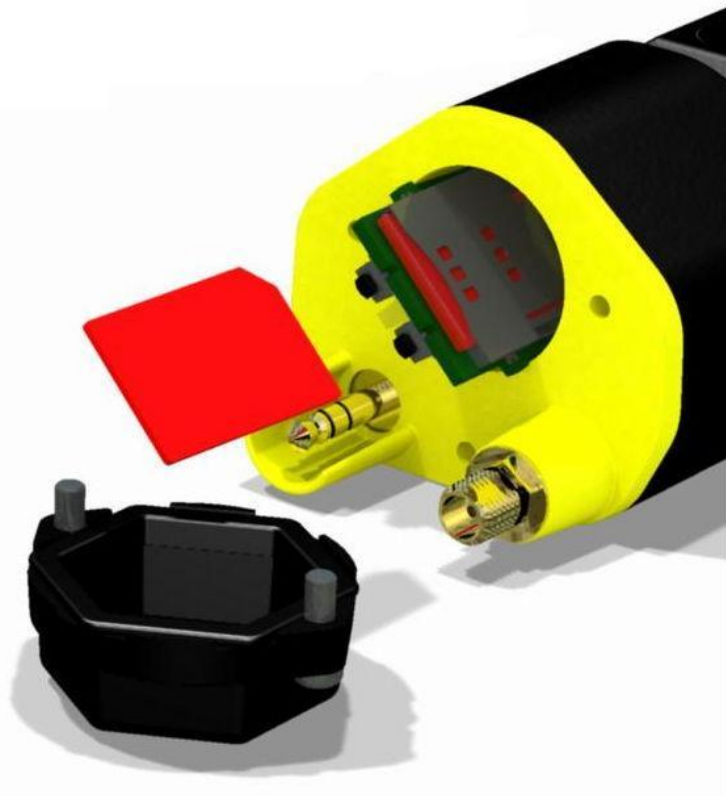
STORM Guardian SIM fitting

1. Switch the STORM Guardian OFF by holding the power button down until you see a red flash.
2. Open the SIM cap by loosening the two screws.
3. Insert the SIM as oriented above. Push it into the slot and it should click and stay in place. To remove it, push it again and it should click and pop out. This push-push behaviour only works if the SIM is correctly oriented. To avoid telemetry issues, ensure that the SIM pushed in before refitting the cap.
4. Replace the SIM cap oriented as shown above and tighten the two screws to seal the cap.
5. Switch the STORM Guardian ON by holding the power button down until a green flash is seen.

7.4. Status LEDs

The telemetry status of the logger is indicated by two status LEDs.
The Red and blue LEDs are used in combinations shown below:
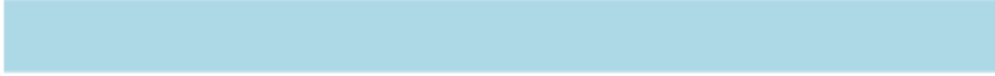
2 s

Single Blue: Modem OFF, Normal Logging

Double Blue: Modem ON, Good Signal, Normal Logging

Blue/Red: Modem On, No Signal, Normal Logging

Rapid Blue flashes: Modem switching On

Solid Blue: Comms Active, Waiting To Receive

Solid Blue with Red Flashes: Comms Active, Transmitting Data

The STORM Guardian also gives a green flash when it times-out waiting for communications and when it first switches on, and a yellow flash to acknowledge the Dialout button being pressed.

Green flashes during normal operation are used to show when the logger is sending commands to the modem.

8. Frequently asked questions

8.1. General

The Logger won't switch on.

The STORM Guardian requires a minimum of fifteen minutes to charge the internal battery if it has been discharged for a length of time. Make sure the logger is connected to an external battery for at least fifteen minutes before trying to power it on again.

8.2. Telemetry

How do I receive data from a remote STORM Guardian?

The simplest and most convenient method is the web-based data collection and alarm forwarding service Timeview Telemetry.

Can I use my Data SIM Cards?

You can, provided it meets conditions in section 7.2. However, we recommend that Casella supplies complete Timeview Telemetry packages including SIM (UK only), web data collection and alarm forwarding.

Can I put a telemetry STORM Guardian in a metal enclosure?

Only if you use an external antenna mounted outside the enclosure. Internal antennas will not work properly inside a metal enclosure.

Why won't my logger complete a dial out call or check in?

Confirm that the SIM card is correctly fitted into the SIM card holder (See section 7.3) and ensure that the logger has been configured correctly to operate with the SIM card

Also, check with your service provider that your SIM card is activated.

8.3. Batteries

What sort of batteries does the STORM Guardian use?

The STORM Guardian needs an external battery or battery pack. This can range from 3.6V to 20V

9. Applications

The STORM Guardian helps you collect data from sensors in remote locations. This chapter describes some of the sensors the STORM Guardian is commonly used with, and lists the equipment you may need for each.

9.1. Tipping-bucket rain gauges

The tipping-bucket logging mode records the time that tips occur to the nearest 2s.

The "multi-tip" rainfall feature counts the number of pulses that occur within this 2s period, allowing a maximum of 20 tips in a 2 second period. Tips occurring faster than this are considered to be contact bounce, and are suppressed. Tips are then all logged with the same time stamp.

The storage interval is not used. Because data is recorded at unpredictable times, there is no way to tell when a logger in tipping bucket mode will be full.

Old data is overwritten when the storage is full. The logger gives a red flash whenever a tip is recorded. From Harvest select the Rain gauges class from the Sensor dialog (see section 11.7).

Different tipping bucket sizes are available. Note that you can also use the pulse-counting ranges from the Frequency sensor class if you want to record the number of tips in a period and do not want to know the times of individual tips.

9.1.1. Rainfall intensity alarms

STORM Guardian loggers support rainfall intensity alarms for channels configured for tipping-bucket logging. Up to 4 alarms are supported for each rainfall channel. Each alarm has a set

point amount in mm, an integration period and a suppression period. The set point, integration period and suppression period can be individually set for each alarm, so for example a rain gauge channel could have the following alarms set:

Amount	Integration period	Suppression period
25mm	2h	4h
30mm	6h	4h
30mm	12h	24h
50mm	12h	24h

Up to 16 integration periods are supported:

10m	15m	30m	1h
2h	3h	4h	6h
8h	12h	18h	24h
2d	3d	5d	7d

These are configured via a drop-down menu on the alarms dialog box.
Up to 8 suppression periods are supported:

1h	2h	4h	8h
12h	18h	24h	48h

These also appear as a drop-down menu. The rainfall alarms are checked at a user specified interval. All four alarms are evaluated at the same interval. The following intervals are supported:

2m   5m   15m   30m   1h

An example of a dialog box that can be used to specify the rainfall alarm parameters is shown below:
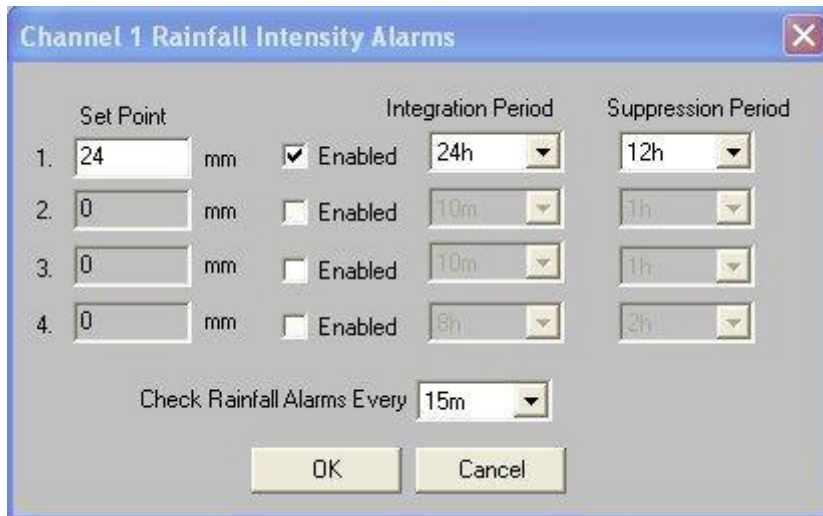
At every "Check Rainfall Alarms" period, the logger will scan the tip records starting with the most recent first. It then scans further back (Date & Time descending) until a tip record is reached that is older than the "Integration Period" (in the example, any tip records exceeding the previous 24 hours).

The tip count to this point is calculated into rainfall and then compared with the "Set Point". If the rainfall exceeds the "Set Point" then an alarm is created.

After an alarm is created, no further alarms will be created until the "Suppression Period" has elapsed.

10. Specification

10.1. Sensor inputs

4-20mA input	50 ohm resistance
	1V maximum drop
	16 bit resolution
	0.1 % accuracy
	Transient protection

SDI-12 input	8 channels total, up to 8 sensor addresses
Digital input	2s rainfall tip timing resolution 65000 event count 650Hz max frequency 10K internal Pullup

10.2. Sensor Power Supply

Power output	Switched 12V 100mA output current Configurable warm-up

10.3. Storage

Storage capacity	29768 16-bit readings total for up to 8 channels
Storage intervals	10s 30s 1m 2m 5m 10m 15m 30m 1h 2h 3h 4h 6h 8h 12h Storage interval for each channel can be set independently. Data is recorded at cardinal points.

10.4. Communication

Transport	Internal GSM/GPRS modem
	USB to Female Jack (3.5mm) local comms data cable (Order ref.CBL-TAD-USB)
Protocols	Modbus ASCII
	DNP3

10.5. Power

Battery	External 3.6V to 20V

10.6. Mechanical

Connectors/switches	1 Sensor and battery connector plug with 6 screw terminals
	1 External local comms connector
	1 External GSM antenna SMA socket
	1 Power switch
	1 Dial-out button
Dimensions (mm)	Diameter 49
	Length 170
Construction	Overmoulded body with polycarbonate end caps.
Protection	IP65
Operating limits	-40–70 deg C, 0–100% RH

11.   Harvest software

11.1. Getting Harvest software

Your STORM Guardian logger may have new features that require the latest version of Harvest software.
For software and User Manual contact Casella sales department. Harvest for Windows PCs is supplied on CD with updates available online.
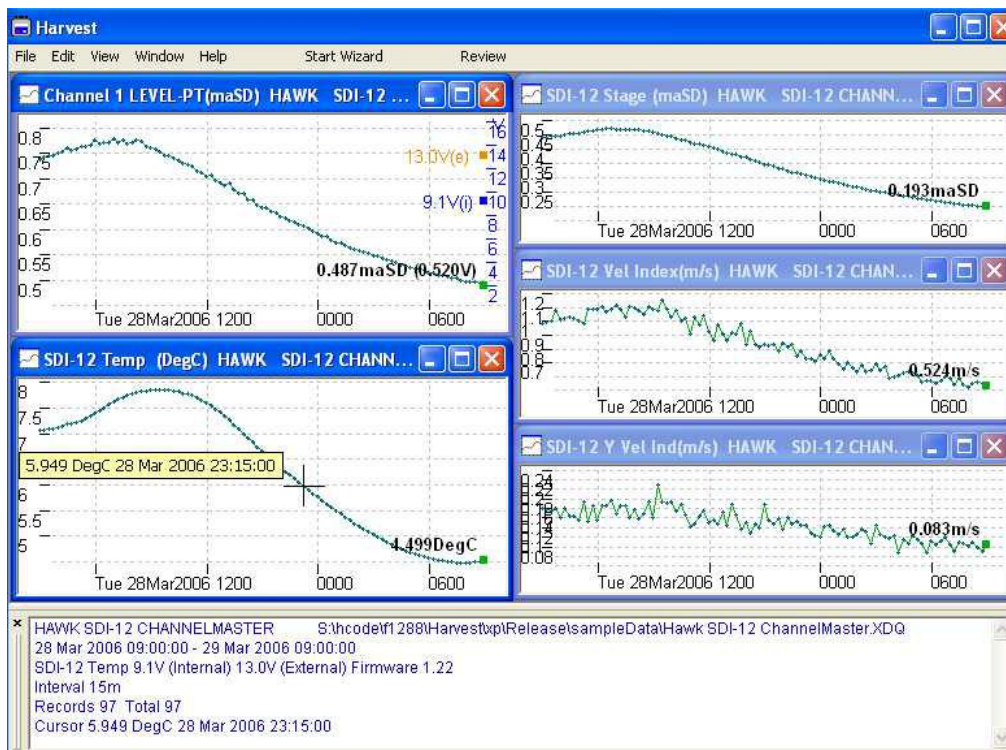
11.2. Installation

Harvest software is distributed as a self-extracting setup file.
The file name indicates the software version

For example, **"harvest301setup.exe"** means version 3.01.

11.3. Usage

Use Harvest to read and configure local and remote Casella loggers, and to view and export data from them.

Harvest software communicates with the logger in these possible ways:

1. Direct comms via a USB to Female Jack (3.5mm) local comms data cable..
2. Through a serial or USB modem (GSM or PSTN; only certain types are supported) connected to the PC

11.4. Local wired comms

Wired communications, direct to a PC USB port is possible with a CBL-TAD-USB. This plugs directly onto the Male Jack connector (3.5m) on the STORM Guardian.

11.5. Remote telemetry

Dialling Casella telemetry outstations is simply a case of entering the phone number for the outstation in the Dial field of Communications Parameters box. With a number entered in the Dial field, the software tries to contact a modem on the specified serial port and dial the specified number before interrogating the outstation.

The software hangs-up automatically after communications finish, successful or not.

A blank Dial field means no modem search is performed, and interrogation begins for a logger connected to a local serial port.

11.5.1. <u>Modems</u>

The GSM and PSTN (land-line) modems used in the Casella telemetry outstations are special embedded modems and may not connect reliably with all PC modems. Casella supply the F1206 GSM and PSTN USB modems which are PC versions of the same modem used in the outstations.

This ensures reliable connection in cases when a USB port is available on the PC, and is the recommended solution.

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Casella also recommends modems made by 3Com (US Robotics). Both internal and external 3Com modems have been tested and found to work reliably with the embedded modems used in Casella outstations.

11.6. Data retrieval: XDQ files

Harvest retrieves data from an STORM Guardian and stores it in a tree format of folders based on the Group and Tag stored at the outstation.

The STORM Guardian stores the group and tag names internally, so that data can be retrieved without specifying this information. If Harvest reads data from an outstation with an unknown group or tag, these folders are created.
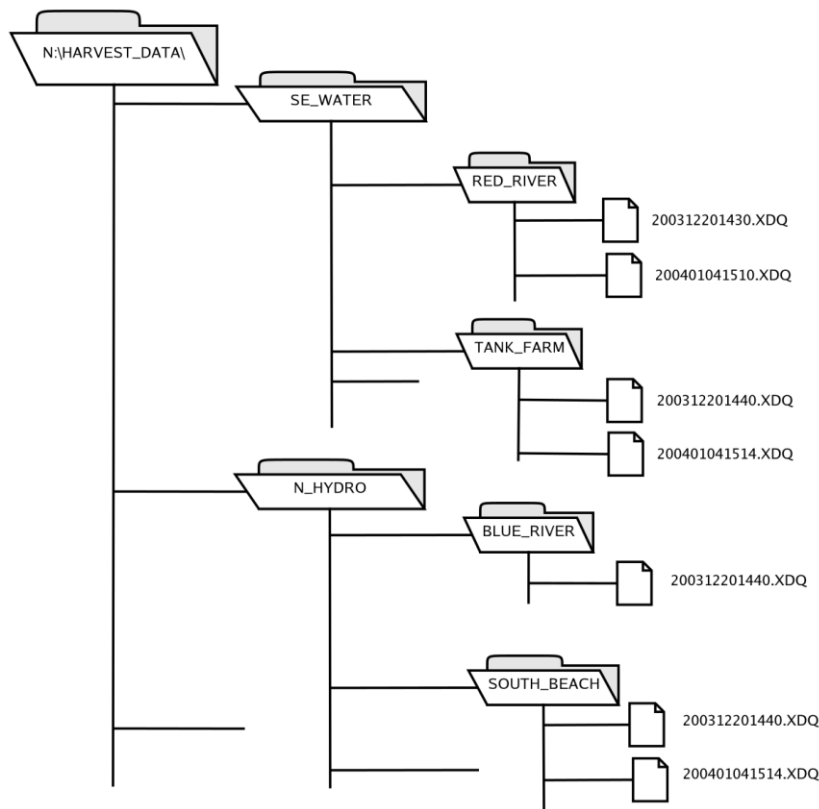
Each time an outstation is polled, a new XDQ data file is created. The data file names are based on the date and time from the outstation clock at the start of the communications session.

Data file names have the format YYYYMMDDHHMM.XDQ, so for example the file "200401251430.XDQ" was read on 25 January 2004 at 1430h.

This naming convention means that data files returned from field laptops and PDAs can be merged into the main group/tag tree with no risk of over-writes.

Note:

Outstations cannot be read by two systems at once, and most transfers take longer than a minute, so duplicate data file names are very unlikely

The XDQ data files contain configuration information as well as time series or event data.

The header of an .XDQ data file contains a full list of all configuration parameters, not just those used to set up the outstation. Discrepancies between the configuration file and the header in the data file are reported in logs Harvest displays during communications. XDQ data files are stored in exactly the same way in Pocket Harvest as they are Harvest. XDQ data files can be transferred from a mobile device running Pocket Harvest using Microsoft ActiveSync and these files can then be viewed or exported in Harvest.
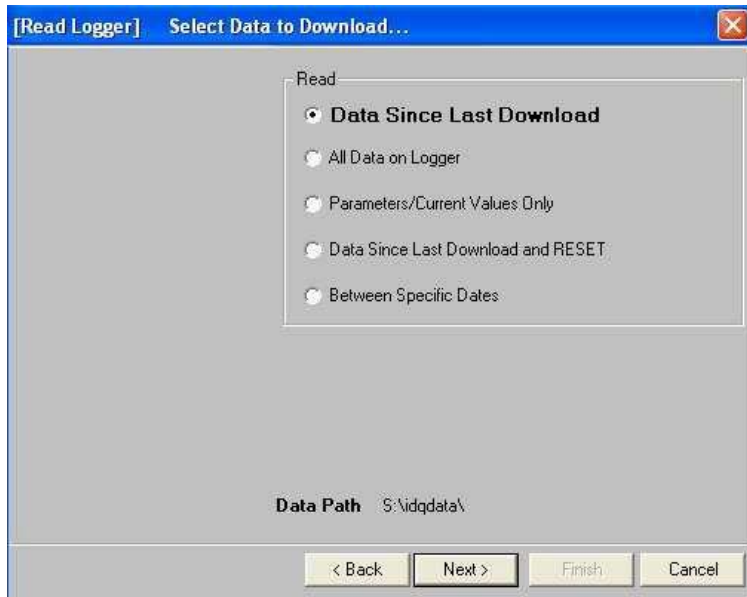
11.7. Reading the current configuration

Select Start Wizard to display the Harvest configuration wizard.
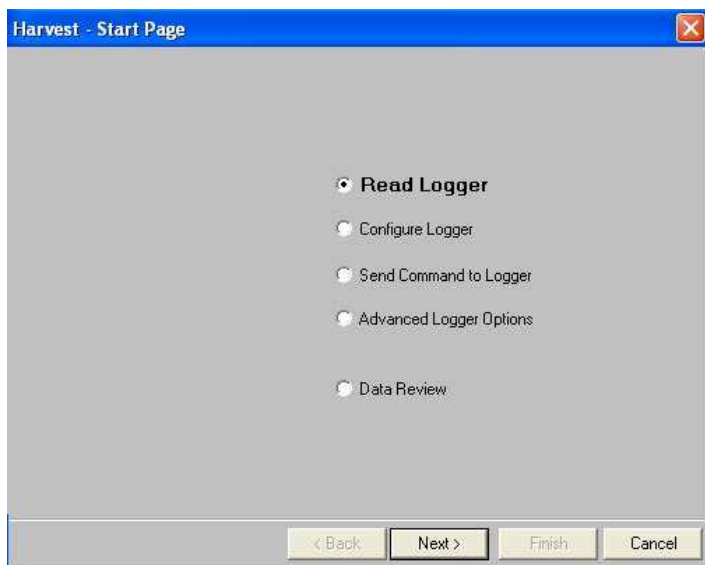
The Harvest configuration wizard

Choose the Read option and press next. Select the Logger Type, press next and then select the period of data to download from the logger and Press next again.

Harvest Read Logger Options

You will be prompted to choose between Local comms or Remote comms with the logger (using a modem). For Local comms you will just need to select the COM port. For Remote comms you will need to enter a phone number in addition to selecting the COM port.

The STORM Guardian blue and red LEDs should indicate comms is in progress. A steady blue light indicates comms is being detected which may or may not be valid. Red Flashes indicate transmission of packets, usually a sign of valid communications. Once the read has completed, a plot should be left on the Harvest Screen, showing what data is currently in the STORM Guardian.

Right-click on the plot and select Configure from the menu. A tabbed box appears, and you can complete the fields that are not greyed out.
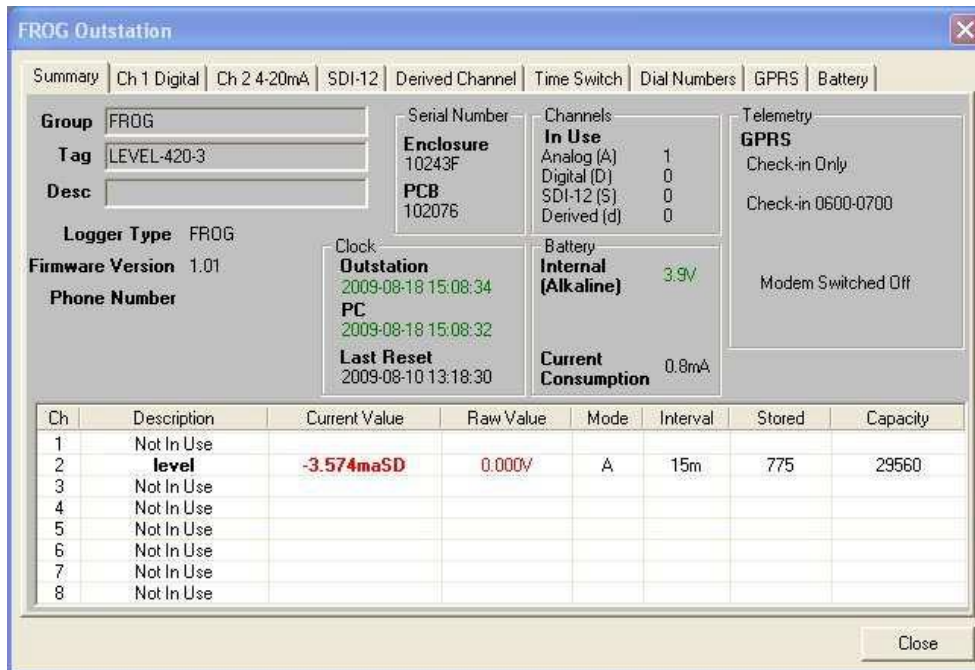
The Harvest summary screen

11.7.1. <u>Reading parameters only</u>

If you just want to check that the logger is correctly configured without reading the data, select the 'Read parameters only' option. Only the logger header information will be read, which takes less time than reading the stored data. Logger information will be displayed, but no data file will be stored.

11.7.2. <u>Resetting after reading</u>

With the 'Reset after read' option, the logger data will be erased and the logger clock set to the system time in your computer. A warning is issued for any command that will result in data being erased. A reset is only performed after a read has succeeded - *failed reads will not cause a reset*.

11.8. Changing logger configuration

You can change the sensor, storage interval, tag and description from the 'Configure' option of the wizard.

11.8.1. <u>Group and tag specification</u>

The important fields on the system tab are the Group and Tag. You should choose these carefully to fit into your data collection scheme, because they define the folder names where your data will be stored by all data collection and alarm processing applications.

11.8.2. Changing sensor type

The channel tabs are where you configure the STORM Guardian for specific sensors. Do this by selecting the Change Sensor box. From the Sensor Calibration dialog, pick the sensor you wish to use.
Select the 'Change sensor...' check box and the Sensor Selection form appears.
At the top of the box are two lists. The upper list is the class of sensor, and the lower list selects the sensor within the class. Once a sensor is selected, the required sensor card number and how it should be wired are displayed.

If you are unfamiliar with using the sensor, consult the Applications section for specific guidance and points to watch. Alarms are also configured from the channel tabs. Some sensor types have Calibration buttons that appear below the selection lists.

11.8.3. Sensor calibration

Some sensors, in particular those for water level, require up to 3 additional parameters before they can be configured. The Calibration button displays a form where these values can be entered.

In addition, the displayed units and number of decimal points in exported data can be changed from default values on this form.

More details on sensor calibration for specific applications can be found in the Applications section.

11.8.4. Dial outs

See section 11.5 for information about the dialling sequence.

11.9. Exporting data

11.9.1. Data File types

There are various file types than can be exported using Harvest. Each file type has a different format and method of displaying data. Other formats can be specified by the format parameter. These other formats are generally reserved for custom third-party applications and are not described here.

11.9.2. CSV files

The default export format is CSV which can be viewed, manipulated and graphed in Microsoft Excel or compatible spread sheet software. This file type shows data in a simple, compact format. Below is an example of a CSV file and how it will display data from a single parameter ('channel') logger.

	A	B
1	Logger tag:	LEVEL
2	Logger description:	FROG
3	Channel tag:	Level
4	Channel no:	1
5	From:	13/11/2009 07:05
6	To:	13/11/2009 23:40
7	Number of records:	200
8	Isodaq Data File:	
9	Sensor units:	maSD
10	Latitude:	
11	Longitude:	
12	13/11/2009 07:05	0.118
13	13/11/2009 07:10	0.117
14	13/11/2009 07:15	0.118
15	13/11/2009 07:20	0.118
16	13/11/2009 07:25	0.118
17	13/11/2009 07:30	0.118
18	13/11/2009 07:35	0.118
19		

Example CSV of A single channel logger

Some types of data have built in support for viewing and downloading Totals derived from that data. These data types include rainfall data from Tipping Bucket Rain gauges, Vaisala Weather Stations and OTT Pluvio weighing principle rain gauges.

In addition to rainfall any Derived Daily Totals channel in the logger configuration will have these additional Totals options (See section "Derived Daily Flow Totals from Water Level"). The user will receive an additional CSV displaying those totals. The totals can be exported in the following ranges:

Minute, Hourly, Daily, Weekly and Monthly.

11.10. Reconfiguration

Before you reconfigure your logger, check the following:

- That you have already read the data from the logger, if you need it, and stored it safely.

- The system clock on your PC or hand-held is correct: this is used to set the time in the logger.
- If your PC is using battery power, ensure the batteries are OK: if the reconfiguration fails half-way through the logger will be left in an unknown state.

If these conditions are met, press Proceed. Final confirmation that you wish to erase the logger is requested, then the logger is re-configured.

The reconfiguration has succeeded if the new logger parameters are displayed on screen. Check these before you leave site to ensure that they are what you meant them to be.

11.11. Sending Commands

There are a number of commands in Harvest that can be sent to a STORM Guardian outstation. These commands can be accessed by selecting Access Outstation and then choosing Send Command. Additional commands are available by selecting the Advanced Commands option.
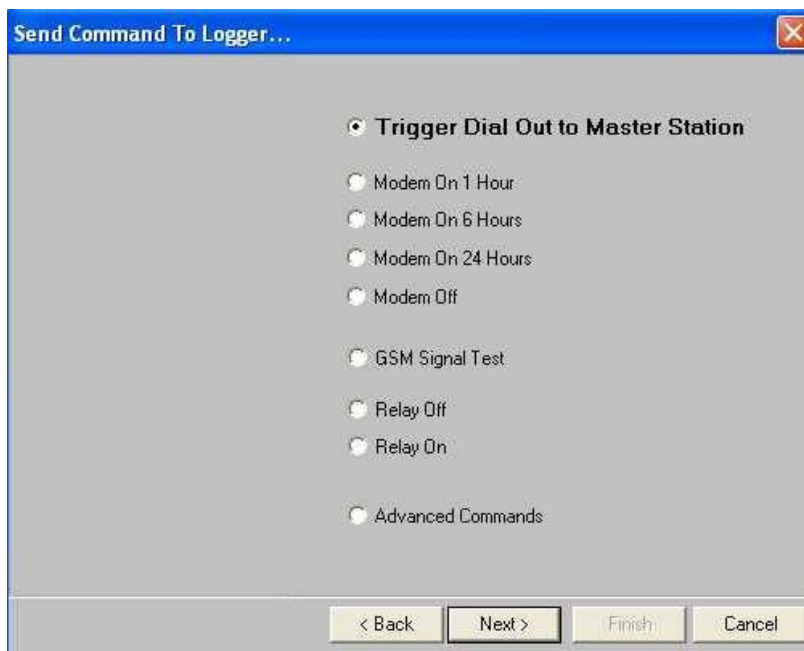
Sending a command to a STORM Guardian

The following table summarizes the commands that are relevant to a STORM Guardian.

Command	Description
Trigger Dial Out To Master Station	Forces outstation to dial-in to phone numbers in Timeswitch dial list
Modem On 1 Hour	Leaves outstation modem switched on for the next 1 hour.
Modem On 6 Hours	Leaves outstation modem switched on for the next 6 hours.
Modem On 24 Hours	Leaves outstation modem switched on for next 24 hours.
Modem Off	Switches outstation modem off.
GSM Signal Test	Runs GSM signal survey
Acknowledge Alarms	Acknowledges any unacknowledged alarms on the STORM Guardian.
Power Fail	Simulates power failure condition.
Battery Alarm Test	Simulates a low battery condition.
Read Channel	Continuously reads specified channel, returning up to date current values.

11.12. Monitor Communications

You can monitor the modem communications of a STORM Guardian using the Start Wizard/Advanced Logger Options/Monitor Comms option. Select the COM port that the outstation is connected to and you will see details of incoming and outgoing modem calls.

Note, you will only see commands and data sent to the modem by the STORM Guardian.

11.13. Upgrade Logger Firmware

You can upgrade the firmware of a STORM Guardian using the Start Wizard/Advanced Logger Options/Upgrade Logger Firmware option. When upgrading logger firmware, select the correct Logger Type. If you select Identify Device before upgrade,

Harvest will automatically check that the device is of the correct type and if the firmware upgrade is necessary. If you select Restore Configuration After Upgrade, the logger will be read

before the upgrade and reconfigured after the upgrade, automatically re-synchronizing the logger clock.

12.   Reed Switch Details

Switching contact closure time is typically less than 100 milli-seconds for 0.2mm of rain (N.B. closure time will be faster for 0.5 mm of rain).

Maximum current rating	300 mA
Breakdown voltage	200 V D.C. minimum
Contact resistance	150 mW
Insulation resistance	109 W
Capacitance open contacts	0.2 pF
Life	106 operations.

Reed switch connections are made via a 2 way terminal block (see Figure 5).
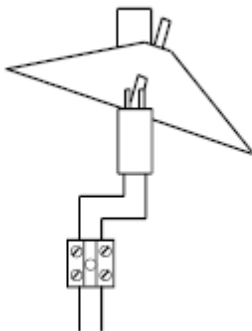
Connections for reed switch

13.   Servicing

To ensure its conformity with the specification, this instrument is thoroughly inspected and its accuracy verified prior to dispatch. Test information is filed under the instrument serial number, which should, therefore, be quoted in any correspondence.

Casella undertake to rectify any defect in the instrument that is directly attributable to faulty design or assembly, and which becomes apparent during the warranty period. In order to take advantage of this warranty, the instrument must be returned, carriage paid, to the Casella factory or accredited agent, where necessary repairs will be carried out.

The warranty period runs for 12 months from the date of receipt of goods, with exceptions on certain specialised components supplied by other manufacturers which may be warranted for shorter or longer periods by their actual manufacturers. In all such cases, the benefit of these undertakings will be passed on to the user.

Casella's liability is limited to items of their own manufacture, and they do not accept liability for any loss resulting from the operation or interpretation of the results from this equipment.

To obtain repair under warranty or for servicing, the instrument should be packed and returned in its original packing or an equivalent to the Service Department at Bedford. Insure to full value and ship pre-paid.

For repair or service outside the United Kingdom, please return to our appointed distributor. Please include a letter giving full details with your packing list. It should contain the following information:

- Instrument Type(s) and Serial Number(s),
- Customer name and address,
- Contact name and phone number,
- Details of any PC and Software involved, including Version Number(s),
- Reason for returning the equipment with a detailed description of the fault,
- List of any error messages that may have been displayed.
- The necessary adjustments or repairs will be carried out, and the instrument returned as soon as possible.

14.   Specification

Bucket size:	0.1mm, 0.2mm, 0.5mm
Aperture:	400 cm2
Accuracy:	±2% at 1 litre/hour
Transducer:	Magnet/Reed switch
Operating temp range:	1°C to 85°C
Weight:	4.5Kg
Battery life:	Up to 7 years

15.   Ordering Information

Part Number:	Description:
0.1mm	103771D
0.2mm	103772D
0.5mm	103775D

Accessories

Battery single cell	B158
Replacement logger	LOG8