

kelman



REZAP Fault Master

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L.V. Solutions

Introduction

The **REZAP** is the leading low voltage cable fault auto-recloser in the UK. The **REZAP Fault Master** is the latest and most advanced version of the **REZAP** unit, building upon established features while adding powerful new communications and reporting tools.

The **REZAP Fault Master** has been designed as a scalable platform on which new fault management and fault location technologies can be built.

Benefits of using **REZAP Fault Master** include:

Reduce response times

- *real-time information sent to engineers*
- *restoring power fast via remote operation*
- **REZAP** lockouts avoided by 'Auto Reset'
- *removing dependence on customer notification of outage*

Reduce engineer workload

- *reducing the number of site visits*

Identify overload conditions

- *continuously logs load current*
- *distinguish between faults and overloads*

Aiding fault location

- *mobile phone controller*
- *fault-thumping mode*
- *data logger*
- *ability to prevent phase-phase re-close*
- *single ended fault location capability*

Find lost REZAP FM units

- *GSM based location service*

Managing the LV network

- *region and substation based data management*
- *easily see active **REZAP FM** units*
- *view fault history*

IIP reporting

- *reports outages and customer minutes lost by region or substation*

Investing in the future

- *the **REZAP Fault Master** architecture is designed for scalability*

REZAP FM

Fault Location

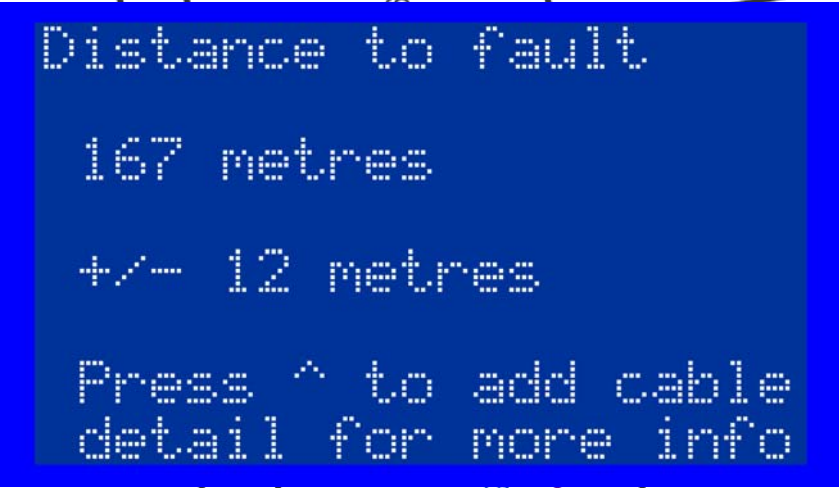
Fault Location

Using years of experience, Kelman has developed sophisticated single ended fault location algorithms. Using impedance to fault calculations combined with patented fault location theory, the **REZAP Fault Master** can estimate the distance to a fault.

All the voltage and current data needed to provide a distance to fault estimation is gathered by the **REZAP FM** when installed onto a feeder with a fault condition.

The estimated fault location is given on the **REZAP FM** display to the staff on site, and can be used on both permanent faults and on intermittent faults.

Using the estimation given by the **REZAP Fault Master**, it is usually easy to narrow the field of the search to less than 15% of the cable network. The results can be used to start excavation right away, or to enable a targeted installation of **DELTA V** fault location technology.



Distance to fault
167 metres
+/- 12 metres
Press ^ to add cable
detail for more info

Above: A typical fault location result on the LCD display of the **REZAP Fault Master**.

REZAP Fault Master

Features

Data Logger

The **REZAP Fault Master** has a data logger that will record voltage and current waveforms when triggered on over current or under voltage using programmable levels set with the **REZAP Connect** software.

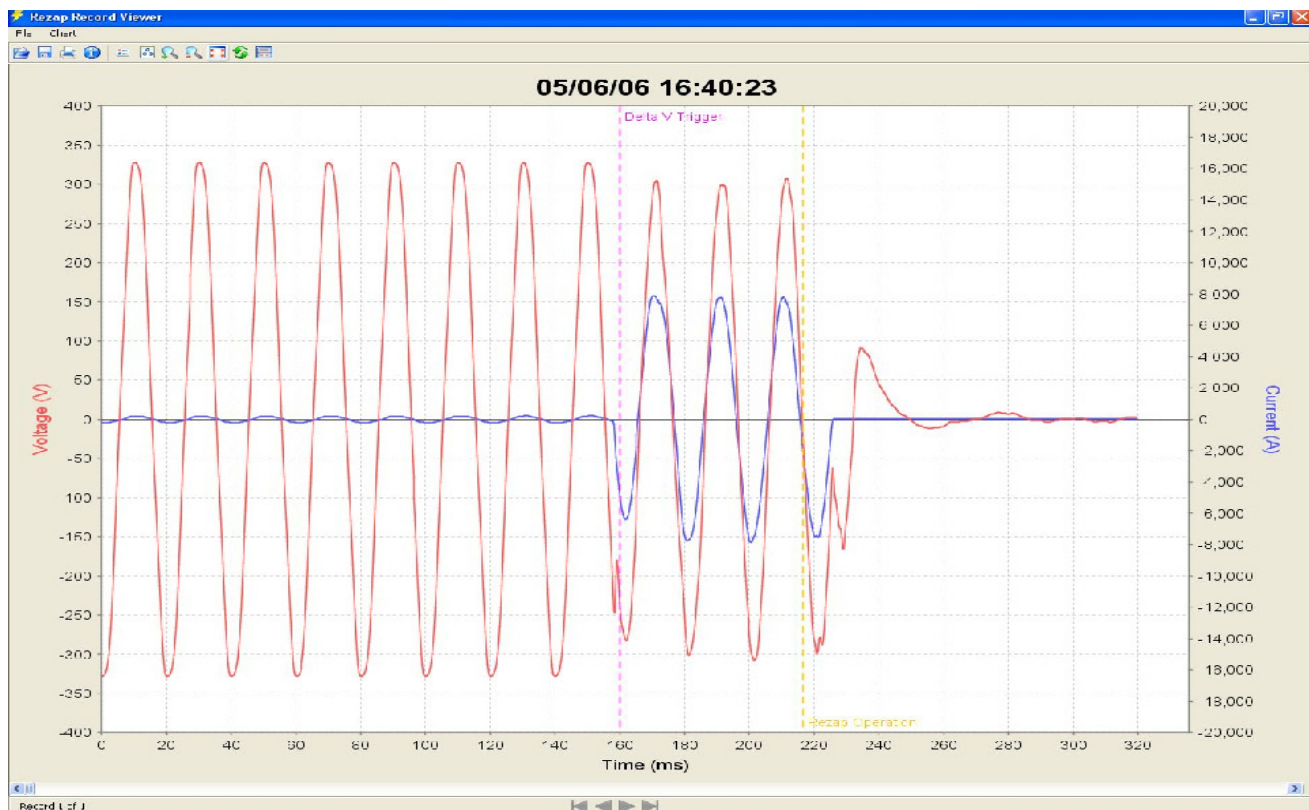
The information from the data logger can be used to determine the severity of the fault and to estimate if the fault is close in to the substation, or lies further out on the feeder. The information is loaded directly from the **REZAP Server** and can be saved to a local file to e-mail and print. The data can also be saved into a CSV formatted file.

Load Profiler

The Load Profiler built into the **REZAP Fault Master** takes an average reading of the current flowing over each hour, as well as additional readings. **REZAP** Load Profiler software displays these readings for the last few days, allowing an engineer to determine if a fuse is blowing due to intermittent fault activity or overload conditions.

Message Forwarding

SMS and e-mail messages can be sent to engineers and other staff when a fault becomes active. Messages can be sent from individual installations or from an entire area. It is possible to set up message rules while the **REZAP Fault Master** is powered off.



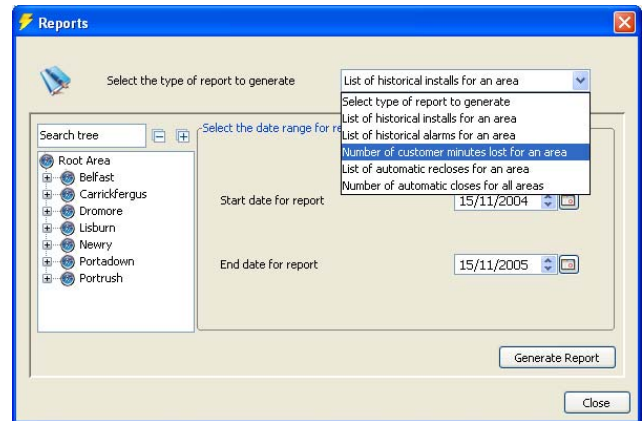
TTL Auto Reset

The **REZAP Fault Master** Trips to Lockout (TTL) counter can be automatically reset to the default value after a specified period of fault inactivity. This will reduce the number of times an engineer will need to attend to their **REZAP Fault Masters**, but will ensure that adequate protection is provided for highly active faults.

Location Service

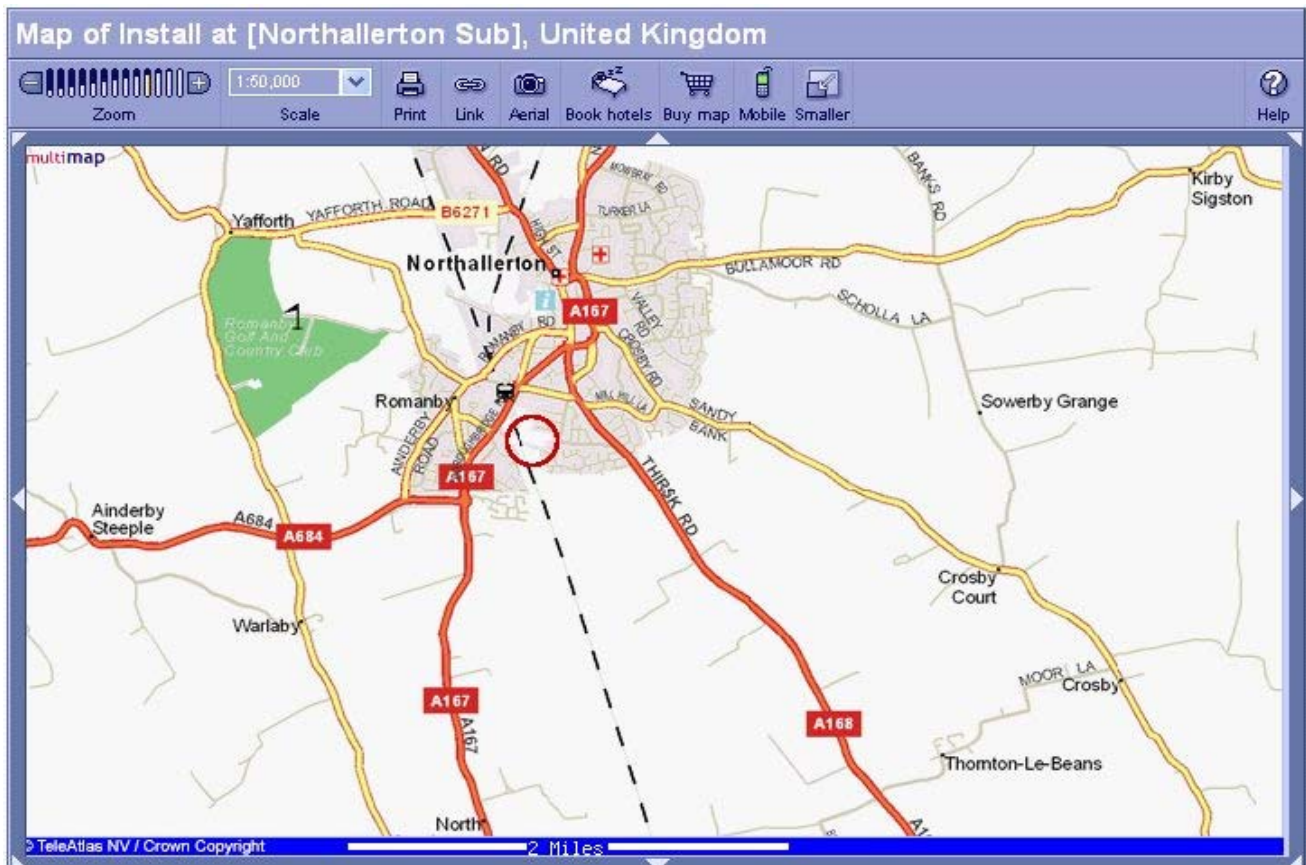
When a **REZAP Fault Master** is installed and closed, it will request a GSM based location lookup. The result from this is stored on the **REZAP** Server, and can be accessed through the **REZAP** Control Centre Software.

Below: a map of the installation area of a **REZAP FM**



Reporting

Control Centre software can be used to create reports about fault activity. It can collate information like CML's for substations, regions and individual **REZAP Fault Masters**. This is useful for gathering information for IIP reporting.



Fault Management REZAP

Control Centre Software

REZAP Control Centre software

The **REZAP** Control Centre Software is used to manage the fleet of **REZAP Fault Master** units installed on your distribution network. **REZAP** Control Centre allows you to filter information by area, by substation or by individual installation.

Events and Records that a **REZAP Fault Master** has generated can be viewed, along with Alarms and Warnings from new events. The Control Centre software can be installed on computers across your organisation, and can connect to the information held on the **REZAP** Server via a LAN, WAN or internet connection. Information from **REZAP Fault Master** units is stored as events. The **REZAP** Control Centre allows staff to look at the events to see what activity there has been since the **REZAP** was installed.

The screenshot displays the REZAP Control Centre software interface. On the left, a tree view shows the network structure, including regions like Lakeland, Lancashire, and Manchester, with various substations listed. The main area is divided into two tables: 'Events' and 'Alarms'.

Events Table:

Number	Asset	Install	Timestamp	Category	Event	Origin	Chan
54857	92-0103	Devron Mill	Thu Sep 21 16:47:14 BST 2006	Breaker Close	Auto re-close	Internal	0
54855	92-0103	Devron Mill	Thu Sep 21 16:46:44 BST 2006	Power	Power on Bus	Internal	0
54846	92-0103	Devron Mill	Thu Sep 21 15:34:59 BST 2006	Power	Power off Bus	Internal	0
54850	92-0103	Devron Mill	Thu Sep 21 15:34:59 BST 2006	Breaker Open	Backup-active Trip	Internal	0
54834	92-0103	Devron Mill	Thu Sep 21 13:28:23 BST 2006	Breaker Close	Auto re-close	Internal	0
54831	92-0103	Devron Mill	Thu Sep 21 13:27:53 BST 2006	Power	Power on Bus	Internal	0
54826	92-0103	Devron Mill	Thu Sep 21 13:19:29 BST 2006	Breaker Open	Backup-active Trip	Internal	0
54822	92-0103	Devron Mill	Thu Sep 21 13:19:28 BST 2006	Power	Power off Bus	Internal	0
54815	92-0103	Devron Mill	Thu Sep 21 12:51:09 BST 2006	Breaker Close	Auto re-close	Internal	0
54812	92-0103	Devron Mill	Thu Sep 21 12:50:39 BST 2006	Power	Power on Bus	Internal	0
54807	92-0103	Devron Mill	Thu Sep 21 12:39:28 BST 2006	Breaker Open	Backup-active Trip	Internal	0
54802	92-0103	Devron Mill	Thu Sep 21 12:39:27 BST 2006	Power	Power off Bus	Internal	0
276	92-0106	[unknown substation]	Wed Sep 20 21:43:16 BST 2006	Settings	Rezap protection rating changed	Local	0
277	92-0106	[unknown substation]	Wed Sep 20 21:43:16 BST 2006	Settings	Protection settings changed	Local	0
275	92-0106	[unknown substation]	Wed Sep 20 21:43:15 BST 2006	Settings	Reclose settings changed	Local	0
272	92-0106	[unknown substation]	Wed Sep 20 21:09:40 BST 2006	Breaker Open	Manual Trip	Local	0
265	92-0106	[unknown substation]	Wed Sep 20 21:04:48 BST 2006	Breaker Close	Manual re-close	Local	0
263	92-0106	[unknown substation]	Wed Sep 20 21:04:38 BST 2006	Settings	Trip to lockout counter reset	Local	0
258	92-0106	[unknown substation]	Wed Sep 20 21:02:52 BST 2006	Power	Power on Mains	Internal	0
259	92-0106	[unknown substation]	Wed Sep 20 21:02:52 BST 2006	Warning	No bus power or Fuse blown	Internal	0
253	92-0106	[unknown substation]	Wed Sep 20 18:26:24 BST 2006	Power	Power Off	Internal	0
250	92-0106	[unknown substation]	Wed Sep 20 18:25:56 BST 2006	Breaker Open	Manual Trip	Local	0
227	92-0106	[unknown substation]	Wed Sep 20 18:23:06 BST 2006	Breaker Close	Manual re-close	Local	0
223	92-0106	[unknown substation]	Wed Sep 20 18:22:56 BST 2006	Settings	Trip to lockout counter reset	Local	0
217	92-0106	[unknown substation]	Wed Sep 20 18:22:06 BST 2006	Power	Power on Mains	Internal	0
218	92-0106	[unknown substation]	Wed Sep 20 18:22:06 BST 2006	Warning	No bus power or Fuse blown	Internal	0

Alarms Table:

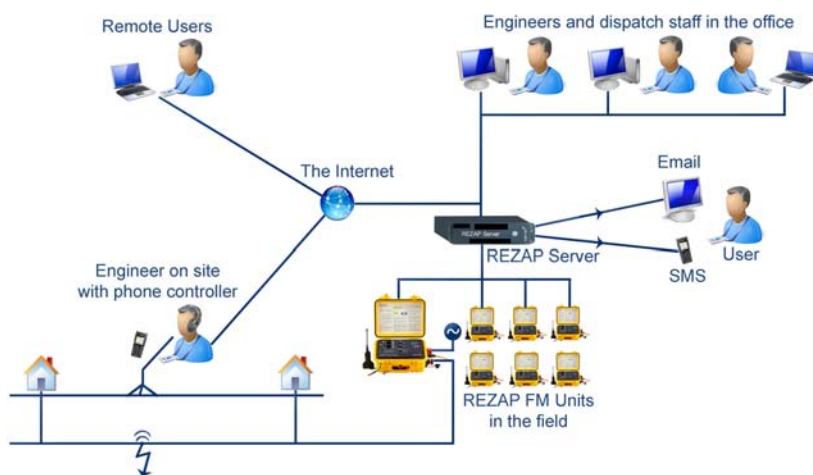
Alarm Type	Severity	Asset	Install	Raise Timestamp	Clear Timestamp
Unresponding REZAP	Warning	92-0106	[unknown substation]	Fri Sep 22 09:43:30 BST 2006	
No Bus	Warning	92-0103	Devron Mill	Thu Sep 21 15:34:59 BST 2006	Thu Sep 21 16:54
Power off	Warning	92-0103	Devron Mill	Thu Sep 21 15:34:59 BST 2006	Thu Sep 21 16:54
Auto trip	Alarm	92-0103	Devron Mill	Thu Sep 21 15:34:59 BST 2006	Thu Sep 21 16:54
Auto trip	Alarm	92-0103	Devron Mill	Thu Sep 21 13:19:29 BST 2006	Thu Sep 21 13:2
No Bus	Warning	92-0103	Devron Mill	Thu Sep 21 13:19:28 BST 2006	Thu Sep 21 13:2
Power off	Warning	92-0103	Devron Mill	Thu Sep 21 13:19:28 BST 2006	Thu Sep 21 13:2
Auto trip	Alarm	92-0103	Devron Mill	Thu Sep 21 12:39:28 BST 2006	Thu Sep 21 12:5
No Bus	Warning	92-0103	Devron Mill	Thu Sep 21 12:39:27 BST 2006	Thu Sep 21 12:5
Record trigger	Warning	92-0103	Devron Mill	Thu Sep 21 12:39:27 BST 2006	Thu Sep 21 12:5
Power off	Warning	92-0103	Devron Mill	Thu Sep 21 12:39:27 BST 2006	Thu Sep 21 12:5
Manual trip	Warning	92-0106	[unknown substation]	Wed Sep 20 21:09:40 BST 2006	
Locked out	Alarm	92-0106	[unknown substation]	Wed Sep 20 21:09:40 BST 2006	
Breaker failure	Alarm	92-0106	[unknown substation]	Wed Sep 20 21:05:41 BST 2006	
Power off	Warning	92-0106	[unknown substation]	Wed Sep 20 18:26:24 BST 2006	Wed Sep 20 21:4
Manual trip	Warning	92-0106	[unknown substation]	Wed Sep 20 18:25:56 BST 2006	Wed Sep 20 21:4

At the bottom left, there is a 'Network Server Status' section showing 'Network operator: Vodafone' and a 'Signal strength' indicator with a bar graph.

Remote Communications

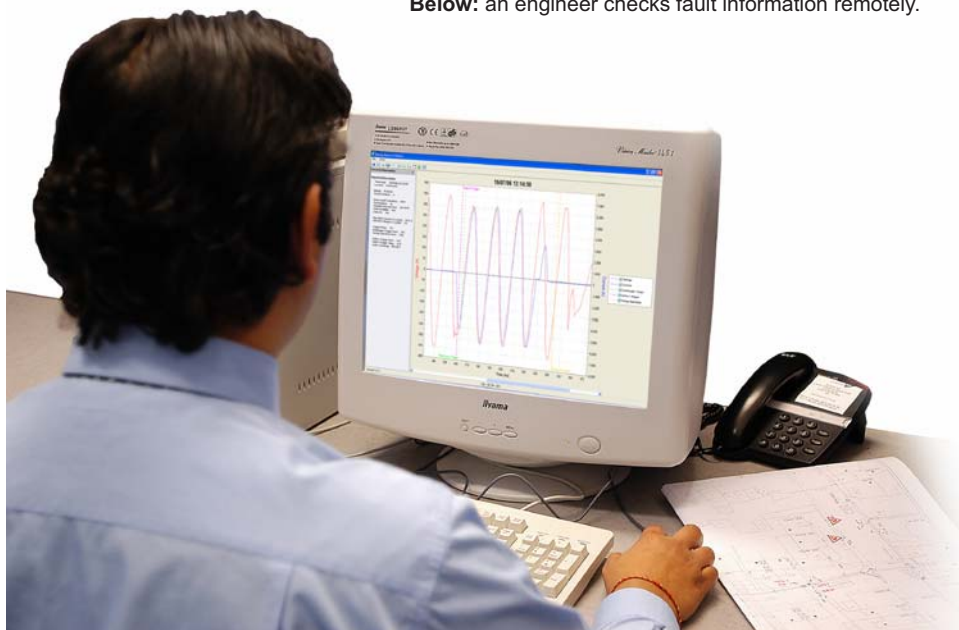
Overview

The **REZAP Fault Master** is equipped with a comprehensive communication system. Using a GPRS Enabled SIM Card, the **REZAP Fault Master** sends data from the field to a server via the internet. The server forwards the information to the appropriate staff by SMS message and e-mail.



Above: an overview of the REZAP FM communications infrastructure.

Below: an engineer checks fault information remotely.



REZAP Server

The **REZAP Server** is the backbone of the **REZAP** communications infrastructure. It receives information from **REZAP Fault Masters** in the field. Information is stored against the substation name and location, and is forwarded to staff who have requested information to be sent to them via SMS and e-mail.

The server also allows engineers to remotely configure and operate the **REZAP FM** from their laptop or office computer using Connect Software (pages 9 & 10).

*Note that a **REZAP Server** is required to avail of **REZAP Fault Masters** communications dependant features.

They can also look at data from the Datalogger using Record Viewer software (page 4) and determine if outages are caused by faults or overloading using the Load Profiler software (page 4).

Engineers and Admin staff can check the information coming from active **REZAP** units using Control Centre software (pages 6 & 7).

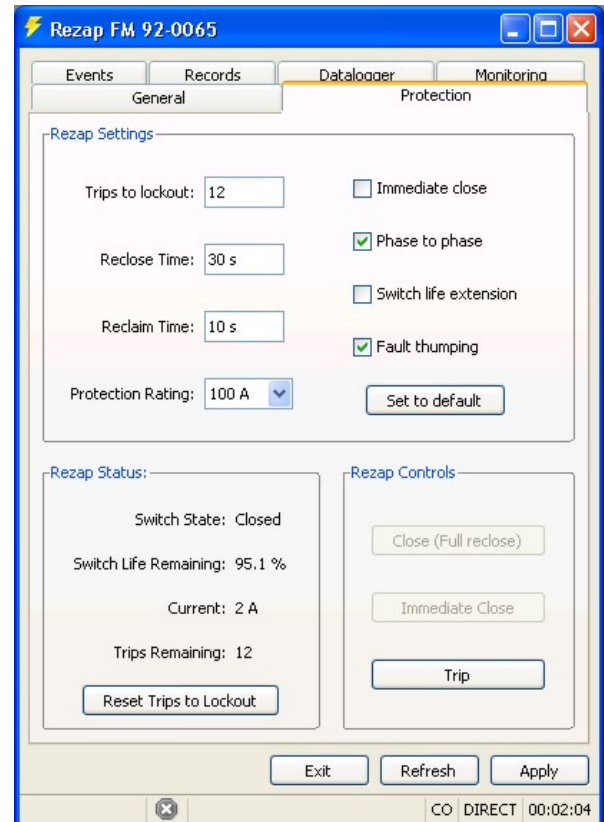
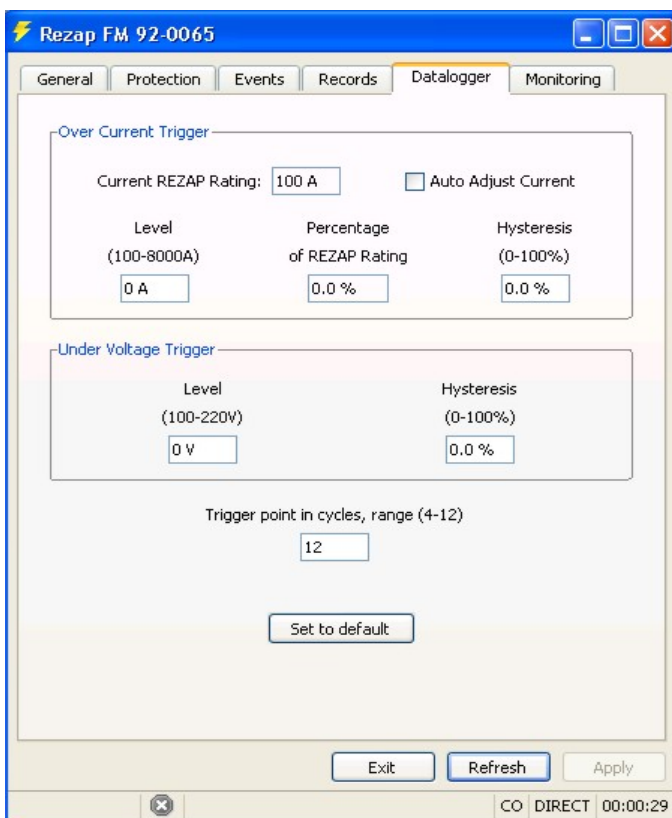
Remote Operation

REZAP Connect

The **REZAP** Connect software allows an engineer to configure and operate the **REZAP Fault Master**. The software can connect to the **REZAP Fault Master** remotely using the GPRS antenna via the internet, or directly using the provided serial connection cable.

Reducing Engineer Workload

Remote operation can save many trips to site when simple configuration settings are to be changed or a reclose operation is to be attempted after a fault condition has led to lockout.



Above: The protection tab allows an engineer to configure the **REZAP FM** Settings, monitor the real-time status, and trip and close the **REZAP FM** remotely.

Left: The datalogger set-up screen allows the user to configure when a voltage and current record will be captured. This can be set to trigger on over current or under voltage, with programmable hysteresis to give reliable operation.

REZAP Configuration

Basic setup of the default Trip to Lockout settings, reclose and reclaim time, and the protection rating can all be configured remotely using the Connect software.

Connect software also provides important information about the condition of the **REZAP Fault Master**. It can read events and records stored in the **REZAP Fault Master** directly, and allows configuration of the datalogger and load profiler functions.

Fault Thumping and Mobile Controller

Fault Thumping Mode

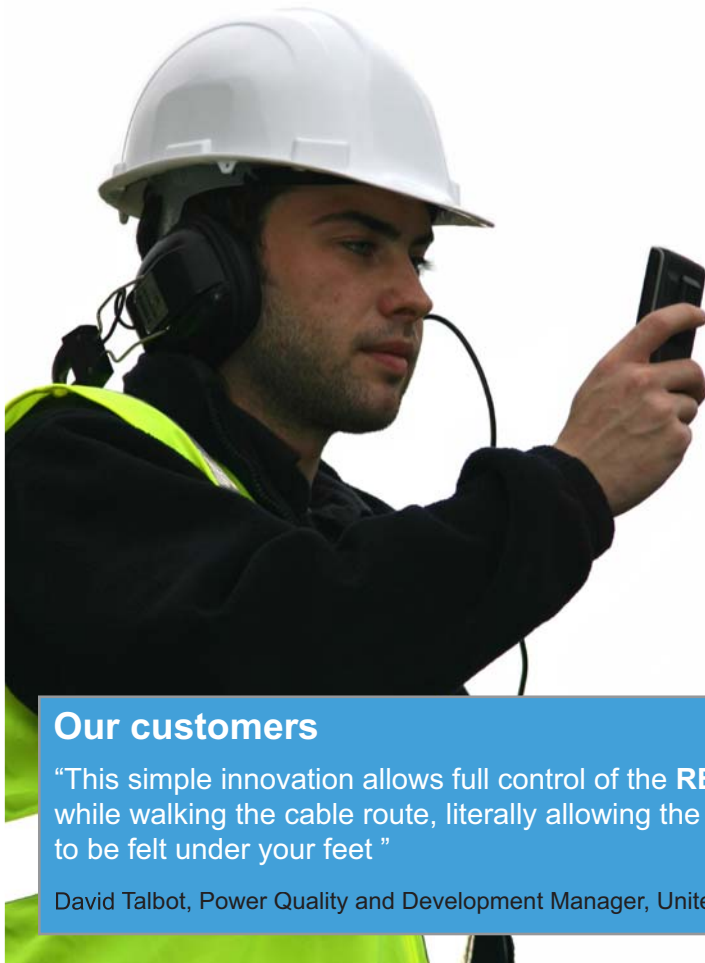
Once a fault has been conditioned and becomes permanent, it can be found by 'thumping'. To thump a cable, an engineer stands over the suspected fault location and the **REZAP FM** is closed onto the fault. If a loud 'thump' is heard from the ground, then the fault position has been found.

Fault Thumping Mode will allow approximately an extra 20% energy above the maximum fuse rating to pass, creating a louder 'thump' in the ground. This is especially useful when used in conjunction with the Mobile Phone Controller.



Mobile Phone Controller

An engineer can pair his mobile phone to the **REZAP Fault Master** in the substation, and then walk the cable route while controlling **REZAP** operation. Information about BUS and FEEDER voltage as well as instantaneous current can be seen on the mobile phone. It is possible to trip and close the **REZAP Fault Master**, as well as perform a Fault Thump type close from the engineers mobile phone.



Our customers

"This simple innovation allows full control of the **REZAP** while walking the cable route, literally allowing the 'thump' to be felt under your feet"

David Talbot, Power Quality and Development Manager, United Utilities



Specifications

REZAP Fault Master

Low Voltage cable fault auto-recloser specifications

Rated interrupting voltage:	415 V rms
Rated load current:	400 A rms 630 A rms (optional)
Maximum fault current breaking capacity:	16 kA rms
Maximum fault making capacity:	35 kA peak
Interrupting life @ 16 kA:	50 operations
Interrupting life @ load current:	10,000 operations
Maximum rating of series fuse:	500 A Class J (400 A unit) 710 A Class J (630 A unit)
Instantaneous operating time:	20ms from detection of over current, i.e. 1 cycle typical
Enclosure:	360x280x140mm, <10 kg
Temperature range:	-20 to +50 °C

REZAP Server (optional)

Using a **REZAP** Server the following are possible:

- ⚡ Communications features including SMS and e-mail alerts
- ⚡ Mobile Phone controller
- ⚡ Load Profiler
- ⚡ Report Generation
- ⚡ Remote configuration and operation
- ⚡ Automatic storage of fault history including events and records
- ⚡ REZAP Control Centre Software suite
- ⚡ Single Ended fault location

Only one **REZAP** Server is required per utility.

Future proof your company

The **REZAP Fault Master** and **REZAP** Server have been designed as a powerful platform to support new Kelman Low Voltage technology.

Related Products



DELTA V

LV Fault Location System

- Designed to eliminate intermittent faults
- Accurate fault location
- No interpretation of waveforms
- Limited cable data required
- Radio options



RETRACE

LV Phase and Feeder Identification System

- Extremely simple to use
- Reliable results
- Portable and lightweight



FUSEMATE

LV Fuse Replacement System

- Compact and reliable
- Suitable for pole-mounted fuses, link-boxes and substations
- JP and JS fuses
- No cables



RESTORE

Temporary LV Supply Restoration

- Safe temporary connection
- Quick LV supply restoration system
- Fail safe measures
- Portable and lightweight

For further information on any Kelman product, please contact Kelman at the address below.



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