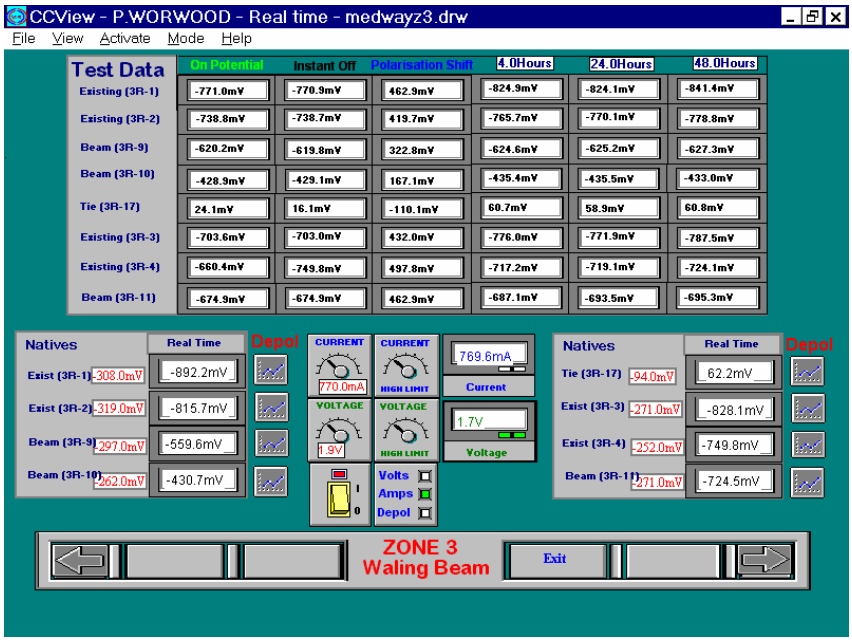
Remco Systems Limited
Intelligent Remote Monitoring and Control

4. Cathodic Protection Monitoring & Control



Remco Overview

remco has developed a complete range of monitoring and control equipment specifically designed for civil and structural engineering applications. These applications include:

- Cathodic protection monitoring and control
- Corrosion monitoring (Condition monitoring)
- Structural monitoring

The ***remco*** system offers a comprehensive and cost-effective solution to all remote monitoring and control applications. Key features of the system include:

- Flexible modular design provides economic solutions
- Proven fast network communications
- Monitoring of a wide range of sensors
- Alarm reporting to a range of network devices
- Operates under MS Windows (versions 98, 2000, Millennium, NT & XP)
- Customised presentation of live and historical data
- Data acquisition and reporting at operator specified intervals either manually or automatically at pre-scheduled intervals
- Supports operator friendly supervisor software with on-screen dynamic graphic displays

A comprehensive bureau service is also available whereby ***Remco*** will monitor and/or operate the monitoring system remotely and report to the Client at agreed intervals.

Cathodic Protection Monitoring and Control

The ***remco*** system has been successfully used for the remote monitoring and control of many different types of cathodic protection systems. The ***remco*** system can measure and record monitoring data from a wide range of sensors and devices, including:

- supply voltage and current to each cathodic protection zone
- potentials at embedded reference electrodes
- ambient humidity
- ambient temperature
- voltage attenuation
- isolated bar currents

The requirements for the successful operation and control of cathodic protection systems using the ***remco*** system are simply an IBM compatible office-based supervisory desktop or laptop supervisor personal computer (PC) with modem and communications software.

The ***remco*** system has the flexibility to allow data to be collected at operator specified intervals either manually or automatically at pre-scheduled intervals via the supervisor PC. Data may also be accessed locally on-site via the keypad or through a suitable RS232 communications port to enable a laptop to be linked into the system on-site. The ***remco*** system provides facilities for displaying data graphically or as customized reports. Data may also be retrieved in a file format suitable for export to a spreadsheet program for further analysis.

Monitoring and Control Capabilities. Precision Control from Integrated Power Supplies

The ***remco*** system uses integral fine control power supplies to achieve precise remote control of any cathodic protection system that it is installed as part of. The ***remco*** system allows separate control for each individual cathodic protection zone with full range adjustment capability for voltage and current outputs at pre-set values without affecting the other circuits in the installation.

The ***remco*** power supplies provide the extra low d.c. voltage supplies required to each cathodic protection zone and are suitable for connection to a 230 volt, single phase 50 Hz a.c. supply. Each power supply module provides independent and continuous control over the entire current and voltage ranges of each output channel within a safe terminal voltage.

The ***remco*** system has a battery back up system to maintain the memory of all data in case of power failure.

For cathodic protection systems, the ***remco*** system can be operated such that on a single interruption of the d.c. power supply to the selected cathodic protection zone, the "instant off" or decay potentials may be acquired for all the reference electrodes within that cathodic protection zone.

Alternatively, the ***remco*** system can be operated such that the power supply is interrupted simultaneously throughout the entire installation, therefore allowing global operation.

The ***remco*** system is also capable of monitoring the recovery potentials following reinstatement of the power supply.

Effective Management and Control of Monitoring Data

The ***remco*** system supports operator friendly supervisor software which operates under MS Windows with on-screen dynamic graphic displays. Graphic displays can be customised according to individual monitoring requirements to include both real time (live) and archive data information.

Typical monitoring data that may be recorded by the ***remco*** system for a cathodic protection installation may include:

- supply voltage and current to each cathodic protection zone
- potentials at embedded reference electrodes under the following conditions as part of performance monitoring:
- cathodic protection current on ("on" potential)
- cathodic protection current instant off,
  cathodic protection current off at operator specified intervals, typically at intervals of up to 48 hours after the cathodic protection current has been switched off.
  The calculated current density for the cathodic protection zone
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- the calculated potential decay; the difference between the cathodic protection current off at intervals of up to 48 hours off with respect to the "instant off" potential
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- the calculated polarization shift: the difference between the "instant off" potential and the native (rest) potential

In general operation, the ***remco*** system can allow the following operator enabled adjustments to be made:

- the date and time of the start of data acquisition
- the time interval of the start of repeated data acquisition
- the date and time of the completion of data acquisition

The ***remco*** system displays the operation status of the cathodic protection system as part of on-screen graphics display. Options for cathodic protection systems include displays indicating:

- Voltage control (constant voltage, variable current)
- Current control (constant current, variable voltage)
- Autopotential control
- Manual control
- Depolarisation (indicating the cathodic protection system is potential decay testing)

The ***remco*** system has a comprehensive in-built alarm reporting facility. Programmable control limits for automatic control allow alarm limits to be pre-set for the operational maximum and minimum limits of any of the following for alarm reporting:

- Current and/or voltage at the d.c. power supply
- the "on" potential at reference electrodes
- the "instant off" potential at reference electrodes
- the potential decay at reference electrodes
- Autopotential
- Average autopotential

Alarm events are recorded for type, time and date in a log. The log also records the identity of the respondent and the actions taken.

Adjustment events are recorded for time, date, operator identity and reason for adjustment.

Data may also be retrieved in an ASCII comma delimited file format suitable for export to a spreadsheet program for further analysis.

Powerful and Flexible Communications and Control Equipment for Networked Operation

Each cathodic protection system incorporates sufficient memory and communications capacity and capability to receive commands from a central control unit (UCC) to execute the regime of measurements to energize any probes and instruments, collect data in digital form and to transmit this data to a supervisor PC via a modem link.

The ***remco*** system is capable of monitoring the locally stored data and of automatically transmitting the stored data to a supervisor PC for archiving before the local capacity is exceeded. The UCC has sufficient microprocessor, memory, communications and battery back up capability to enable it to:

- ensure that no recorded data is over-written

The ***remco*** system provides comprehensive facilities for displaying data graphically. Typically, graphs may be produced based upon any of the following options:

- acquired data against time of data acquisition
- manipulated data against time of data acquisition
- data from four or more output channels on a single graph
- a movable and scaleable time base
- communicate by modem link to a supervisor PC, to receive commands, transmit data from the monitoring system and re-set the memories when data transfer is confirmed
- facilitate real time communication between any part of the monitoring system and the supervisor PC such that real time data can be view at the supervisor PC
- provides a suitable RS232 communication port to enable a laptop to be linked into the system on-site, to allow full access for local operation and control at the monitoring station
- operate an in-built alarm system

TECHNICAL SPECIFICATION AND SCHEDULE

MONITORING EQUIPMENT	
Resolution	± 1 mV at 2000 mV scale, ±10 mV at 2000 mV scale - accuracy of at least 0.15%
Input impedance	>100 M.ohm
Monitoring at reference electrodes	Range for potentials: -2000 mV to +2000 mV
Monitoring of ambient humidity	Range: 10-90% RH, accuracy of ± 1% RH
Monitoring of ambient temperature	Range: -20°C to 60°C, accuracy of ± 1°C
Control capability	Constant voltage, variable current at step increments of max. 0.1 volts Constant current, variable voltage at step increments of max. 0.1 amperes
Time interval for data acquisition	Variable: 1 second to 30 days
Local data capacity	> 3 months
INSTRUMENT AND CONTROL PANEL	
General	
Enclosure shell, fixings and mountings, access door(s)	Enclosure shell: high impact, heavy gauge, rigid plastic, IP65 protection to BS EN 60529 Corrosion resistant fixings and mountings (stainless or hot dipped galvanized steel to BS 729, threaded components - sheradised steel to BS 4921) Instrument and control panel components mounted onto a removable backboard Enclosure access door(s) with fitted door stays and tamper resistant locks
Typical components	Instrument and Control panel enclosure Low voltage a.c supply terminals Power supply modules Remco remote monitoring and control equipment Anti-condensation heating where necessary
SUPERVISOR SOFTWARE	MS Windows versions 98, millennium, 2000, NT & XP software compatible, offering a full graphical / text reporting and interrogation system. Management reporting and graph facilities, network expandable and security password protected. DDE links for Excel etc. included.
COMPUTERS AND PERIPHERALS	PC Type: Desktop Pentium P 1 or better, 14 inch Monitor and mouse Operating System: Microsoft Windows Supervisor Software One copy of Supervisor Software Excel DDE Link (Excel at extra cost) RAM: 32Mb minimum Hard Disk: 1 Gb minimum On board Modem, 14,400 bips minimum
MONITORING CAPABILITES	Availability of Outside Limits, High/Low Limits and Open/Short Circuits. Sensor alarms, Measured values, Logging, Limit Alarms, Remote Alarming, Remote printer, fax. Graphics, reports, graphing, archiving, cabinet control services.

TECHNICAL SPECIFICATION AND SCHEDULE (Continued)	
DATA ACQUISITION AND CONTROL UNITS	Microprocessor based device with on-board memory, full reporting and alarm facilities. Stand-alone capability, EPROM retained program with lithium battery back-up. Keypad option available, laptop connections typically included. Networking capability with intelligent inter-station communications.

Remco Systems Limited
Suites 12 & 14 Holland House
Bath Street
WALSALL WS1 3BZ
Tel: +44 1922 641444
Fax: +44 1922 621550
Email: remcoltd@aol.com

Information Sheets:

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5. Corrosion Monitoring (Condition Monitoring)