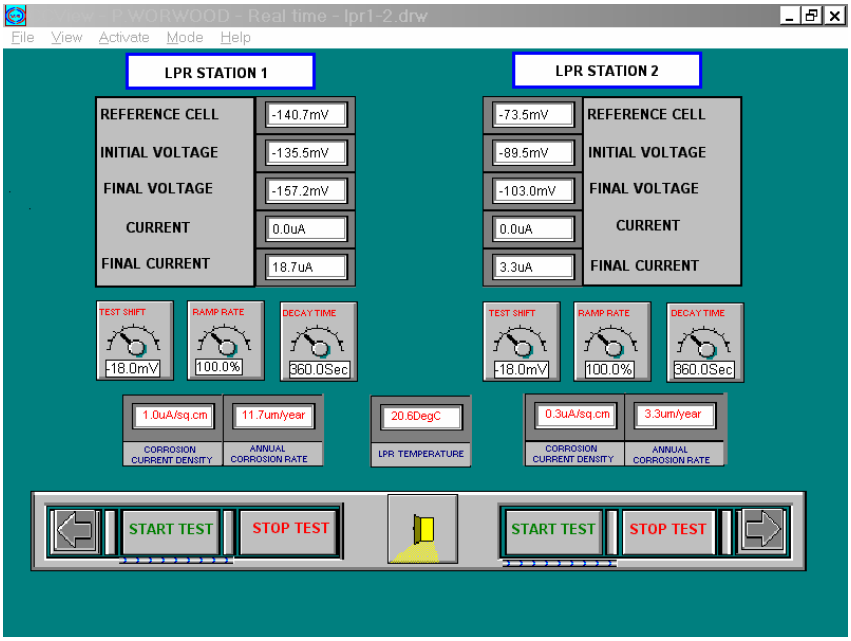
Remco Systems Limited
Intelligent Remote Monitoring and Control

5. Corrosion Monitoring



Remco Overview

Remco have 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, Millennium, 2000, 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.

Corrosion Monitoring

The ***remco*** system has been successfully used for the corrosion monitoring of many different types of structures. The ***remco*** system can measure and record monitoring data from a wide range of sensors and devices including:

- potentials at embedded reference electrodes
- ambient humidity
- ambient temperature
- equilibrium relative humidity and temperature
- resistivity measurements
- corrosion rate measurements

The requirements for the successful operation and control of a corrosion monitoring system 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.

Information Sheet 5.2

Monitoring and Control Capabilities.

Precision Control of Integrated Power Supplies

The ***remco*** corrosion monitoring system can comprise be a single or a group of corrosion monitoring probes and associated permanent data logging and microprocessor equipment. The monitoring stations may also include resistivity probes and/or other probes. Instrumentation to measure the air temperature and relative humidity may also be present as part of the monitoring system.

The ***remco*** system uses integral fine control power supplies to achieve precise remote control of any corrosion monitoring system that it is installed as part of. The ***remco*** system allows separate control for each individual monitoring station 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 monitoring station 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.

The ***remco*** system can be operated such that on a single interruption of the d.c. power supply, the power supply to individual monitoring stations or the entire installation can be interrupted for safety purposes.

Effective Management and Control of Monitoring Data

The remco system supports operator friendly supervisor software which operates under the 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 (historical) data and information.

The ***remco*** system can remotely monitor and control individual corrosion rate monitoring probes and is able to measure and record the following where appropriate for each monitoring location:

- the identity of each corrosion rate monitoring system and its associated probes and other instrumentation
- the concrete temperature and the resistivity at each area
- the reinforcing (or coupon) steel/concrete potential with respect to a standard reference electrode
- the current required to produce any desired potential (polarization) shift
- the value of the potential shift arising from the application of current

The ***remco*** system can calculate and report on any of the following where required:

- the corrosion rate at the time of measurement by the Linear Polarisation Resistance (LPR) technique
- the annual corrosion rate
- the electrical resistivity of the concrete
- the air temperature and relative humidity at each monitoring station

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 corrosion monitoring system as part of on-screen graphics. Options for corrosion monitoring systems include displays indicating:

- LPR measurement test in operation
- LPR measurement test completed
- Real time potential measurements of reference electrodes
- The ***remco*** system has a comprehensive integral 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:
- Potentials at reference electrodes
- Temperature and relative humidity
- Corrosion rate

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.

The ***remco*** system provides comprehensive facilities for displaying data graphically. Typically, graphs may be produced with 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 delimited file format suitable for export to a spreadsheet program for further analysis.
- a movable and scaleable time base. Data may also be retrieved in an ASCII comma

Information Sheet 5.3

Powerful and Flexible Communications and Control Equipment for Networked Operation

Each corrosion monitoring system incorporates sufficient memory and communications capacity and capability to receive commands from a central control unit (CCU) to execute the regime or measurements to energize all 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 automatically transmitting the stored data to a supervisor PC for archiving before the local capacity is exceeded. The CCU has sufficient microprocessor, memory, communications and battery back up capability to enable it to:

- ensure that no recorded data is over-written
- 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 viewed at the supervisor PC
- provides a suitable RS232 communication port to enable a lap-top to be linked into the system on-site, to allow full access for local operation and control at the monitoring station
- operates an in-built alarm system

TECHNICAL SPECIFICATION

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
Time interval for data acquisition	Variable: 1 second to 30 days
Local data capacity	3 months
Measurement of Polarisation	Variable: Anodic (+20 mV) to Cathodic (-20 mV)
Polarisation resolution	0.5 mV
Current Output	± 15 mA
Overall accuracy of measurements	<5%
Corrosion Rate Range	micrometres/year to 2.8 mm/year
Corrosion Current Measurement Range	0.05 mA/cm^2 to 10 mA/cm^2 for reinforcement sample sizes in the range of 10 mm^2 to 1000 mm^2, with an accuracy of ± 1%
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.

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Information Sheets:

1. Remco Overview
2. Intelligent Data Acquisition
3. Networked Solutions
4. Cathodic Protection Monitoring & Control
5. **Corrosion Monitoring (Condition Monitoring)**
6.