

GEMINI Range

Automated distribution solutions - towards smarter electrical networks

ENGINEERING BRILLIANT SOLUTIONS



Lucy Switchgear - systems provider

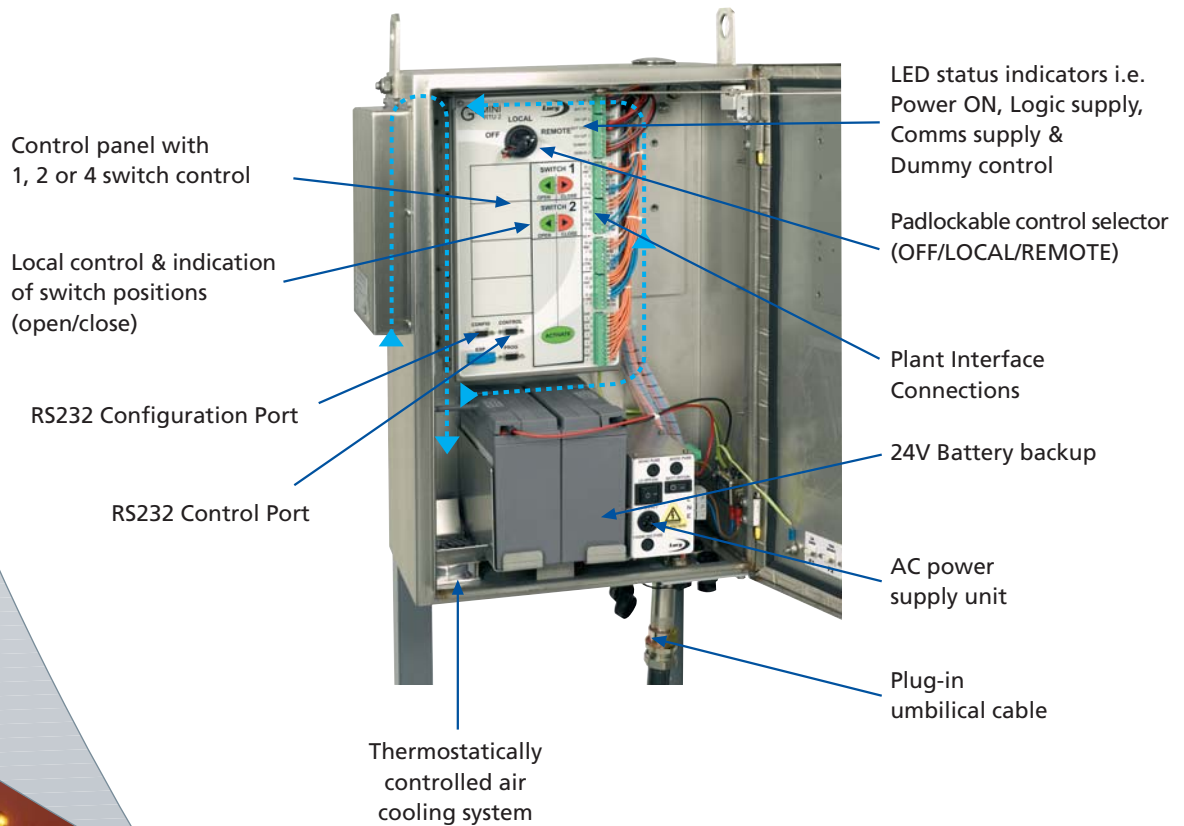
With years of experience in the design and manufacture of medium voltage switchgear, Lucy Switchgear can now offer a 'system solution' approach for the rapidly growing Medium Voltage (MV) network automation market.

Our key in-house development of the GEMINI-RTU 2 has enabled Lucy Switchgear to provide automated solutions for its range of RMU and pole-mounted switchgear. This systems approach has also been possible by the development of a number of 'building block' products that allows a secondary automation system to be devised. The GEMINI automation products are described in more detail in the subsequent pages of this brochure.

If you are looking for assistance in implementing an MV network automation programme, we can offer a number of complementary services to achieve your business objectives:

- System design and integration
- On-site installation and commissioning
- Technical support including spares and repairs
- Consultancy and comprehensive training

Compact G2-RTU

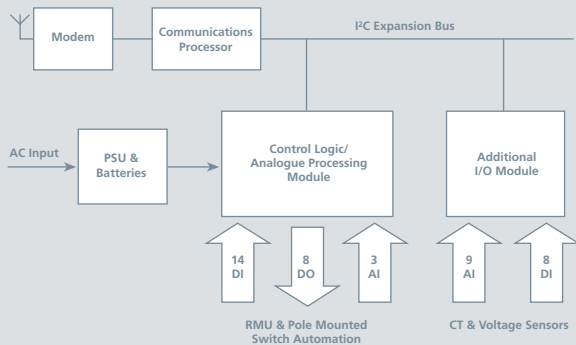


GEMINI-RTU 2

Lucy Switchgear introduces the second generation of the highly successful Gemini-RTU, namely the Gemini-RTU 2 or G2-RTU.

This multi-purpose Remote Terminal Unit (RTU) continues to provide the telecontrol interface for the Lucy Switchgear range of pole and ground mounted medium voltage switchgear. In addition, in its basic form, the G2-RTU can be sold as an OEM component part for integration to third party MV switchgear.

Gemini-RTU 2 System Architecture



Core Design

The G2-RTU is equipped with control electronics, communication module, battery back-up system and charger. The control electronics system consist of two core components, namely:

- Control Logic comprises a high performance PIC based processor handling power and I/O processing.
- Communication Module performs all the protocol and communication functions (including the automation sequencing) on a 68,000-based processor with a multi-tasking operating system.

All the configuration of the RTU database and communication parameters can be carried out locally using a laptop running the G2-RTU configurator utility or remotely from a master system.

Hardware Interfaces

The G2-RTU can support, as standard, up to 14 digital inputs (3 can be configured as analogue inputs) and 8 single digital outputs. All I/O is fully isolated together with the 12V, 3A DC dedicated supply for the communication device. For ease of removing the inner RTU enclosure for maintenance or upgrade, the I/O connections are plug and socket arrangements.

Three RS232 connection ports on the front panel are assigned to the configuration, re-programming and host port for the communication link. A fourth port allows the addition of further I/O modules (if required).

Local electrical operation can be performed via an Activate and Open or Close membrane push buttons (provided the padlockable control selector is in Local). For RMU applications, the G2-RTU is manufactured in a two or four switch control format. Each controllable circuit has an identifiable label adjacent to the control.

All Open/ Closed statuses of the switching functions are visible on the front control panel via LEDs and all controls outputs will momentarily illuminate when active. The control panel also includes a comprehensive array of LED indications for various RTU services.

Armoured connection to an external plant is achieved through the plug and sockets on the RTU gland plate and these significantly reduce the on-site installation times and potential errors.

Power Supplies

The RTU incorporates an auto-switching power supply unit for accepting AC inputs of 110 or 230V. This module also comprises an AC outlet for accessories such as laptop computers or communication devices.

Isolating switches for the AC and DC supplies provide independent control.

Battery Back-up System

Improved battery back-up design enables the G2-RTU to operate under AC input failure conditions for up to 48 hours (depending on the communication device e.g. GSM/GPRS modem). A pair of 12 year life, 12V SLA batteries support the RTU during this period and are supplied as standard. The G2-RTU provides a comprehensive and continuous condition monitoring facilities for the battery back-up system.

For very hot conditions, a high temperature batteries option is available upon request.

All battery connections are via a simple plug and socket arrangement.

Flexible Communications

The G2-RTU maintains its flexibility as a device that can support a host of different communication media including radio (low/ high power), RS232/RS485, packet data networks, GSM/GPRS, PSTN, Internet and fibre optic.

The software protocols to communicate with the host SCADA or master RTUs include the de-facto worldwide standards such as DNP3 and IEC 60870-5-101/4. Other protocols can be also be considered on request. This makes the G2-RTU connectivity to most systems seamless.

The G2-RTU is equipped with a universal mounting plate for the chosen communication device.

Key features

- Local and remote operation
- DNP3 and IEC 60870-5-101/104 protocols as standard - others on request
- Flexible communications interface - radio, RS232, RS485, Paknet, GSM, GPRS, PSTN, Bluetooth, optical fibre, TCPIP (Transmission Control Protocol/Internet Protocol). Supports SMS messaging
- Analogue monitoring (AI)
- Isolated digital inputs (DI)
- Digital control outputs (DO)
- Embedded automation sequencing (e.g. Auto-changeover and Auto-sectionalising schemes)
- 24V battery for continued operation under power failure conditions
- Monitoring (battery condition, temperature compensation, number of switch operations, automatic cooling system, gas pressure)
- Fully EMC and Environmentally tested



Optional Functions

The functionality of the G2-RTU can be further enhanced by the addition of the following options:

- Further I/O modules to increase the RTU I/O handling capacity (via I²C link)
- Fault passage module for detecting earth/overcurrent faults including general current monitoring
- LV maximum demand processing
- Standard or bespoke (on request) automation sequences embedded in the G2-RTU
- High temperature batteries

Controlled Environment

All the RTU electronics are contained within an inner enclosure inside the IP54 stainless steel cabinet and is suitable for use in outdoor hostile environments.

A thermostatically controlled ventilation system has been incorporated into the design of the enclosure to maintain an acceptable operating temperature inside the cabinet. The overall standing load of the RTU has been significantly reduced and the G2-RTU is a low power consumption device. The inner working temperature of the RTU can be configured as a reportable alarm.

Excessive dust settlement is reduced inside the RTU control cabinet by incorporating a unique baffle filter system on the air intake aperture.

The G2-RTU has been subjected to the latest rigorous and exacting **EMC and Environmental** test standards to ensure a most robust and reliable product.



Applications

As outlined earlier, the G2-RTU is a key component part of the automated MV switchgear offered by Lucy Switchgear and includes the following products:

RAPIER RX-RC - Remotely controlled air break switch disconnecter up to 36kV

RAPIER GX-RC/S - Remotely controlled gas enclosed load break switch or sectionaliser up to 38kV

SABRE RMU Range - Automated, SF6 insulated ring main units up to 24kV

TRIDENT RMU range - Automated, oil-insulated ring main units up to 15.5kV

Retrofit Actuators - For legacy oil/gas-insulated ring main equipment (Lucy or third party manufacture)

OEM RTU - For integration into 3rd party MV switchgear e.g. auto-reclosers



G2-RTU for ground mounted applications:

- Controls and monitoring for up to 4 motorised functions (ring switches or circuit breakers)
- Inbuilt earth and phase fault passage detection
- Supports up to 4 external fault passage indicators
- Current monitoring from analogue inputs and voltage sensing
- Embedded automation sequences such as Auto-changeover or Auto-sectionalisng
- RTU mounting options include wall, floor or switchgear



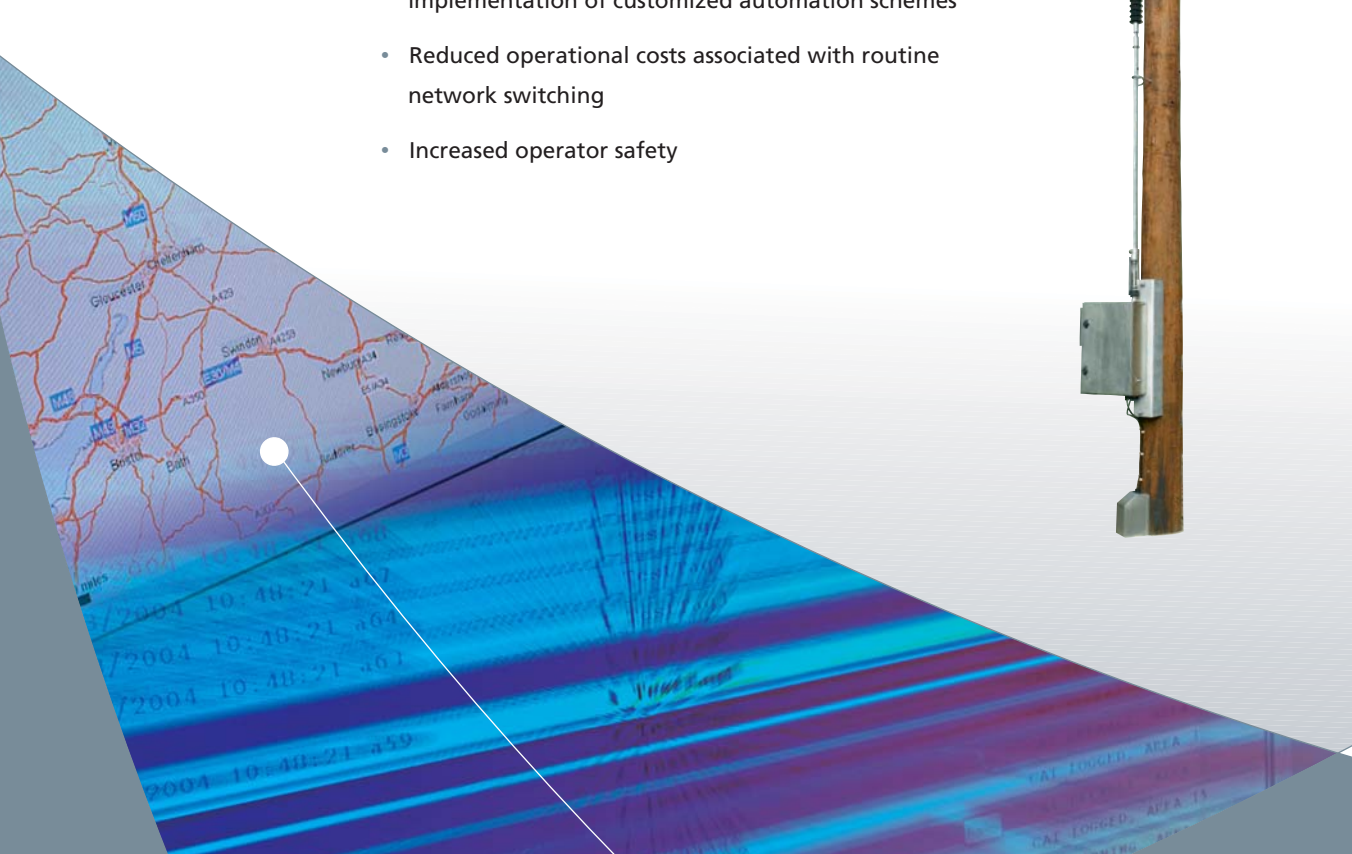
G2-RTU for pole mounted applications:

- Inbuilt low power actuator to drive air break switch disconnectors (RAPIER RX-RC)
- Supports retrofit fault passage indicator/current sensor (RAPIER RX-RC)
- Voltage sensing (RAPIER GX-RC/S)
- Sectionaliser functionality (RAPIER GX-RC/S)
- Pole mounted RTU

Key benefits of remotely controlled MV switchgear

The benefits to the network operator of implementing a programme of remote control and automation on their secondary distribution networks are significant and include:

- Reduced time in diagnosing system faults, locate and isolate the faulty section of network
- Faster response time and network reconfiguration resulting in a reduction in customer minutes lost (CML)
- Optimisation of asset management through the implementation of customized automation schemes
- Reduced operational costs associated with routine network switching
- Increased operator safety



GEMINI-DC Data Concentrator

Gemini-DC or Data Concentrator

The GEMINI-DC is a standalone device acting as a SCADA front end processor and performing key functions such as:

- Data capturing and monitoring
- Simple control of serial ports
- Protocol conversion
- Data concentration for transmission over Ethernet



Device Hardware

Housed in a compact enclosure, the GEMINI-DC comprises a PCU together with four serial ports and one 10 baseT Ethernet port. The serial channels can be configured as two RS 232/485 and two additional RS 232 only ports plus one Ethernet port. The serial communication interfaces supports speeds of up to 56kbytes.

Designed for substation applications, the GEMINI-DC operates on input power of 24 to 160V DC or 110/120V AC.

When acting as a Data Concentrator, the SCADA master communicates with the GEMINI-DC as if it were a single RTU with a large database of digital and analogue data points. This database is mapped to individual GEMINI-RTUs and IEDs, which communicate through the GEMINI-DC serial channels utilising radio or other communications devices.

When acting as a Protocol Converter, the GEMINI-DC can translate a number of protocols between serial/ Ethernet channels; these include the IEC 60870-5-101/104 and DNP3 communication protocols.



Easy to configure

Configuration of the system can be carried out centrally from the control centre using the graphic-based GEMINI Configurator Editor and application software.

Each communications port, serial or network, can be easily configured for a different protocol as well as for master or remote mode.

The software incorporates a comprehensive debug and monitoring feature, which allows problems to be identified and solved quickly.

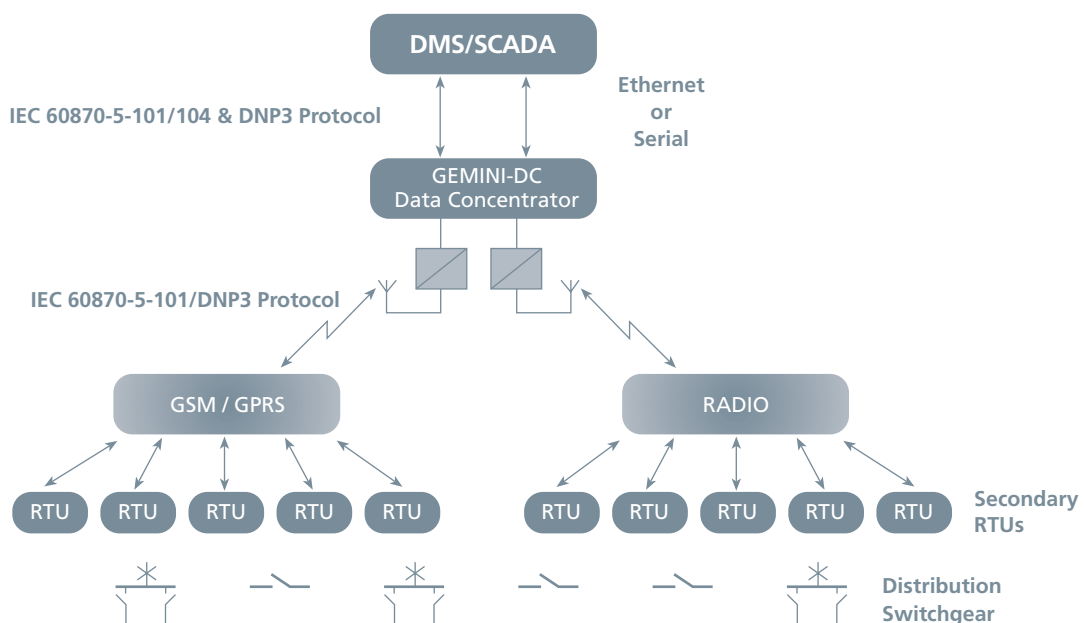


Key functions

- Protocol converter/translator: translates between legacy proprietary protocols and standard protocols
- Data concentrator: concentrates data from three slave channels, one master serial channel or four slave channels on LAN/WAN circuit
- Multi-port: allow multi-port access to single-ported device. Each host port can support a different protocol
- Network transport: add ethernet access to a serial port. Supports DNP3 LAN/ WAN, IEC 60870-5-101/104 and Modbus/TCP
- Byte transport: transport legacy bit-protocols over almost all serial communications media

Benefits

- Provides centralised and distributed processing of secondary nodes, thus preventing server overloads
- Allows multiple serial data streams to be combined into a single data hub for monitoring and control
- Minimises communication traffic with the master scada



GEMINI-SCADA Supervisory Control And Data Acquisition

Lucy Switchgear, as a system provider and integrator of Secondary Control Systems, offer consultation services and technical support to assist operators and managers with their automation projects. Working closely with your in-house expertise, our specialist automation team can offer cost-effective software solutions to assist you with the day-to-day management of your distribution network.

Architecture

Based on a high level SCADA programming language and field-proven Citect technology, the GEMINI software architecture combines flexibility and scalability.

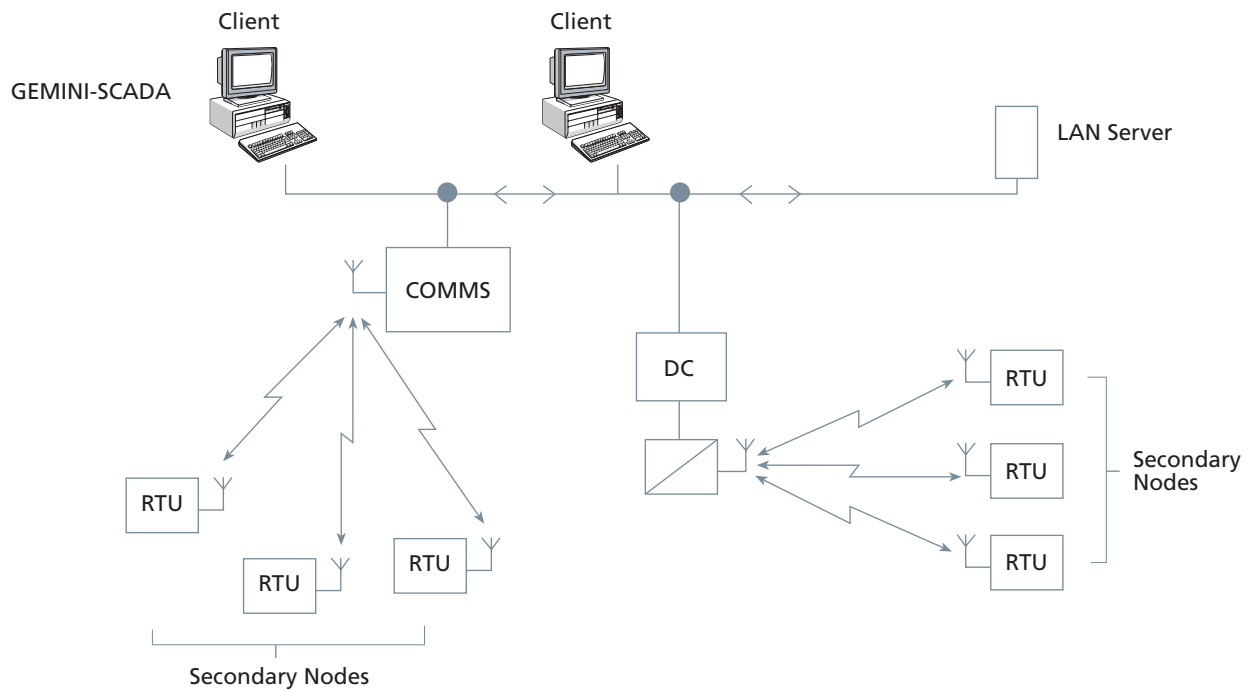
Lucy Switchgear can integrate to most existing SCADA systems or provide a standalone secondary SCADA system as part of a turnkey automation solution. Full technical support and training services are also available.



Key functionality

- Monitoring of fundamental system parameters such as voltage, current, switch status
- Event logging (switch operating times, date and time stamps)
- Event reporting (down time, fault duration calculation)
- Historical and real-time trending (all configured analogues are logged to historical files for analysis purposes)
- Advanced alarm management (fault identification, alarm condition monitoring and confirmation)





Easy to use GEMINI software package

The software uses either geographic maps of the network or customised single line diagrams of the remote substations to identify each switchgear equipment.

The high resolution user display/Human Machine Interface provides operators with valuable real-time information (i.e. current status, switch ID, analogue and digital I/O values) for asset management and control of strategic switching points on the network.

Based on an intuitive and user friendly operator interface, the GEMINI-SCADA is easily configurable to implement specific functions and sequencing such as Auto-Changeover or Auto-Sectionalising in the event of detection of total or partial voltage loss.

The GEMINI-SCADA software is centred on reliability with multi-level redundancy to ensure continuous and consistent operation of the SCADA system.

Other features

- Highly secured software with multi-level password protection
- Networking
- High RTU control capability
- Protocols capability: DNP3 and IEC 60870-5-101
- Communications media supported: radio, RS232, RS485, Paknet, GSM/GPRS, PSTN, Bluetooth, optical fibre, TCP/IP
- Multiple operating systems: Windows 98, NT, 2000, XP
- Multilingual capability

Specifications for GEMINI range

GEMINI RTU		
General	Enclosure	Stainless steel
	Degree of Protection	IP54
	Operating Temperature	-25 to 55°C
	Relative Humidity	Up to 95%
	Method of Mounting	Floor, wall, pole or RMU switchgear
	Dimensions	H 600mm, W 400mm, D 210mm
RTU Hardware	Processor Module	68000 Microprocessor
	Power Supply	110/ 230V AC supply
	Battery Type	2x12V DC, sealed lead acid batteries
	Battery Charger	Temperature compensated 50VA, fully protected
	Control Electronics	PIC based processor with expandable I ² C bus
	Inner Enclosure	Stainless steel
Inputs/ Outputs	Ventilation	Microprocessor controlled, long life fan with baffle air intake filter
	Digital Inputs	14 isolated digital inputs - expandable
	Digital Outputs	8 isolated digital outputs - expandable
	Analogue Inputs	3 CT analogue inputs as standard (DIs reduced to 11)
	Expansion I/O Module	9 CT analogue inputs, 8 digital inputs, 2 digital outputs
	Communications	Communication Interfaces
Protocols		DNP3, IEC 60870-5-101/104 & Modbus (others on request)
Communication Media		RS-232/ 485, UHF/ VHF radio, Packet Data, GSM/ GPRS, PSTN, Leased or Twisted Pair Lines, Optical Fibre, Internet (TCP/IP) & Bluetooth
Switchgear Interface	Controls	Membrane push-button for Open/ Close operations in conjunction with Activate push-button up to four switching functions (standard 1, 2 or 4 switch control formats)
		Selector control for Off, Local or Remote modes
	Indications	RTU services such as DC/ AC supplies, Dummy Control and Debug LEDs
		Switch status LEDs for Open/ Closed positions
		Control Output LEDs (illuminates when active)
Cables	Configurable LED indications	
Software	Configuration	Plug-in, multi-core umbilicals to switchgear
		Windows based software for configuration of:
		<ul style="list-style-type: none"> • Protocol parameters including device and I/O addresses • Parameters for the communications device • Parameters for digital, analogue and counter points • Automation sequences • Power saving routines • Battery tests
Environmental Standards	Environmental (Atmospheric)	EN 60068-2-1 Temperature Cold Heat
		EN 60068-2-2 Temperature Dry Heat
		HD 323.2.30 S3 Relative Humidity
	Environmental (Mechanical)	IEC 60255-21-1 Vibration
		IEC 60255-21-2 Shock
		IEC 60255-21-2 Bump
Electrical	IEC 60255-21-3 Seismic	
	EN 50093 Voltage Dip Immunity Test	
	IEC 60950-1 Dielectric	
EMC Standards		IEC 60950-1 Impulse Voltage
		EN 61000-4-12 Oscillatory Waves Immunity Test
		EN 61000-4-2 Electrostatic Discharge Immunity Test
		ENV 50140 Radiated Electromagnetic Field Disturbance Test
		ENV 50204 Radiated Electromagnetic Fields From Digital Radio Telephones Immunity Test
		EN 61000-4-4 Electrical Fast Transient/ Burst Immunity Test
		EN 61000-4-5 Surge Immunity Test
		ENV 50141 Conducted Electromagnetic Field Disturbance Tests
		EN 61000-4-16 Power Frequency Test
		EN 50081-2 Conducted and Radiated Emissions Test

Specifications for GEMINI range

GEMINI-DC		
Hardware	Processor	AMD Elan microprocessor
	Power	24 to 160V DC or 110/120V AC
	Temperature	0 to 70°C
	Watchdog Timer	Automatic restart in the event fatal hardware or software error
	Activity LEDs	Complete set of RS232 and Ethernet signal plus one software controlled communication LED per channel
	Dimensions	H 70mm W 260mm D 200mm
Software Configuration	Database	Off-line creation via Windows Utility, loaded through network or configuration/maintenance port
	Protocol	Selectable via channel
	Master/ Slave Mode	Selectable by channel
	RTU/ point count	Capacity for over 50,000 points and large number of devices
Communications	Serial	Four RS232 ports, one of which can be used for RS485 operation
	Network	10Base-T Ethernet port
	Maintenance	Separate configuration and maintenance port
Applications	Protocol Converter	Add new protocol capabilities to existing devices
	Multi-port	Allow multi-port access to single-ported device. Each host port can support a different protocol
	Network transport	Add Ethernet access to a serial port. Supports DNP3 LAN/WAN, IEC 60870-5-101/104 and Modbus/TCP
	Byte transport	Transport legacy bit-protocols over almost all serial communication equipment
	Data concentrator	Concentrate data from three slave channels, one master serial channel, or four slave channels on LAN/WAN circuit

GEMINI-SCADA		
Software	Development language	Citect
	Operating systems supported:	Windows 98, NT, 2000, XP
Communications	Protocols	DNP3 and IEC 60870-5-101/104 as standard (Others on request)
	Communications Media	RS232, RS485, UHF/VHF Radio, Paknet, GSM, PSTN, GPRS, Bluetooth, Optical Fibre, TCP/IP

APPLICATIONS

Ring Main Units and derivatives (FRMU, SABRE, Scimitar SFRMU and other third party RMU), Air Break Switches (Rapier RX), Enclosed SF6 Insulated Load Break Switches (Rapier GX), Auto-reclosers, other OEM components

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A global network

In association with industrial partners and contractors, Lucy Switchgear has established a global network operating in over 50 countries. Currently its 50 agents, joint venture associates and trading partners represent Lucy Switchgear products all over the world from Europe, the Middle East, the Far East, Africa, Australasia, Central America, the Caribbean to South America thus strengthening the Lucy presence globally.

With headquarters in Oxfordshire, UK, and a main regional office in Dubai, servicing the Middle East, the Lucy group is constantly looking to develop further partnerships.

