SIEMENS

ST950

Intersection controller

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ST950 Intersection controller

- Fully integrated UTMC OTU and MOVA 7 functionality
- Easy to use web based user interface
- Inbuilt live graphical site map
- Unique audible feedback of controller operation to ease on-street maintenance activities
- Multi-Language capability
- Local and remote user access
- LV (230V) and ELV (40V, 42V and 48V) lamp drive systems
- Up to 32 phases, 32 stages and 8 independent streams.
- Up to 240 digital inputs/ output lines
- Integral lamp monitoring of all phases and signal colours

The ST950 is the latest in a long line of highly successful intersection controllers from Siemens. Building on more than 30 years of microprocessor based traffic controller design, the ST950 family offers both familiarity and many exciting new user and maintenance features.
With integrated UTMC and MOVA functionality it offers great flexibility, providing Intersection, Pelican, Puffin and Toucan methods of control, at both LV (230V) and ELV (40V, 42V and 48V) output drive level options.

The controller family is compatible with the whole range of Siemens street-furniture, including Helios CLS LED traffic signals, LED nearside signals and LED wait indicators, which all offer significant power and cost savings compared with conventional incandescent solutions.

Fully integrated UTMC and MOVA 7 functionality

Using a powerful ARM microprocessor core, the ST950 is able to offer fully integrated UTMC and MOVA functionality utilising advanced IP communications to the central office, without the need for additional outstation equipment. Up to 4 MOVA streams and up to 64 detectors per MOVA stream are supported.

Each stream is configured using the familiar MOVA set-up program and communication with MOVA is achieved via an IP link using MOVACOM.

MOVA data-sets are able to be changed either locally or remotely without impacting the running controller on-street. A new MOVA mode is also provided by the controller, explicitly enabling MOVA control to be reported back to an associated instation system.

Full UTMC OTU functionality is also supported using the same principals and offering a similar user experience to that provided by the new Stratos Outstation, minimising user retraining.

The controller may be specified to include an additional 2U equipment rack, which neatly houses the chosen IP communication router or modem, providing for example, ADSL, Fiber or 3G communications to the central system.

Easy to use user interfaces

To simplify user interaction with the controller, the ST950 provides an extensive web browser interface which is accessible either locally or remotely. Offering a consistent style and where appropriate consistent functionality with the free standing GEMINI UTMC OTU, this interface is able to be accessed locally via a USB port on the controller CPU, via Ethernet (if a communications router is provided) or via a simple plug-in Wi-Fi interface module.

Related data items are conveniently grouped together so that data changes can be made with the minimum of page-changing. The interface fully manages the control of level 3 data items and will actively prevent these from being changed remotely (as required by TR2500), whilst ensuring that other changes are able to be made simply and efficiently.

The browser interface is capable of supporting multiple languages and new languages are able to be easily added to the system as required.

The interface also supports a live site map which shows the status of key items, such as phases and detectors in real time on a graphical representation of the site.

Signal heads may be shown as aspect displays or as STS representative symbols allowing users to easily appreciate the whole site operation in real time. Data for the map display may be configured locally or imported from the IC4 Emulator tool.

A standard TR2500 25-way serial handset port is also provided and many controller features are able to be altered using the traditional Siemens handset mnemonics if required.
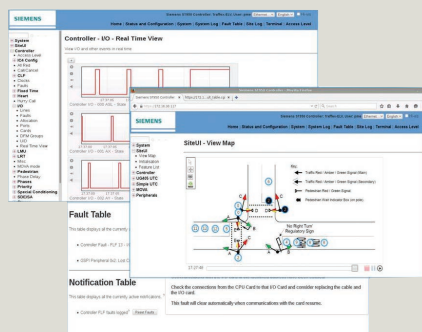
Integrated LV (230V) and ELV (40V, 42V and 48V) lamp switching

The ST950 retains the robust and proven lamp switch designs of the ST900 family.

When configured as a standard 230V controller the ST950 supports both High Intensity incandescent lamps and also LED signals. Where LED signals are used, specially adapted lamp switch cards provide reliable switching and lamp monitoring, particularly for Siemens Helios LV CLS LED signals.

The ST950 ELV implements the proven Siemens full wave rectified 'DC' system which offers a wide range of benefits, including:

- Increased electrical safety for members of the public in the event of damage to the signal installation
- Increased electrical safety for personnel working on or around the intersection
- Reduced power costs
- Reduced cabling costs
- Reliable lamp monitoring of very low power LED traffic and pedestrian signals
- Low supply current in-rush versions minimising supply fusing and supply capacity requirements

To deliver these benefits, the ST950 ELV incorporates many unique design features including:

Use of a fully rectified ELV supply: The use of a full wave rectified ELV supply allows very efficient semiconductor switches to be used, reducing unnecessary heating effects in the controller, contributing to improved reliability and lower power consumption.

Active short circuit protection on all outputs: Often the most frequently damaged components within a traffic controller are the output drive switches, which are particularly vulnerable to cable faults and short circuits. The ST900 ELV design incorporates an active short circuit protection system on all lamp outputs, ensuring that even under direct short circuit conditions, the outputs are protected from damage.

Active residual current quench on all outputs: The power requirements of LED-based street furniture are becoming ever lower. As this occurs, there is an increased risk that stray and residual voltages, remaining present after a signal is switched off, will cause the controller to register conflict or correspondence faults incorrectly. The ST900 ELV is ready today to deal with the very low power signals expected in the future, as each output is equipped with an active circuit that eliminates these stray voltages, without wasting power when the signals are switched on.

Intelligent lamp switch system: The ST900 ELV provides an intelligent lamp switch card that implements full voltage monitoring on each of its 32 outputs, using two separate safety systems. Current and voltage monitoring on each output is also provided, so that any output may be used for any signal colour. Additionally, ELV LED traffic signals as well as LED nearside and LED wait indicators can be monitored directly, without the need for any additional intelligence in the signals themselves. This high degree of flexibility allows output use to be optimised, for example, only using a single drive for green arrows, making the most efficient use of the available controller hardware.

By default ST950 ELV controllers provide a nominal 48V lamp drive level, reducing to 27.5V when the signals are dimmed. Optionally the controller can provide either 40V or 42V drive levels, by the provision of an alternative ELV output transformer.

- Modular construction - available in an outercase or as a 19 inch, 6U rack
- Simple installation - easily retro-fitted to existing controller cabinets
- Dual processor safety system
- Separate 'applications' processor
- Multi-mode operation including advanced 'ripple' stage change algorithm
- Supports configuration changes with signals on
- Fully approved to UK Highways Agency specification TR2500 and TR2513

Enhanced I/O capability

Using its internal serial architecture, the ST950 family is able to support up to 240 I/O lines allowing up to a maximum of 240 digital inputs or up to 96 isolated digital outputs to be provided, depending on the controller configuration.

The serial I/O cards are designed as 'intelligent terminal blocks' and are located directly where needed within the controller cabinet to optimise street wiring. In installations where very large numbers of street cable connections are needed, the serial bus architecture allows the I/O cards to be easily located in an adjacent cabinet, easing potential installation problems. To aid flexibility further, standard loop detector cards are also connected to the controller using the same efficient serial bus, via intelligent backplane adaptor cards.

The ST950 also fully supports the WiMag (magnetometer) I/O card, which when fitted in a WiMag rack allows up to 60 magnetometers to be efficiently interfaced directly to the controller without the need to use detector backplanes.

Modular construction

Three main construction options are available, which are modular and can be expanded to meet the needs of a wide range of intersection applications.

Standard 230V (LV) outercase: A single-door outercase providing a 6U controller logic rack and equipment mounting frame, as well as extensive street cable termination capability. Up to 32 phases can be accommodated together with detectors and ancillary equipment including freestanding Outstation Transmission Units (OTUs), Outstation Monitoring Units (OMUs) and other approved items. Manual panel access is provided through a separately locked access door contained within the main outercase door.

Standard 48V (ELV) outercase: This offers the same basic outercase as the LV system but with an enhanced 6U controller rack. This accommodates the ST950 central processor and logic power supplies, as well as space for up to 12, 4-channel detector cards and a UTMC OTU or MOVA unit if these facilities are not provided using the fully integral facilities.

Flexibility is enhanced by locating the lamp switch cards directly within the controller cabinet, very close to their street cable termination positions, minimising interconnecting cables and improving reliability. Where very large intersections are to be accommodated, additional ELV lamp switch and I/O cards may be located in an adjacent cabinet, significantly easing installation and maintenance of street wiring.

Optionally the ELV controller can provide either 40V or 42V drive levels, by the provision of an alternative ELV output transformer.

Free standing logic rack: Rack-only solutions are provided for both the LV and ELV controllers, housing the main logic power supplies, central processor and lamp switch cards. An extensive range of mounting kits is available for fitting the ST950 into a variety of existing cabinets, providing a particularly cost-effective route to controller modernisation.

Simplified installation and maintenance

Installation is simplified by the modular nature of the equipment. The controller root and cabinet, complete with street cable and mains supply termination may be installed without the logic rack, which can be added at a later date. The controller also supports the latest NAL bases, providing easy connection to integrated duct works.

Uniquely the controller is able to provide audible feedback, in the form of spoken phrases via a plug-in Bluetooth dongle, to a Maintenance Engineer on site utilising his mobile phone or other device capable of establishing a Bluetooth link with the controller.

Uniquely the controller is able to provide audible feedback, in the form of spoken phrases via a plug-in Bluetooth dongle, to a Maintenance Engineer on site utilising his mobile phone or other device capable of establishing a Bluetooth link with the controller. For example an Engineer may select a detector input to monitor and move to the location of that detector. The controller will "talk" to the engineer via the Bluetooth link and tell him when the loop input is active, enabling him to focus on observing vehicles moving over the loop rather than trying to visualise both activities on the street and data being displayed on a terminal device.

In addition many changing controller parameters may be displayed visually, as a time-based graph, aiding the Engineer when diagnosing intermittent or infrequent events.

An extensive inbuilt self-test facility, which validates both the controller hardware and the street connections, provides a further invaluable aid to controller commissioning.

The controller is also able to provide a full statement of timing, and other data, including detailed hardware information about all intelligent PCBs fitted in the controller, formatted to be used as part of an annual Periodic Inspection report. The report is able to be simply exported from the controller to a PC from a web page locally or remotely. Alternatively it can be exported directly to a USB memory stick on site using simple handset commands.

Reliable facility-rich software

The ST950 facility set is based on the well proven and highly reliable ST900 and offers many features and facilities including:

- 32 phases, 32 stages.
- 8 streams.
- 8 maximum green sets.

- 8 hurry calls which are in priority order.
- 8 uni-directional detector loop units.
- Multi-mode operation with stage ripple change facility for improved intersection capacity.
- Fully integrated Light Rapid Transport (LRT) mode for use at Tram / Road intersections.
- Fully configurable lamp sequences for worldwide application.
- Fully integral and configurable lamp monitoring of both incandescent and LED signals.
- Flexible part-time and start-up modes, allowing any stream to be sent in and out of part-time mode without affecting any others.
- Cableless linking (Plan) facility with sophisticated plan timetables and 32 plan groups.
- Event timetable which supports actions based on 32 independent events with easy programming.
- Time system with full date details – automatically time synchronised to central system where the controller linked to Siemens UTMC central system.
- Date stamped rolling log providing detailed history of events and faults, coupled with improved presentation to aid recognition of entries.
- Uncomplicated web browser user interface capable of multi-language support

User configurable

The ST950 is highly user configurable allowing it to be programmed to meet almost any traffic control demands.

The IC4 configurator is an easy to use tool for generating configuration data sets for the complete family of Siemens controllers, including the ST700, ST750, ST800, ST900 and ST950. Most data is simply entered via a series of 'forms' and is validated for correctness as part of a sophisticated error checking process. Enhanced navigation aids and

Enhanced safety features

Two independent microprocessors and comprehensive hardware self-check features ensure an unprecedented level of controller safety. All phase output colours are provided with dual-channel voltage monitoring, allowing the controller to be configured to perform green-green, green-yellow and green-red/yellow conflict monitoring.

In addition the controller offers in-built lamp monitoring sensors to allow a wide range of tungsten halogen, tungsten filament and LED-based signals to be monitored for failure. For UK applications, conflicts or other major failures result in the signals being extinguished in a fail-safe manner.

For non-UK use, the controller has an option to feature a built-in fail flash system. This offers selectable 'off' or flash red/yellow for each phase, with programmable mark/space and flash rate.

selectable levels of configuration complexity, insulate the user from controller facilities that are not being used, simplifying the configuration process.

An extensive traffic conditioning language is also supported, enabling complex special conditions and actions, over and above those offered directly within the controllers operating firmware, to be efficiently programmed.

The configuration data created by IC4 may be loaded into the controller using several different methods:

• On-Street, directly from a PC, via the USB handset interface.

• On-Street, directly from an appropriately configured USB memory stick.

• Remotely, by downloading the configuration from a central office. Depending on national regulations, the new configuration can either be enabled remotely or be held waiting for an Engineer to activate it on-street.

Subject to safety constraints, most configuration data, including UTMC OTU and MOVA datasets may be loaded into the controller and activated whilst the signals remain illuminated, ensuring minimum disruption to traffic whilst a configuration update is undertaken.

The configuration data as well as controller fault and operation logs and many other controller operating parameters are stored on a removable SD card held on the main controller CPU card. In the unlikely event of a CPU card failure this card may be removed and installed into the replacement CPU, returning the controller to operation which exactly replicates the original.

This card may also be used to store other data such as site drawings, log book information, controller handbooks and other site notes that may be of help to a maintenance engineer on-site.

Configuration data can be retrieved via the USB web interface and easily imported back into IC4 for re-editing. Existing data from T200, T400, ST800 and ST900 controllers can be imported as the basis of new ST950 family configurations, significantly easing controller upgrades.

The optional controller emulator links seamlessly with IC4 to provide an advanced environment for de-bugging and proving ST700, ST800, ST900 and ST950 controller family configurations. It ensures an accurate representation of the controller's operation on a PC, using the same software source files as the appropriate controller firmware.
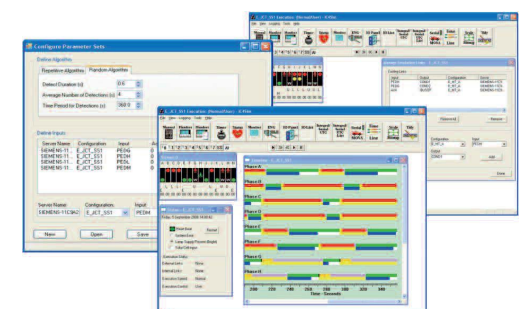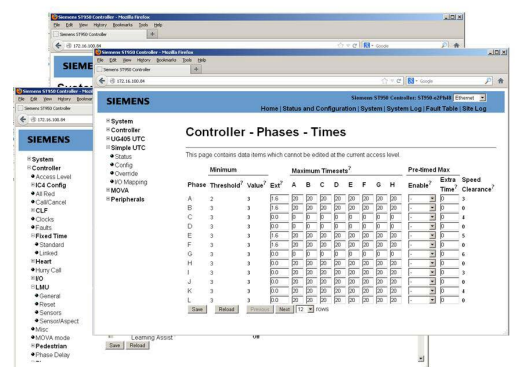
Technical specification

Inbuilt modes of operation
- Manual
- Vehicle Actuated
- MOVA (Implements MOVA 7)
- Pedestrian Fixed Vehicle Period
- Part-Time
- Hurry Call
- Fixed-Time
- Urban Traffic Control
- LRT
- Pedestrian Vehicle Actuated
- Cableless Linking
- Emergency Priority

Phases and stages
- Number of hardware phases: 1-32
  (Phase sequences programmable)
- Number of independent streams: 8
- Number of stages: 32
- Number of switched signs: 0-32
- Number of max. green periods per phase: 8
- Number of phase delays: 120
- Number of call and cancel timers: 8
- Number of stage-based all red extension units: 7
- Number of phase-based intergreen delays: 64
- Number of hurry calls: 8
- Number of emergency/priority units: 8

High-speed vehicle detection
Integral speed discrimination, double/triple speed assessment
- Number of assessors: 16

Cableless linking facilities
Number of plans: 16
- Number of groups per plan: 32
- Number of time switch settings: 64
- Number of group influences: 10
- Timing sources 50/60Hz mains, Internal Crystal, NTP network time server or optional GPS clock

Inputs and outputs
- Number of digital inputs: 0-240 compliant to TR2523
- Number of isolated digital outputs: 0-96 compliant to TR2523
(Actual number of inputs and outputs possible depends on configuration, up to a maximum of 240 in total)

Environmental
- Designed to meet: - UK TR2500
  - TR2513
  - EN12675
  - EN50278
- Supply interruption: Continuous operation up to 50ms break
- Supply failure: Automatic restart without operator intervention
- Operating ambient temperature range: -25°C to +70°C

Lamp switch

Standard 230V controller
- Lamp switching type: Solid state triac
- Number of phase outputs per lamp switch card: 24 (arranged as 8 x 3 aspect phases)
- Maximum lamp load per output switch:
  - Standard Controller: 4A
  - LED Controller   4A
    (monitoring limited to 1A load)
- Maximum number of lamp switch cards: 4
- Maximum total lamp load: 20A
- Lamp supply voltage: As per input supply
- Signal dimming: 120V, 140V, 160V AC RMS.

Note 1: Dimming not supported for 100V and 110V mains input.
Note 2: 120V dimming not recommended for LED controllers

ELV controller
- Lamp switching type: Solid state FET
- Number of phase outputs per lamp switch card: 32 (each fully configurable as red, yellow or green drives)
- Maximum lamp load per output switch: 2A (A phase may use multiple outputs where higher current required)
- Number of lamp switch cards supported: 6 (3 max per ST950 cabinet)
- Maximum total lamp load: 20A
- Heavy current options: 40A
- Lamp supply voltage: 48V RMS, (rectified and negative w.r.t. protective earth)
- Signal dimming: 27.5V RMS, (rectified and negative w.r.t. protective earth)
- 40V and 42V ELV lamp supply drives available as an option

Other facilities
- Fully integrated MOVA 7 and UTMC OTU functionality - licensed by Smart Card
- Standby mode: - Signals off
                          - Software flash
- Failure modes: - Signals off
                          - Independently controlled fail flash
                          - Software flash on a per-stream basis

Flash type – selectable: flash red or yellow per phase
Mark/space and flash rate selectable for whole controller
- Web based user interface with audible feed for maintenance activities
- High-speed handset port 1200, 9600 and 19200 baud. Port is auto-bauding to match incoming data

Electrical
- Input power supply (+20, -15%):
  100V, 110V, 220V, 230V, 240V AC RMS
- Supply frequency: 50/60Hz ±4%

Dimensions
Standard outercase
- Height: 1160mm   • Width: 725mm   • Depth: 420mm

Rack system
- Height: 266mm   • Width: 482mm   • Depth: 280mm
Rack system requires minimum 15mm clearance in front of fixing plane)

Compatibility
- Able to drive and lamp monitor:
  - Standard UK HI incandescent signals
  - Standard UK LV regulatory signs
  - Siemens Helios LV LED signals
  - Siemens Helios ELV signal heads
  - Siemens Helios ELV regulatory signs
  - Siemens ELV nearside indicators
  - Siemens ELV LED wait indicators
Other signals may be compatible – consult Siemens for details

Cuckoo kits
ST950
- Siemens T400, ST800,
- Microsense MTC and Sentinel
- Peek TSC3 and TRX
ST950 ELV
- Siemens T400, ST800
- Microsense MTC and Sentinel
- Peek TSC3 and TRX

Upgrade kits
- Siemens ST900 and ST900ELV

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