WILLOWGLEN

REMOTE TERMINAL UNIT

Control With Innovation

Willowglen 6500/6600/7000/4601 Series Remote Terminal Unit

Willowglen 6500/6600/7000/4601 Series RTU provides SCADA telemetry and control functionality in a rugged and highly reliable package.

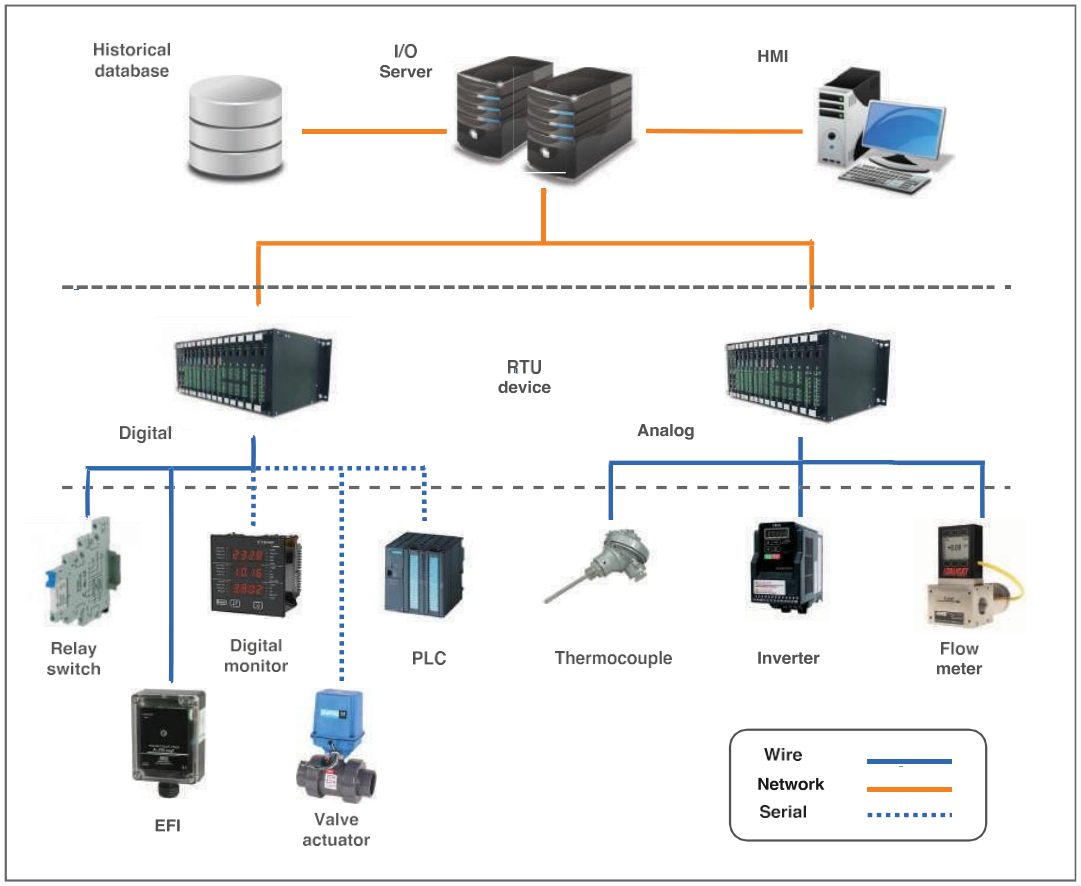
- Configurable for both mission-critical, large IO point count applications and compact monitoring and control application utilizing just few IO points.
- RTU OS, Firmware and Application compliance with Center for Internet Security® (CIS) Distribution Independent Linux.
- Supports a suite of industry standards communication protocols including secure versions of the protocols:

Standard Protocols	Secure Protocols
MODBUS RTU	-
MODBUS TCP	MODBUS TCP TLS
IEC60870-5-101	IEC60870-5-101 SA
IEC60870-5-104	IEC60870-5-104 TLS & SA
DNP3	DNP3 TLS & SA

- Built-in operator-friendly web-based configuration tools greatly reduce engineering configuration work.
- Dedicated R&D division for hardware & software system design and customization to meet any customer requirement.

Designed for reliability, security, performance, and maintainability, our RTU & SCADA system have been installed worldwide for various industries such as oil and gas, power, transportation, BMS, water and wastewater industries.

System Overview



Scalable and Customizable Architecture

As an integrated RTU and ISCS software manufacturer, we assure partners and stakeholders with long term product support.

Modular Architecture

6500/6600/7000 series standard configuration comprise of:

- Rack or plate mounted CPU, Digital and Analog Input / Output Modules plus accessories
- Scalable to 8, 12 or 16 module per rack. Multiple racks can be linked via RS485 serial communications
- Customized sub-rack for small point count application Remote IO capable

4601 series compact RTU with built-in IO:

- All-in-one RTU for low point count RTU, low power
- Datalogging feature
- Deployable for indoor/outdoor installation and in harsh environments.

A single CPU can support up to 4 extended rack to provide expansion up to 2000 I/O points.

Powerful CPU Module with Versatile and Secure Communications

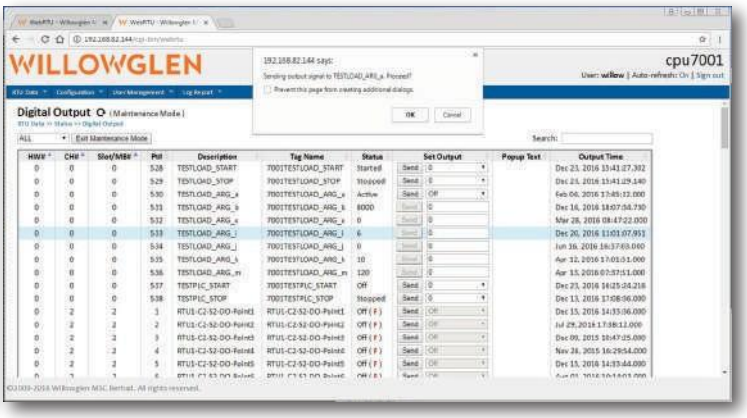
CPU module consists of powerful 32-bit ARM Cortex processor with large memory and storage capacity with functions and performance of an RTU, PLC and Data Concentrator all-in-one.

- Built-in multiple communication ports and native support for standard protocols such as IEC60870-101, IEC60870-104, DNP3, MODBUS TCP and their Secure Authentication counterparts, IEC60870-103 and MODBUS RTU. Additional proprietary protocols can be added as part of customization.
- Customizable to meet National and International Cyber Security Agency requirements.
- Runs on Linux platform, comes with built-in applications such as IEC61131-3 compliance logic programming tools, network configurations, security, data management, GPS time synchronization and full hardware and application logs and diagnostics.
- The OS features embedded programming environment allowing seamless integration with customized application and protocols.
- For high reliability and availability systems, two CPUs can be configured to work together in fault tolerant or hot standby mode.

WebRTU Configuration & Maintenance Tool

Configuration of IO points, protocol mapping, network interface, access control, and security can be done directly or remotely using standard web browser.

- Real-time display of data, system, error logs and system health.
- Portable Maintenance Tool (PMT) and RTU Programmer available for extensive maintenance, debugging and programming.



Robust Input Output Modules

Willowglen designs and manufactures Digital Input Module (DIM), Digital Output Module (DOM), Analog Input Module (AIM), Analog Output Module (AOM), Expansion Module (EXP) and accessories.

- No additional conditioning circuit is needed at the front-end interface to field devices.
- Local processing enables independent functioning from the main CPU.
- DI module front end circuit is optically isolated
- DO module has built in Select-Before-Operate (SBO) function and relay output.
- Built-in LED indicators for communication and channel status.
- Built-in diagnostic port for maintenance and calibration.

Compliance

Willowglen RTU modules conform to IEC and CENELAC (EN) mechanical, environmental, electrical and EMC standards. The RTU are also in compliance with IEC 62443 and CIS standards as well as EN50121-4 for railway application. All tests were conducted at IEC17025 certified laboratories such as TUV SUD (CANADA), SIRIM and MIMOS (Malaysia). The RTU enclosure can be designed to meet Ingress Protection (IP) standard as required by customers.

Electrical Environment	
IEC 60255-27	Insulation Resistance Test
IEC 60255-27	Dielectric Withstand Test
IEC 60255-27	Impulse Voltage Test
IEC 61000-4-2	Electrostatic Discharge Test
IEC 61000-4-3	RF Electromagnetic Field Disturbance Test
IEC 61000-4-4	Fast Transient Disturbance Test
IEC 61000-4-5	Surge Voltage Immunity Test
IEC 61000-4-6	Conducted RF Disturbances Test
IEC 61000-4-8	Power Frequency Magnetic Field Test
IEC 61000-4-12	Damped Oscillatory Waves Test
IEC 61000-4-16	Main Frequency Voltage Test
IEC 61000-4-17	Ripple Test on DC Power Supply
IEC 61000-4-29	DC Supply Interruptions Test
IEC 60950-1	Safety Standard Clause 5.5
CISPR 32	Radiated & Conducted Emission Test
Mechanical Environment	
IEC 60068-2-6	Vibration Test
IEC 60068-2-27	Shock Response & Endurance Test
IEC 60068-2-27	Bump Test
Atmospheric Environment	
IEC 60068-2-2	Dry Heat Test
IEC 60068-2-78	Damp Heat Test (Steady)
IEC 60068-2-30	Damp Heat Test (Cyclic)

APPLICATIONS

Willowglen 4601, 6500, 6600 and 7000 series RTUs are multi-industry proven products that has been installed in Europe, Middle-East and Asia for various industry.

The RTU can be offered as standalone products or packaged with the WillowLynx or Xentral Integrated Supervisory and Control System (ISCS) software. Compatibility with industry standard protocol allows it to be easily integrated to existing systems regardless of master systems.

Our Xentral Safe (XS) suite has been certified with SIL Level 2, complying to the EN50128 requirements, proven to be robust and reliable system following the international standards on safety and operation.

Willowglen also has the expertise in full system replacement, without affecting operation of existing plant and processes.

Water and Wastewater Treatment

The Willowglen RTU and WillowLynx / Xentral ISCS System enables smooth and smart operation of facilities and process making it easier to achieve target water volume and quality, plant efficiency, reliability while conserving energy and reducing operational cost. SCADA allows management and operation of many treatment plants and reservoirs simultaneously by integrating all plant control into an integrated control center.

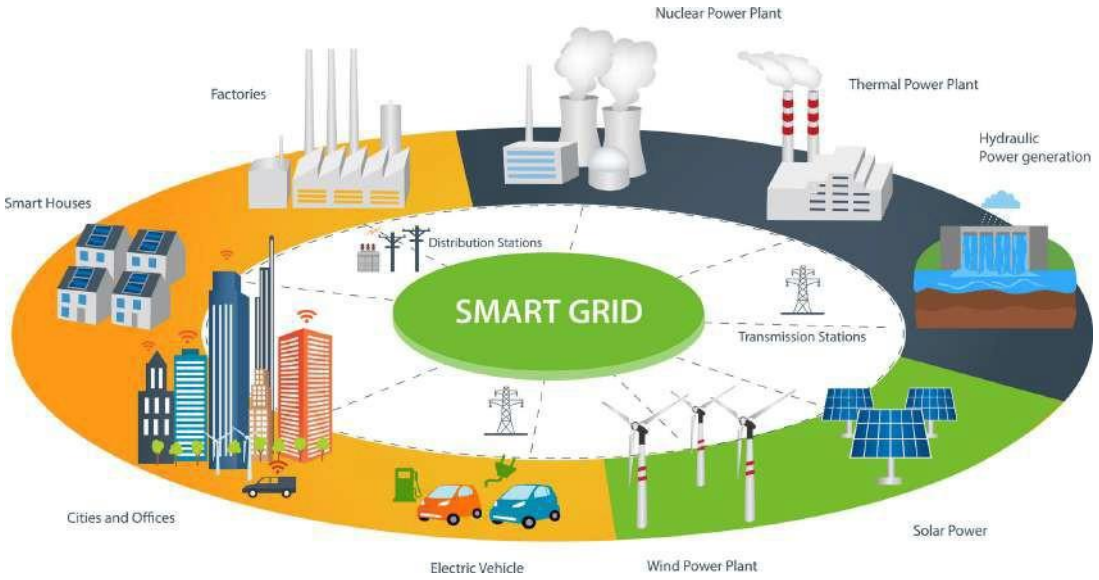
- Process control from sedimentation, aeration, carbon and sand filter to final collection tank
- Monitors and controls level and pressure transducers, flowmeters, valves, pumps, dissolved oxygen temperature etc.
- Integration to plant physical security measures by integration to personnel card access, CCTV and perimeter fencing system.

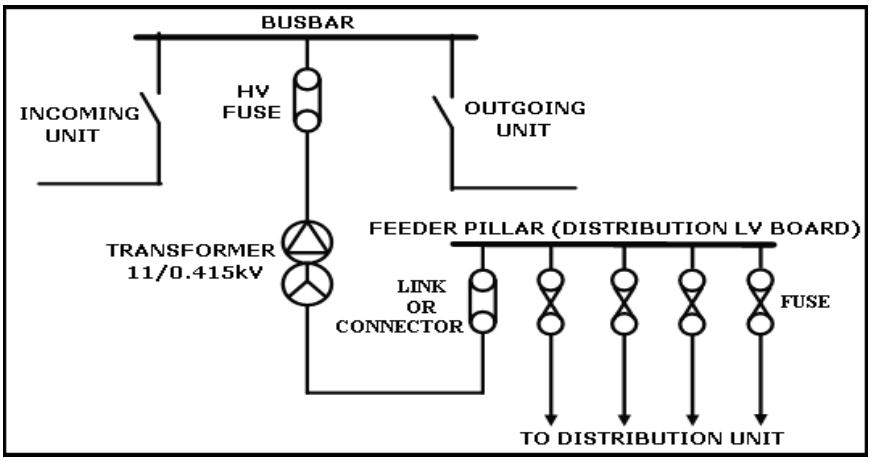
Gas Transmission and Distribution

SCADA systems provide for safe, reliable, and efficient operation of gas transmission systems. Advanced applications and interfaces to business systems provide the keys for highly profitable operation.

- Typical RTU installation at metering, odorizer, valve and compressor stations.
- Monitors and controls the valves, pressure transmitters, pressure regulators, temperature, heaters, and flow meter and data loggers.
- At the compressor station with PLC systems, RTU can be used as data aggregator for transmission to the control center.
- Real time and archived data for pipeline modelling, forecast, short and capacity planning, survivability analysis, leak detection etc. Data can also be used for online customer billing and marketing.
- Redundant communication media guarantee uninterruptible operation at main and backup control center

Low and Medium Voltage Substations



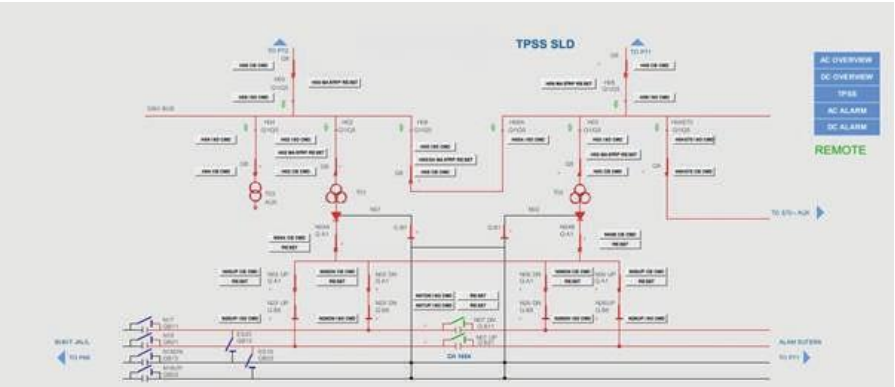


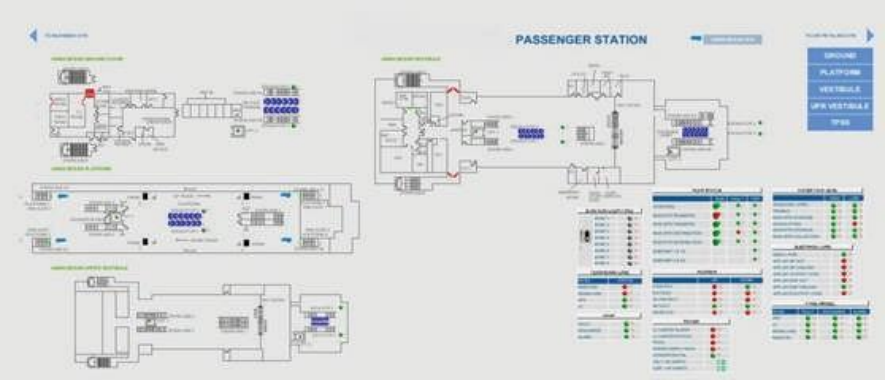
Cost effective design for large scale deployment in tens of thousands substation for monitoring and controlling circuit breakers, load break switches, protection relays, EFI, disturbance recorders etc.

- Upgradable and configurable to include features for various substation configuration and smart grid systems,
- Built-in Power SCADA features such as select-before-operate (SBO), sequence-of-event (SOE), GPS input for millisecond time-sync accuracy

Transportation

Willowglen RTU and its ISCS software, WillowLynx / Xentral, have been installed to run operation of major regional and metro rail lines.





- Monitor and control equipment and systems such as automated passenger announcement (PA), passenger information system (PIS), platform screen doors (PSD), environmental control systems (ECS), fire alarms, emergency blue light stations, signalling systems, UPS, passenger intrusion emergency stop systems (PIES), and many others.
- Designed for safety related application.
- Achieved Reliability, Availability, Maintainability, and Safety (RAMS) target of 99.99%.

RTU Technical Specifications

Specification	RTU6500/6600/7000 Series	RTU4601
Microcontroller	AM335x ARM® Cortex™-A8	ARM® Cortex™-A7
Clock frequency	800 MHz	696 Mhz
RAM	512MB DRAM, 4MB SRAM	512MB
Flash size	512MB	512MB
SD Card	Up to 32GB	Up to 32GB
Operating system	Linux	Linux
Serial COM options	2 x RS232, 3 x RS485	1 x RS232, 1 x RS485 (Support full duplex)
Ethernet	1 x RJ45 10/100Mbps, 1 x RJ45 10/100/1000Mbps	1 x RJ45 10/100Mbps
USB	1 x Host + 1 x OTG	1 x Host
Power consumption	10W maximum	11.4W maximum
Specification	**Input/Output Module**	**Built-in Input/Output Channels**
Types	DI, DO, AI, AO	DI, DO, AI
Microcontroller	8-bit 8051	-
RAM	1KB internal + 32KB external	-
Flash ROM	16KB	-
EEPROM	512B	-
Serial COM options	1 x RS232, 1 x RS485	-
Operating environment	0ºC to 70ºC, 5%-95% humidity	0ºC to 70ºC, 5%-95% humidity
Visual indication	LEDs for RX/TX, Module Heartbeat, I/O points	Heartbeat, Run, Comm TX/RX, DI & DO points
Power requirements	+12 to +28 VDC	+12 to +28 VDC
Specification	**Digital Input Module**	**Built-in Digital Input**
Channels	16/32	10
Input type	Opto-isolated, 0V (L) to (18-25) VDC (H), can function as 200Hz counter	Opto-isolated, 0V (L) to (18-25) VDC (H), can function as 200Hz counter
Type	Dry contact up to 3kΩ	Dry contact up to 3kΩ
Contact wetting	4mA rated at 24V supply	4mA rated at 24V supply
Loop power	Internal or external 24V±20%	Internal or external 24V±20%
Protection	0.9A self-healing fuse for system power 120mA self-healing fuse for inputpoints	0.9A self-healing fuse for system power 120mA self-healing fuse for input points
Power consumption	5.5W/6.5W with all contacts closed using internal loop power	-
Specification	**Digital Output Module**	**Built-in Digital Output**
Channels	8/16	4
Output type	Relay or open collector	Relay
Output configuration	SBO (default) or normal output	SBO (default) or normal output
Relay output	Potential free SPST-N/O contacts	Potential free SPST-N/O contacts
Protection	1A self-healing fuse for system power	1A self-healing fuse for system power
Power consumption	0.75W/1.3W with all relays open, 2.75W/7.5W with all relays closed	-

Specification	Analog Input Module	Built-in Analog Input
Channels	8/16	4
Input type	Single ended or differential input	Single ended or differential input
Input configuration	0-5V, 0-10V, ±5V, ±10V, 1-5V, 0-20mA, 4-20mA, ±5mA	0-5V, 0-10V, ±5V, ±10V, 1-5V, 0-20mA, 4-20mA, ±5mA
Input resolution	12-bit plus sign	16-bit plus sign
Input accuracy	<0.1% of Full Scale at 25ºC <(0.005% or 50ppm)/ ºC of Full Scale at 10-55ºC	<0.1% of Full Scale at 25ºC <(0.005% or 50ppm)/ ºC of Full Scale for 10-55ºC
Input resistance	215Ω for current input >10MΩ for voltage inputs	215Ω for current input >10MΩ for voltage inputs
Input filter	2nd order Butterworth low-passwith 6Hz cutoff frequency 72dB attenuation @ 50Hz	2nd order Butterworth low-pass with 6Hz cutoff frequency 72dB attenuation @ 50Hz
Protection	4A self-healing fuse for system power 120mA self-healing fuse for input points	4A self-healing fuse for system power 120mA self-healing fuse for input points
Power consumption	9.5W/20.7W using internal loop power	-
Specification	**Analog Output Module**	**Not available**
Channels	8/16	-
Output type	Digitally isolated, single ended	-
Output configuration	0-5V, 1-5V, 0-10V, 1-10V, 0-20mA, 4-20mA	-
Output resolution	12-bit	-
Output accuracy	0.1 % (250Ω current mode load) 0.2 % (0-1kΩ current mode load)	-
Output drive capability	<1100Ω in current mode >3000Ω in voltage mode	-
Protection	4A self-healing fuse for system power 120mA self-healing fuse for input points	-
Power consumption	10W/20W maximum	-

Enhancing Business

Preserving Environment

Security & Protection

ABOUT WILLOWGLEN

Willowglen Malaysia Sdn. Bhd. is the corporate headquarter and also the research and development division of the Willowglen Group. It is listed on the main board of Bursa Malaysia with subsidiaries in Malaysia, Singapore and Indonesia. Working together with partners in Europe and Middle East, we have the expertise to offer local and international customers a one-stop SCADA and integrated security control system (ISCS) solutions.

With more than 50 years of experience, Willowglen's capability goes beyond SCADA and its related solutions. We are continuously evolving and have recognized that being dynamic and flexible are important in adapting in a rapidly changing industry. Our operation is structured to maximize strength in R&D, engineering services, project management and maintenance support to provide high quality services expected by our customers.

WILLOWGLEN STRENGTH AND SERVICES

- R&D and Manufacturing
- System Design and Integration
- Project Management
- Maintenance & Support

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