SUPCON Group Co., Ltd. is a leading supplier of automation & information technology, products and solutions in China. SUPCON's business has spread over China, Vietnam, Pakistan, Sudan, North Korea, Myanmar, Thailand, India, Canada, etc.

Process automation is the core business of SUPCON. SUPCON aims to provide the excellent systems, instruments, optimized and advanced control softwares for our customers all over the world.

SUPCON has helped over 3,000 customers to optimize their business and production processes, which enables them to improve their efficiency, productivity, competitiveness and profitability. SUPCON’s products and solutions have also played an important role in different process industries such as chemical, petrochemical, oil & gas, power, metallurgical, paper & pulp, cement, glass, pharmaceutics, etc..

WebField is the common brand for SUPCON’s control system products, including JX series, ECS series, and GCS series, which can meet the customized needs of different industry fields, different customers, and different processes. So far, SUPCON has provided more than 4,000 sets of control systems for our customers, SINOPEC (China Petroleum & Chemical Corporation), CNPC (China National Petroleum Corporation), Bao Steel Group, Capital Steel Group, Qinshan Nuclear Power Company and many other famous companies are all SUPCON’s customers.

### 1. System Overview

WebField ECS-100X control system is the latest family member of the SUPCON WebField control systems. This web technology-based control system is developed to adapt to the development of the network technology, especially the Internet and web technology. The system integrates the latest field bus technology, embedded software technology, advanced control technology and network technology, and has realized compatibility with several buses and integration with other systems. Various DCS, PLC and the field intelligent devices can access to ECS-100X system to achieve process control information sharing. System network is composed of the I/O bus, controlling network, operating network and the information management network. On basis of network strategy and data division, the operating network adopts the pier-to-pier C/S communication structure to achieve real-time data communications and historical data inquiries between operating nodes, including real-time data, real-time alarms and historical trend, historical alarms and the operation log.

Based on WebField ECS-100 control system, ECS-100X adopts packaging main controller, which uses high-performance chips, as well as high-speed I/O processing module, to improve speed and system performance.
2. System Characteristics

ECS-100X system is provided with the following distinctive characteristics:

- **Security**
  The security and anti-interference of the system conform to the international standards in the industrial environment.

- **Compatibility**
  According with the field bus standard, coexistence of the traditional analog signal and the digital signal will enable enterprises existing industrial automation programs and the implementation of the algorithm technology to be easier to execute.

- **Openness**
  Merged with all standardized software and hardware interfaces to facilitate access to the most advanced equipment and third-party distribution control system, logic controller. Remote operation can be realized through various long-range mediums or the Internet.

- **Integration**
  As an open and extensible system, it can easily be expanded and integrated using data station, OPC Server or gateway modules and it is achievable to connect to the isomeric system.

- **Equipment Management**
  Advanced devices management functionality (SAMS), users can configure and adjust the intelligent transmitters according with the filed bus standard. It facilitates automatic management on intelligent devices to achieve the perfect combination of the device management and process control.

- **Remote Services**
  Through remote communication media to achieve remote monitoring, fault diagnosis, system maintenance, operation guidance and system upgrading.

- **Fault Diagnosis**
  Provided with fault diagnosis from the network I/O modules, the controller to the field transmitters and sensors. It is easy to clear fault such as thermocouple wire-break.

- **Data Management**
  Collection, management, storage, and the data is transmitted to the public database. The data can also be distributed to different report forms to ensure the best running status.

- **Graphic Interface**
  Providing integrated graphics interface configuration tool to conveniently and quickly generate graphic images and a wide range of graphic library is provided.

- **Alarm**
  Using distributed alarm management system. It can manage unlimited regions’ alarms, alarms based on events, alarm severity, alarm filtering and remote alarms through dial-up input or output management equipment.
- **Real-time Simulation**
  System provides offline real-time debugging and simulation. It aims to shorten the field debugging cycle and reduce the risk of the scheme implementation.

- **Mechanical Structure**
  Using 19 inches international standards mechanical structure, the standard combination of components is used to facilitate applications in a variety of environment.

- **Running Environment**
  Reasonable cooling airflow design, dust-proof design in the cabinet.

- **Power Supply**
  Using concentrated mode of power supply, the AC and DC power supply both adopt hot redundancy mode. Plug and play components to facilitate installation and maintenance.

- **System Capacity**
  Flexible system capacity can meet requirements from several loops, dozens I/O tags to thousands of control loops, 20,000 I/O tags.

- **Signal Configuration**
  Provide 2-channel, 4-channel, 8-channel and 16-channel signals I/O modules for users with multiple choices, and optimized system configuration.

- **Signal Precision**
  I/O modules use internationally newly high-precision A/D sampling technology (Σ-△A/D), and advanced signal isolation technology, the technologies of hot plug under strictly testing, multi-level PCB and SMT technology that enables higher precision signal collection, and more stability.

- **Control Configuration**
  System control configuration tools FBD, LD, SFC and ST conform to IEC1131-3 standard, which makes the original users familiar with PLC programming easily learn to use ECS-100X.

- **Rapid I/O**
  Provide rapid AI and AO, AI sampling cycle is 50ms.

- **Online Download**
  Engineers can download the configuration online after completing configuration change and compile.
3. System Structure

ECS-100X control system is composed of control station, operating nodes (including engineer station, operator station, server station, data management station, time synchronization server, etc.) and system network (process control networks, operating network), etc. Overall structure of the system is shown in the following:

Engineer station, installed with configuration platform and system maintenance tools, is designed for professional engineers and technicians. The detail functions include: system generation, the definition of the database structure, operation configuration, graphics configuration, reports making and control programming. System maintenance tools achieve network debugging, fault diagnosis and signal adjusting in process control.

Operator station is composed of industrial PC machines, monitor, keyboard, mouse, printer, etc. It’s the human-machine interface for operators to complete the process control management task. High-performance IPC, excellent graphics functionality, multi-window display that can facilitate the realization of the centralized display, centralized operating and centralized management of the process information.

Server station can communicate with the enterprise management network (ERP or MIS) to exchange information, achieving real-time data and historical data share in order to realize totally integrated automation of process automation. Through the pier-to-pier C/S operating network, it can be realized to exchange real-time data and historical data between the operating nodes.

Data management station is used for communication with external data sources to achieve the centralized management of process control data.

Time synchronization server is used for the realization of the system time synchronization.

Control station is the I/O processing unit that directly communicates with the industry filed devices. It’s composed of controllers, data transmission modules, I/O modules, wiring terminal boards and internal I/O bus network, completing the entire industrial process monitoring. Internal components of the control station may be configured to be redundant for user requirements to ensure reliable system control.

Process control network can realize the connection between the operating nodes and the control station to complete transmission of the control information and commands. The process control network’s redundancy design makes information transmission reliable, high-speed.

Operating network uses fast Ethernet network technology to achieve data communication between C/S servers and the clients and time synchronization.
4. System Scale

ECS-100X system's capacity is up to 31 redundant control stations and 64 operating nodes. The amount of the control station lies on the I/O scale. The amount and specification of the operating nodes lies on users’ different requirements. The control cycle of the control station of ECS-100X control system is 50ms. Each control station can handle 192 control loops at most. Each station can be configured with 8 I/O cages at most. Each I/O cage can configure with 16 various I/O modules at most. The I/O capacity of the ECS-100X control system can reach to 20,000 tags.

Historical database capacity: 20,000 points, six months typically.

5. System Hardware

5.1 Control station

Control station is the core unit, which is directly related to the field I/O data sampling, the information transmission and control operation, to complete the real-time industrial process control. By means of software settings and different hardware configuration, control structures with different functions can be constituted, such as Process Control Station, Logic Control Station and Data Acquisition Station. The main controller is the core of the control station, and the main controller through high-speed data network --SBUS to expand various functions, achieving the input and output of the signal and completing the process of data collection, loop control, sequence control, and various control algorithms including optimize control.

The control station is mostly composed of the cabinet, the cage, the power supply unit, terminal boards and various modules (including the main controller, the data transmission modules and input/output modules). The main controller uses 32-bit ARM processing chips to achieve superior performance and fast computation speed.

5.2 Operating nodes

Operating nodes are the human-machine interface of the control system, including the engineer station, the operator stations, data management station and server stations. When install system software, it can be chosen to install the engineer station, or the operator station. The setting of network strategy determines the work role and style of the operating nodes.

In ECS-100X system, an operating node may be set as common work mode or C/S work mode according to the actual situation by choosing the corresponding network strategy. In the common work mode, all operating nodes are set as engineer station or operator station, and the network strategy are set as “local”, the operating nodes communicate directly with control stations via the controlling network. In C/S work mode, the “client” operating nodes communicate with the “server” stations via operating network. The real-time data of the control stations transmits to the “client” nodes from the server.

In ECS-100X system, a specified server station may be configured, or you can set an engineer station or operator station as server station by the network strategy setting.

Data station can be specialized configured, and can also be shared with another operating node. By setting network strategy, data station can be configured as extern data sever for providing data to other operating nodes on the operating network to realize data sharing.
6. System Network

ECS-100X system uses mature computer network communications technologies to constitute a high-speed redundant data transmission network, achieving timely delivery of the real-time data and historical data.

ECS-100X system communications network is composed of 4 levels: Information Management Network, Operating Network, Process Control Network and I/O Bus.

6.1 Information Management Network

The Information Management Network adopts common Ethernet technology for inplant messaging and management. It is the information transmits way of comprehensive management. The network achieves enterprise information management network’s connection with SCnet II Process Control Network through the server station, to obtain the process information and the operating parameters and running information, and to download the management command and production guidance information from the supervisory. Management network uses large network databases and realize information shared, as well as connects all control devices to the enterprise information management network and realizes the integrated management, dispatch, statistics and decision-making in the inplant level.

6.2 Operating Network

Advantrol-Pro achieves a pier-to-pier C/S operating network by the network strategy and data division, realizing the communication of real-time data and the query of history data between operating nodes, including real-time data and historical trend, real-time alarm and historical alarm, the operation log, etc. Operating nodes’ time synchronization is realized through the operating network.

Process Control Networks (SCnet II Network)

SCnet II is ECS-100X system’s network of process control, which employs high-speed redundant industry Ethernet. It has a direct link to the control station and operating nodes. It’s the channel to complete the transmission of real-time process control information with high reliability and real-time. SCnet II can link with the upper Information Management Network or the other manufactures devices through the server station.

The communication interfaces of all the nodes in the process control network SCnet II use the special Ethernet controller. The protocol of data transmission is TCP/IP UDP/IP.
6.3 I/O Bus (SBUS)

I/O bus is the internal communication network of the control station, known as the SBUS. SBUS is redundant which is divided into two levels: SBUS-S2 for connection between the main controller and the data transmission module, SBUS-S1 for connection between the data transmission module and the I/O modules.

7. System Software

ECS-100X control system adopts SUPCON self-developed AdvanTrol-Pro software package. AdvanTrol-Pro software package is an automation application software platform based on the Windows 2000 operating system. It achieves system configuration, data services, and real-time monitoring in the WebField series DCS (Distributed Control System) of SUPCON.

System software characteristics and performance index

- Achieving the operating network services in the pier-to-pier C/S mode, on the basis of network strategy and data division.
- Using high-capacity, high throughput real-time database and data structure with two levels (Area and region).
- Multi-task, multi-thread, 32-bit coding.
- Superior openness, compatibility, facilitating the communication with the third-party intelligent equipments.
- Providing multiple data access interfaces based on API.
- Clear configuration structure, easy to use.
- International standards in control algorithms configuration, powerful combination of graphics configuration and language configuration.
- Flexible operation on real-time and historical trend, supporting offline browse of historical data.
- Powerful graphics, easy to use.
- Flexible reports, easy to use, statistic ability.
- Powerful alarm management, supporting alarm division and classification, and supporting voice alarming.
- Data refresh cycle is 1 second, dynamic parameters refresh cycle is 1 seconds on operating nodes.
- Graphics showing time ≤ 1 second
- Command responding time ≤ 0.5 second
- Key responding time ≤ 0.2 second
- Safety, reliability, long-term stability.
WebField

ECS-100X Control System

SCControl

SCForm

Advantrol

Advantrol - Alarm Overview

Advantrol - System Overview

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