# DAP*server* Platform

## Multi-function Substation Servers

GE's DAPserver Platform of multi-function substation controllers are designed for managing, securing and delivering substation information to utility and industrial users. DAPserver empowers substation operators with the information they need to improve the operability, efficiency and reliability of the power system.

The DAPserver Platform offers the flexibility to build a reliable, scalable and versatile systems to address your substation automation needs. Key design features include:

- Ruggedized and modular hardware for power substation environment
- Low risk migration solution for retrofitting legacy RTUs
- Standards based protocols such as IEC 61850 and DNP3

The DAPserver product range is designed to enrich your existing substation assets and provide a migration path to the next generation of substation automation solutions.

### Key Benefits

- Addresses NERC CIP requirements for legacy equipment
- Defers capital expenditures for new equipment
- Secures remote access to substation information
- Online condition monitoring helps reduce operation and maintenance cost

### Applications

- Retrofitting of substation automation systems
- Supporting multiple protocol interfaces, simplifies device integration into existing systems and eliminates the need to replace existing devices
- Modular hardware provides a simplified upgrade path for legacy RTU devices
- Scalable architecture ensures the DAPserver is suitable for a wide range of transmission and distribution substations
- Able to communicate with D20E I/O

## Asset Condition Monitoring

- DAPserver helps reduce the risks of potential asset failures, operations & maintenance costs
- Substation dashboard of assets allows users to differentiate between critical and non-critical substation alarms
- Collect, manage and deliver non-operational information to enterprise level data warehouses and asset management applications

## Connectivity

- Up to 16 RS232/RS485 serial ports & 64 virtual serial ports
- Custom IP routing to different master devices

## Cyber Security

- Secure remote access enables users to establish a secure network tunnel to the substation devices from a central location
- Remote access provides secure upload of files such as oscillography, fault data, and relay event records
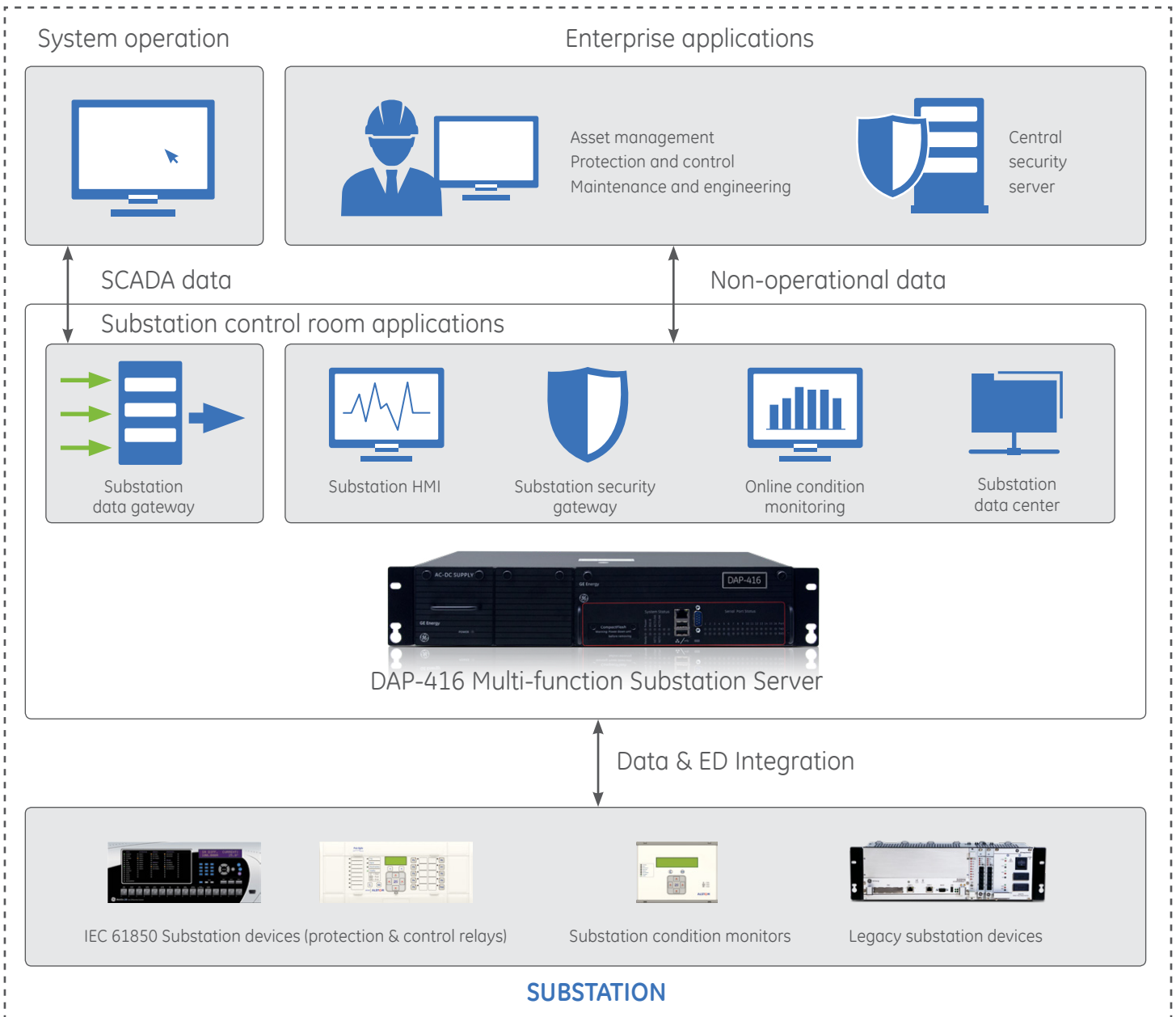- Authentication, authorization and audit logs tools enabling NERC/CIP compliance

## Hardware

- Dual hot swappable power supplies
- Built-in Ethernet switch (2 or 4-ports)
- 2 Independent Ethernet interfaces (IP & MAC addresses)

*imagination at work*

# DAP-416 Multi-Function Substation Server: **Applications**

**Providing the flexibility to build a reliable, scalable and versatile system to meet your substation automation needs.**

System operation        Enterprise applications

Asset management
Protection and control
Maintenance and engineering

Central security server

SCADA data        Non-operational data

Substation control room applications

| Substation data gateway | Substation HMI | Substation security gateway | Online condition monitoring | Substation data center |

DAP-416 Multi-function Substation Server

Data & ED Integration

IEC 61850 Substation devices (protection & control relays)     Substation condition monitors     Legacy substation devices

**SUBSTATION**

| Substation data gateway (SDG) | substation data concentrator including IED integration, protocol conversion and serial to IP conversion |
| --- | --- |
| Substation HMI | graphical user interface, single-line diagram, alarm annunciator |
| Substation security gateway (SSG) | facilitates secure remote access to meet NERC CIP requirements |
| Online condition monitoring | Optimizing the O&M of your critical substation assets |
| Substation data warehouse | Storage for substation device files |

# Hardware

Various platforms are available depending on your substations automation application. We provide the best solutions adapted to your needs.

| | DAP-AT (DAPSERVER) UNO-4673A | DAP-AT (DAPSERVER) UNO-4683 | DAP - 416 |
|---|---|---|---|
| CPU/Memory | Intel Atom (1.66GHz) | Intel i7 (2.0GHz) | Intel Atom (1.6GHz) |
| | Dual core + Hyper threading | Dual core + Hyper threading | |
| | 2GB DDR2 RAM | 4GB DDR3 (3GB RAM+HDD) | 1GB DDR2 |
| Size | 2U rack | 2U rack | 2U rack |
| CF Cards | 16 GB | 16 GB | 16 GB |
| Power Supply | 125VAC/DC | 125VAC/DC | 24VDC/48VDC |
| | 250VAC/DC | 250VAC/DC | 125VAC/DC |
| | | | 250VAC/DC |
| Serial | 2 COMM+8+8+8 (232/485/FO) expansion slots | 2 COMM+8+8+8 (232/485/FO) expansion slots | 2x8 COMM (232/485/FO) |
| LAN | 6 LAN (2x 10/100/1000 & 4x10/100 Base-T) | 6 LAN (2x 10/100/1000 & 4x 10/100 Base-T) | 2 LAN (2x 10/100 Base-T) |
| USB | 6 USB | 6 USB | 5 USB |
| Display Port | NA | NA | NA |
| IRIG-B | IRIG-IN/OUT | IRIG-IN/OUT | IRIG-IN/OUT |
| OS/Firmware | Linux / DAPserver Studio | Linux / DAPserver Studio | Linux / DAPserver Studio |
| HMI | DAPview - VGA | DAPview - DVI-I | DAPview - VGA (KVM) |
| Redundancy | Main-Standby Redundant PSU | Main-Standby Redundant PSU | Main-Standby Redundant PSU |
| Logic Applications | Logic & ISaGRAF IEC61131 | Logic & ISaGRAF IEC61131 | Logic & ISaGRAF IEC61131 |
| Client Applications | 61850, DNP3, Modbus, Courier, Hydran, SEL, 60870-5-101/103/104,  8979, SPA-bus, SC1801 | 61850, DNP3, Modbus, Courier, Hydran, SEL, 60870-5-101/103/104, 8979, SPA- bus, SC1801 | 61850, DNP3, Modbus, Courier, Hydran, SEL, 60870-5-101/103/104, 8979, SPA-bus, SC1801 |
| Server Applications | 61850, DNP3, 60870-5-101/104, Modbus, OPC UA | 61850, DNP3, 60870-5-101/104, Modbus, OPC UA | 61850, DNP3, 60870-5-101/104, Modbus, OPC UA |
| Warranty | 5 Years (extended option) | 5 Years (extended option) | 10 Years |
| LifeCycle | EoL September 2018 (Replaced by DAP-416 or better equivalent) | EoL September 2018 (Replaced by DAP-416 or better equivalent) | Mature |
| LifeCycle | EoL September 2018 (Replaced by DAP-416 or better equivalent) | EoL September 2018 (Replaced by DAP-416 or better equivalent) | Mature |

# Advanced Substation Automation Solutions
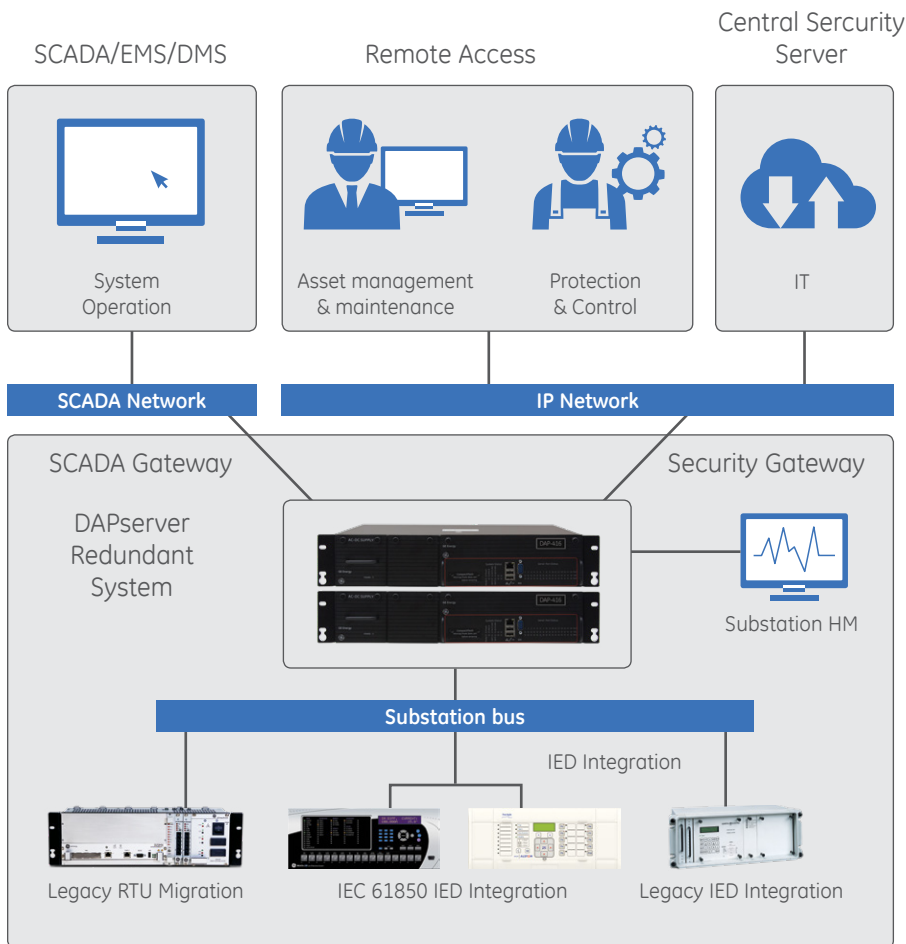
### Substation server

The DAPserver platform of substation hardened devices are designed to operate in harsh environments found in utility and industrial substation applications. It enables the integration of field devices, unification of substation data, interfaces with enterprise applications and secures delivery of substation information to utility users.

### Data concentration

DAPservers have the ability to concentrate data from a wide range of substation devices. The data is collected within the real-time database of DAPserver and is made available to host applications such as multiple SCADA masters or sub-master stations, a local HMI or other substation devices. DAPserver can perform complex calculations and logical operations on the data before it is sent to host applications.

### Software

the core of a DAPserver device is based on the Linux real-time operating system. Modular software applications are available as options depending on the substation application.

## System communications

The ability to acquire data from substation devices is essential to utility substation automation applications. The DAPserver platform consists of a Client application to collect data from substation devices and a Server application to publish data to host applications such as substation HMI and SCADA systems.

## Client application

The interface to substation IEDs - supports native SCADA IED protocols from major vendors as well as non-operational file retrieval.

## Server application

The interface to host applications - supports legacy SCADA protocols as well as IEEE 1815 - DNP3/IP, IEC 60870-5-101/104, Modbus and OPC UA.

## VPort (virtual port) application

Provides secure tunnel connectivity to your substation devices for remote file retrieval, maintenance and diagnostics. By establishing this virtual connection, the overall effect is the same as extending the traditional serial cable connection between a PC and a substation device across your network in a secure manner.

## Substation bus

Supports standards-based protocols such as IEC 61850, IEEE 1815 - DNP3/IP, IEC 60870-5-104 and Modbus.

## Protocol conversion

DAPserver products provide a protocol conversion service which allows integration of substation IEDs, independent of any protocol restriction.

## NERC CIP requirement

DAPserver utilizes the DAPguard cyber security software application for access control and secure communications to substation systems and devices. DAPguard is based on the Linux operating system and tools for authentication, authorization and audit trail. DAPserver can be easily deployed at existing or new substations to address NERC CIP standards requirements.

## Automation applications

DAPserver is equipped with a soft logic programming application. This allows the users to create software applications on an event-driven or periodic basis. An optional software module for the IEC 61131 programming standard is also available.

Combined with the HMI function and IED data integration, the logic application allows the user to create powerful automation solutions. Some examples of automation applications are:

- Substation automation application (interlocking, alarm grouping/ reduction, data conversion)

- Distribution automation application (substation or feeder automation)

- Online condition monitoring of assets (alarm generation on status or analog input limit alarms)

- Automatic file retrieval from the IED after a disturbance event trigger

- Protection relay management

*IED Template library*

*Real-time monitor*

*Relay summary*

*Client configuration*

*HMI configuration editor*
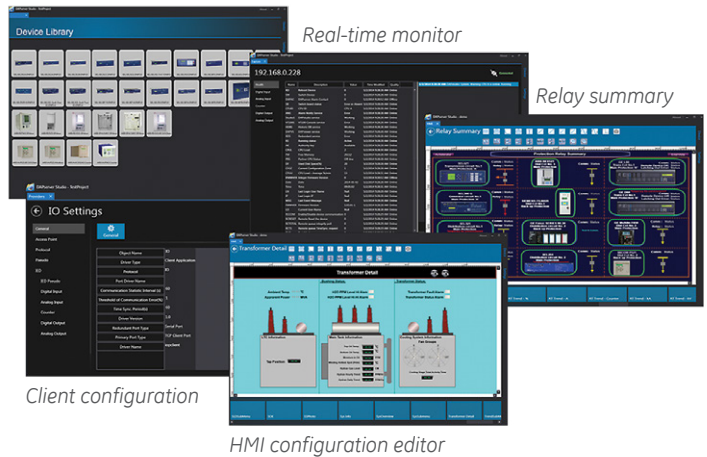
# Redundancy Option

For critical substations, comprehensive redundant architectures are available for added reliability:

- Redundant server - failover switching between primary and secondary server

- Redundant communications - failover switching between communications channels

- Redundant power supply - available on specific hardware platforms

# DAPserver Studio Configuration Tool

DAPserver Studio is an intuitive, user- friendly configuration, maintenance and diagnostic tool for the components of the DAPserver control system. Aside from being the user interface to access all of the functions and database points of DAPserver, DAPserver Studio also provides the following functions:

- Project configuration management

- Uploading and downloading of the configuration and firmware between DAPserver Studio and DAPserver

- Large device library preloaded with templates of commonly used IEDs

- The templates consist of the communications protocol and point mapping of the IED

- Import wizards are available for some commonly used EDs which reduces the configuration time and data entry errors

- Protocol analyzer feature allows the user to analyse the protocol data exchange between DAPserver and the connected devices

# Substation HMI

DAPserver view is an embedded HMI that provides consolidated views for the monitoring, control and maintenance of substation devices either on site or from a remote location. It replaces or complements the traditional mimic control panels.

Some functions of the HMI are:

- Local and secure remote HMI access
- Substation single-line diagram
- Trending for real-time or historical data
- Alarm management for viewing, filtering and acknowledgement
- Custom user screens - easy to use configuration tool

## HMI applications

- Substation graphical user interface
- Substation alarm annunciation
- Visualization of data and information
- Local and remote controls
- Substation and distribution automation
- Protection relay management
- Online condition monitoring
- Remote access to substation EDs
- Security monitoring and management

## HMI benefits

- Improves system availability and reliability
- Improves system security and risk management
- Enables effective decision-making
- Consolidates substation data and information
- Provides role-based visualization for technical and management staff
- Complements SCADA host with detailed information
- Eliminates hard wired annunciator panels
- Reduces dependency on expensive mimic control panels
- Improves staff safety
- Reduces unnecessary travel to sites
- Enables condition-based maintenance and asset management
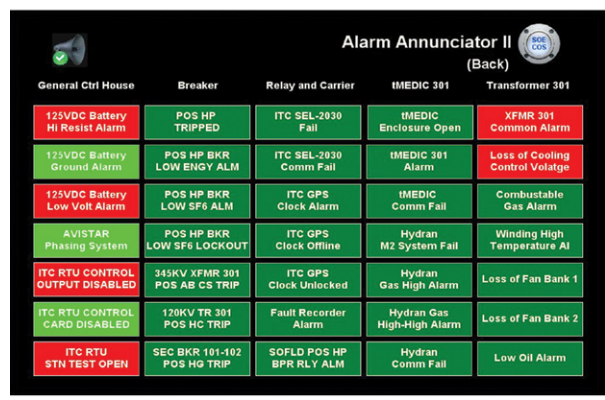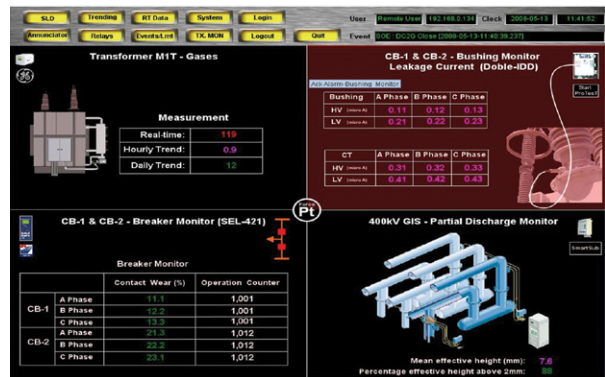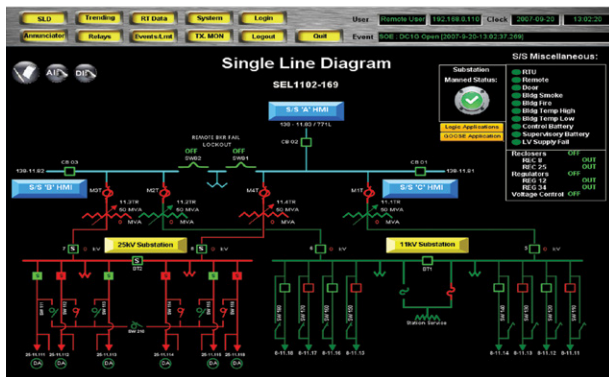
# Engineering Services

The Grid Solutions Substation Automation teams offer a full range of technical services including project management, testing, commissioning and installation support and training.

DAPserver allows us to respond to today's substation automation requirements:

- Meeting the NERC CIP requirements for legacy and new substation automation systems
- Functional testing and integration capabilities - interoperability testing of substation IEDs
- Migration program from legacy RTU based substations to next-generation substation automation systems
- Online condition monitoring to optimize your critical substation assets
- Secure remote access and file retrieval of substation device data
- Centralized substation control room situational awareness IEC 61850 training and workshops

As a partner for your substation automation projects, feel free to contact us to discuss how we can help meet your project objectives.

# Ordering

## DAP-416

| Category | Code | Description |
|---|---|---|
| CPU OPTIONS | P | 1.6 GHz CPU, 1.0 GB DDR RAM, SINGLE ETHERNET, 16GB CF |
| | Q | 1.6 GHz CPU, 1.0 GB DDR RAM, DUAL REDUNDANT ETHERNET, 16GB CF |
| POWER SUPPLY | A | 100-240 VAC (47-63 Hz), 100-300 VDC ( 10%) |
| | B | 20-55 VDC ( 10%) |
| POWER SUPPLY (Redundant) | U | NONE |
| | A | 100-240 VAC (47-63 Hz), 100-300 VDC ( 10%) |
| | B | 20-55 VDC ( 10%) |
| SERIAL COMMUNICATION | U | NONE |
| | 1 | D400 RS-232 IO Assy |
| | 2 | D400 RS-485 IO Assy |
| | 4 | D400 Plastic Fiber Optic IO Assy |
| IRIG-B INPUT CARD | U | NONE |
| | A | IRIG-B INPUT CARD |
| IRIG-B DISTR CARD | U | NONE |
| | B | IRIG-B Distribution Card |
| FIRST NETWORK SLOT | 1 | ETHERNET 4 PORT 10/100 MB TP SWITCH |
| | 2 | ETHERNET FIBER OPTIC (HOT STANDBY) 2 PORT 10/100 BASE-SX |
| | 4 | ETHERNET REDUNDANT TP + COM2 |
| | 5 | D400 100BASE-FX HOT STANDBY ETHERNET |
| SECOND NETWORK SLOT | U | NONE |
| | 1 | ETHERNET 4 PORT 10/100 MB TP SWITCH |
| | 2 | ETHERNET FIBER OPTIC (HOT STANDBY) 2 PORT 10/100 BASE-SX |
| | 5 | D400 100BASE-FX HOT STANDBY ETHERNET |
| USB KVM, AUDIO | U | NONE |
| | A | USB KVM & Audio Card |
| APPLICATION GROUP OPTION | U | NOT REQUIRED |
| | A | Application Protocols Included |
| IEC61850 Protocol Options | U | NOT REQUIRED |
| | A | IEC61850 CLIENT+GOOSE (SUBSCRIBER) |
| | B | IEC61850 SERVER+GOOSE (PUBLISHER) |
| | C | IEC61850 CLIENT AND SERVER+GOOSE |
| HMI OPTIONS | U | NOT REQUIRED |
| | A | LOCAL HMI |
| DAPguard OPTIONS | U | NOT REQUIRED |
| | A | DAPguard Application, Security NERC-CIP |
| IEC61131 RUNTIME OPTIONS | U | NOT REQUIRED |
| | A | IEC61131 Runtime - Programmable Logic Executor |
| FIRMWARE OPTIONS | 1 | Latest firmware version |
| | A | Firmware v6.2.4-5 |

## DAP416-UGK

| Category | Code | Description |
|---|---|---|
| DAP TYPE OPTIONS | A | DAPServer |
| | B | DAP-416 |
| CPU OPTIONS | U | No CPU Required |
| | 1 | 1.6 GHz CPU, 1.0 GB DDR RAM (520-0232 LF) |
| | 6 | |
| | 0 | |
| ETHERNET CONTROLLER OPTIONS | U | None |
| | S | Single Ethernet Controller |
| | D | Dual Ethernet Controller [580-3410 + 977-0544 + 977-0549] |
| FIRMWARE OPTIONS | A | DAP-416 Firmware V.6.2.4-5 Loaded on a 16GB Compact Flash Card (160-0142) |
| | B | DAP-416 Latest Firmware loaded on a 16GB Compact Flash Card (160-0142) |
| | C | DAP Server Firmware V.6.2.4-5 Loaded on a 16GB Compact Flash Card (160-0142) |
| | D | DAP Server Latest Firmware loaded on a 16GB Compact Flash Card (160-0142) |
| IEC 61850 OPTIONS | A | IEC61850 +GOOSE CLIENT (SUBSCRIBER) |
| | B | IEC61850 +GOOSE SERVER (PUBLISHER) |
| | C | IEC61850 +GOOSE CLIENT AND SERVER |
| | U | No Lincense Required |
| HMI OPTIONS | A | LOCAL HMI |
| | U | NO LICENSE REQURIED |
| DAPguard Options | U | NONE |
| | A | DAPguard Application, Security NERC-CIP |
| IEC 61131 RUNTIME OPTIONS | A | IEC61131 Runtime - Programmable Logic Executor |
| | U | NONE |
| APPLICATION PROTOCOL OPTIONS | U | NONE |
| | A | Application Protocols: OPC UA Server, SEL Client, SPABus Client, Courier Client, L&G 8979 Client, SC 1801 Client, and GE Hydran Client |

## DAPS

| DAPS | * | * | * | * | * | * | * | * | * | * | * | * | * | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | | | | | | | DAP-AT - UNO-4673A DUAL PSU ATOM 510 1.6GHz 2GB RAM, 16GB Compact Flash Card (includes base protocols and redundancy) |
| | 2 | | | | | | | | | | | | | DAP-AT - UNO-4673A SINGLE PSU ATOM 510 1.6GHz 2GB RAM, 16GB Compact Flash Card (includes base protocols and redundancy) |
| | 3 | | | | | | | | | | | | | DAP-AT - UNO-4683DP-D34E, DUAL PSU Core i7 2.0GHz, 4GB RAM, 16GB Compact Flash Card ( includes base protocols and redundancy) |
| | 4 | | | | | | | | | | | | | DAP-AT - UNO-4683-D34E SINGLE PSU Core i7 2.0GHz, 4GB RAM, 16GB Compact Flash Card ( includes base protocols and redundancy) |
| Communication Port Options Slot 1 | | U | | | | | | | | | | | | Not Requried |
| | | A | | | | | | | | | | | | 8-port RS-232/422/485 w/EFT protection |
| | | B | | | | | | | | | | | | 4-port RS-232/422/485 w/Iso and EFT, 1-port IRIG-B |
| | | C | | | | | | | | | | | | 4-port Fiber Optic LAN card |
| Communication Port Options Slot 2 | | | U | | | | | | | | | | | Not Requried |
| | | | A | | | | | | | | | | | 8-port RS-232/422/485 w/EFT protection |
| | | | B | | | | | | | | | | | 4-port RS-232/422/485 w/Iso and EFT, 1-port IRIG-B |
| | | | C | | | | | | | | | | | 4-port Fiber Optic LAN card |
| Communication Port Options Slot 3 | | | | U | | | | | | | | | | Not Requried |
| | | | | A | | | | | | | | | | 8-port RS-232/422/485 w/EFT protection |
| | | | | B | | | | | | | | | | 4-port RS-232/422/485 w/Iso and EFT, 1-port IRIG-B |
| | | | | C | | | | | | | | | | 4-port Fiber Optic LAN card |
| APPLICATION GROUP OPTION | | | | | U | | | | | | | | | NOT REQUIRED |
| | | | | | A | | | | | | | | | Application Protocols Included |
| IEC61850 Protocol Options | | | | | | U | | | | | | | | NOT REQUIRED |
| | | | | | | A | | | | | | | | IEC61850 CLIENT+GOOSE (SUBSCRIBER) |
| | | | | | | B | | | | | | | | IEC61850 SERVER+GOOSE (PUBLISHER) |
| | | | | | | C | | | | | | | | IEC61850 CLIENT AND SERVER+GOOSE |
| IEC61850 Protocol Options | | | | | | | U | | | | | | | NOT REQUIRED |
| | | | | | | | A | | | | | | | LOCAL HMI |
| DAPguard OPTIONS | | | | | | | | U | | | | | | NOT REQUIRED |
| | | | | | | | | A | | | | | | DAPguard Application, Security NERC-CIP |
| IEC61131 RUNTIME OPTIONS | | | | | | | | | U | | | | | NOT REQUIRED |
| | | | | | | | | | A | | | | | IEC61131 Runtime - Programmable Logic Executor |
| FIRMWARE OPTIONS | | | | | | | | | | 1 | | | | Latest firmware version |
| | | | | | | | | | | A | | | | Firmware v6.2.4-5 |

## Common to both DAPServer and DAP-416

| DESCRIPTION | OPTION LETTER | CLIENT | SERVER | FUNCTION |
|---|---|---|---|---|
| BASE APPLICATIONS (Included with Firmware automatically) | | DNP3.0 | DNP3.0 | V Port |
| | | Modbus | Modbus | Logic Lock |
| | | IEC61870-5-101 | IEC60870-5-101 | Script Logic |
| | | IEC61870-5-103 | | Batch Control |
| | | IEC61870-5-104 | IEC60870-5-104 | Redundant CPU |
| | | | | Redundant Channel |
| APPLICATION GROUP OPTION (Orderable Group) | A | | OPC UA Server | |
| | | SEL Client | | |
| | | SC 1801 Client | | |
| | | SPABus Client | | |
| | | GE Hydran Client | | |
| | | L&G 8979 Client | | |
| | | Courier Client | | |

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