Advant® OCS
with Master software

Advant Controller 450

Version 2.3/1

Product Guide

3BSE 015 953R201 Rev B

Use of **DANGER**, **WARNING**, **CAUTION**, and **NOTE**

This publication includes, **DANGER**, **WARNING**, **CAUTION**, and **NOTE** information where appropriate to point out safety related or other important information.

DANGER Hazards which could result in severe personal injury or death

WARNING Hazards which could result in personal injury

CAUTION Hazards which could result in equipment or property damage

NOTE Alerts user to pertinent facts and conditions.

Although **DANGER** and **WARNING** hazards are related to personal injury, and **CAUTION** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **DANGER**, **WARNING**, and **CAUTION** notices.

TRADEMARKS

NOTICE

CE MARKING

This product meets the requirements specified in EMC Directive 89/336/EEC and in Low Voltage Directive 72/23/EEC.

3BSE001264/E

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Chapter 1 Overview

Advant Controller 450 is a high-end, high performance process controller for binary, regulatory and supervisory control. Its high processing capacity and wide-ranging process and system communication capabilities make it the ideal choice for demanding applications in industrial environments, either standing alone or as an integrated part of an Advant OCS system as well as in any other distributed control system

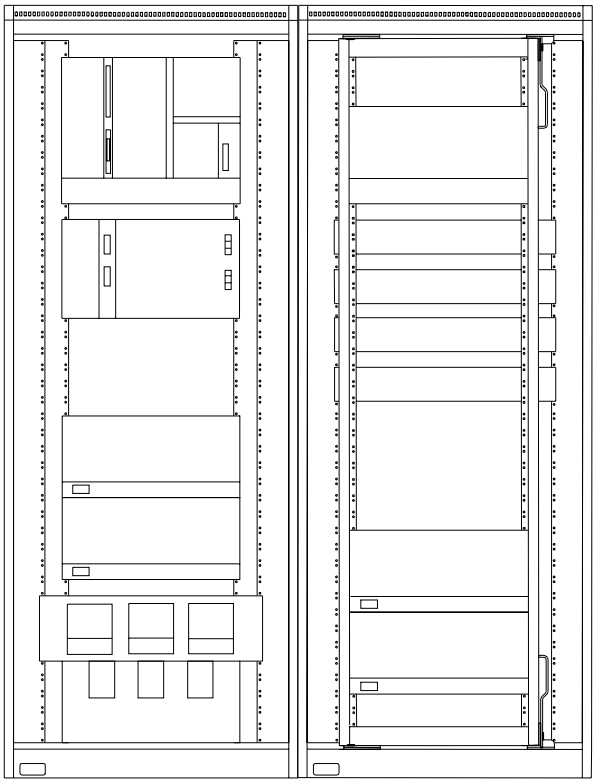

Figure 1-1. Advant Controller 450 with S100 I/O

1.1 Product Benefits

With Advant Controller 450 you will have the latest equipment concerning functionality, interoperability and performance. An increased availability is achieved by using dual redundant processor modules, dual redundant voltage regulators and mains supplies. You will be able to maximize your productivity and at the same time be prepared for easy integration of tomorrow's technology. Advant Controller 450 meets a user's requirement of maximum plant availability.

1.2 Features

Advant Controller 450 covers a wide range of functions such as:

- Logic and sequence control.
- Data and text handling.
- Arithmetic, reporting and positioning.
- Regulatory control including Fuzzy control, advanced PID and self-tuning adaptive control.
- Highly extended flexibility and scalability - hardware as well as software.
- Fully modular with a controller subrack based on FB+ (IEEE 896) as the system bus.
- Self-configuration capabilities which make it possible to add units while the controller is in full operation
- Support of a wide range of central and distributed I/O modules for maximum configuration possibilities, with a maximum I/O capacity of 5700 I/O points.
- Support of local and central HMI for manual control operations, event and alarm handling, trend curve presentation etc.
- Interoperability concerning all communication levels from plant floor fieldbuses to high-speed plant network.
- Support of redundant Fieldbus Communication with Advant Fieldbus 100.
- Support of Advant Fieldbus 100 with cable length up to 13300 m (43300 feet).

Chapter 2 Functional Description

2.1 General Controller Utilities

2.1.1 CPU

The processor module PM511V contains the total amount of RAM (Random Access Memory), which is an 8 or 16 Mbyte dynamic RAM with error correction code. This memory holds the system program which is in use as well as the controller system configuration and application program, that is, all memory executed in run time. The processor module is built-up around a microprocessor, Motorola 68040, running at 25 MHz.

The module front contains the following functions:

- Indicators and a character display for high level system diagnostics.
- The main operable equipment is a four-position rotary switch for start and working mode selection and a restart push button.
- The module front also includes a program card interface and a connection for S100 I/O bus communication.
- You can connect a configuration and maintenance tool on the module front.

Redundant CPU

Optional Advant Controller 450 features redundant processor modules, each containing CPU, memory and switch over function. While the active unit is running the process control functions, the backup unit is on “hot stand-by” and continuously updated by an automatic check pointing procedure. A manually initiated switch-over can be accomplished. No special arrangements are required in the application programs. If a failure is detected in the active unit, it is halted, and the backup unit takes over totally bumpless. Status information is shown on the module front and also sent to AdvaCommand as system alarm.

2.1.2 Memory and Backup

System Program Backup

The system program is backed up in flash PROM and loaded to the RAM in connection to system start. Physically, the standard system program is stored in one program card (PCMCIA). The basic system program card must always be located in the CPU. Normally the program card should be in place during operation. The program card must be in place in order to start-up the backup CPU of a redundant pair. Additional program cards are located in program card interface MB510.

Application Program Backup

The controller system configuration and the application program is normally created in an off-line or sometimes an on-line configuration session supported by an engineering station. The work is basically backed up in the engineering station environment (hard disc, flexible disc or likely).

To restore a RAM which has been cleared by an accident or a fatal error some measures have to be taken, automatically and manually. In addition to the automatic loading of the system program, described above under the heading System Program Backup, somebody has to manually load the application program backup (including the controller system configuration) using an engineering station.

As an alternative, the Advant Controller 450 can be equipped with an optional flash card of similar type as the one used for the system program. The flash card is contained with a DUmp of Application Programs (DUAP) preferably taken while the controller is in the operation mode. At need, the controller system configuration and the application program is likewise automatically loaded from its flash card into the controller RAM. No manual intervention is needed to get into operation after the interruption.

Flash cards are available in different memory-sizes (2, 4 or 10 Mbytes). Select a type that takes the actual application program.

The system program backup and the application program backup can not be mixed in one single program card.

Memory Backup Power Supply

The RAM is secured against loss of power for a minimum of four hours (two hours when redundant processor modules are used) by a backup power supply and battery. This is important for the configured application program, which is basically not otherwise backed up.
If a longer backup time is desirable, you can use:

- Additional backup power supply unit SB510 and battery package (doubled backup time)
- Alternative backup power supply unit SB511 connected to a 24 V or 48 V external battery system
- An application program backup (see heading above).

2.1.3 System Clock, External Clock Synchronization

The processor module PM511V is provided with a calendar clock which is backed up by the same battery used for memory backup. You can set the date and time from the programming unit or from a local operator station, for example, MasterView 320. A slow, smaller adjustment in the interval ±100 s can also be performed with the programming unit. With Advant Controller 450 connected to MasterNet, as a part in a distributed control system, the synchronization occurs automatically with other stations via a network with an accuracy faster than 3 ms.

If extreme synchronization accuracy is required between controllers (in the order of 2 ms) and synchronization to an external clock, an external minute pulse signal can be connected to all systems concerned. The supervision module TC520 has a special input for external synchronization of the calendar clock.

2.1.4 Configuration

You configure the system in accordance with the hardware and software selected, for example, the number of I/O boards, communication lines, functional units and PC programs.
This is performed using commands from a configuration tool such as Advant Station 140 (with AMPL Control Configuration 1.7 or later product versions) and results in the internal organization and activation of the data base and program areas.

2.1.5 Execution

The execution units in a PC program are normally given cycle times of 10 ms - 2 s (5 ms - 32 s after reconfiguration). The internal program system (operating system and PC interpreter) organizes the execution of the units with the periodicity selected, simultaneously performing other tasks such as communication with a MasterView 320 and programming units.

Ordinarily, you can select the same cycle times for reading in values from digital and analog boards.

2.1.6 Start-up

The CPU front panel has a rotary switch which you use to select start and working mode. The normal position of the switch is 1 (AUTO). This means an automatic start when voltage is switched on or when voltage is recovered after a power failure. At an interruption of voltage, the system stores all the information necessary for restarting. Whether the system is to continue operations from its status at the interruption of the voltage or if it is to be reset to zero before restart is selected with parameters.

The different ways to start are CLEAR, STOP, AUTO or OFF LINE. The way to start is selected on the basis of the duration of the voltage failure.

You can connect a control module which is activated when the voltage returns and which executes one cycle to each start alternative. All start modules must belong to the same PC program. You can define how the process is to start with these control modules.
Alarm can also be blocked at initialization of the I/O boards.

2.2 Process Control

Process control applications are programmed in the ABB Master Programming Language (AMPL). AMPL is a function-block language with graphic representation.

The building blocks are called PC elements. There is a wide range of PC elements, from simple AND blocks to complete PID regulators.

Besides the functional PC elements, AMPL also contains several structural elements for dividing a PC program into suitable modules which can be managed and executed individually.

The controller can be programmed fully on-line, that is, with the program running and controlling the process.

PC Elements

The wide range of ready-to-use PC elements is powerful. It contains, for example, elements for:

- Logic and Time Delays
- Sequence Control
- Data and Text Handling
- Calendar Time Functions
- Arithmetic
- Feedback Control
- Fuzzy Control
- Pulse counting and Frequency Measurement
- Positioning
- Reports
- Communication via Fieldbuses.

The PC elements are listed under the program modules in Chapter 3, Software Components.

User Defined PC Elements

Another way to implement your frequently used control solution and ensure a fully integrated engineering environment is to use the optional program module User Defined PC Elements.

A user defined PC element appears in every sense as a standard PC element. Actually the control solution of a user defined PC element is defined by other PC elements. By designing your application with user defined PC elements you gain:

- Significant reduction in translation time
- Memory saving with reuse
- Similar documentation in Function Chart Builder and On-line Builder
- User defined PC element hierarchy
- Reduced man-hours in commissioning and maintenance.

Functional Units

A functional unit is a package of different functions, such as PC elements, DB elements, display elements, dialogs and event and alarm handling. Functional units extend the power of AMPL and supplement the PC element library for more complex control functions.

Since the functional units are ready-to-use, it simplifies documentation and implementation of functions with both control function and associated operator’s action via display screen and keyboard. The operator interface is always consistent to improve the operator’s interaction with the process. Application include regulators, sequence control and motor/valve controls. PC elements and functional units can be used freely together.

The functional units are listed under the program modules in Chapter 3, Software Components.

2.3 I/O System Support

S100 I/O System

S100 I/O boards are located in I/O subracks which are integrated with Advant Controller 450 in the same cabinets and connected to the controller subrack via a bus extension cable (max. length 12 m (39 ft.). For increased availability the S100 I/O bus extension can be doubled (redundancy). S100 I/O subracks can also be distributed via an optical bus extension (max. length 500 m (155 ft.). For further information about S100 I/O, please refer to the *Product Guide for S100 I/O*.

S800 I/O System

The distributed S800 I/O modules communicate with the Advant Controller 450 over the Advant Fieldbus 100, via the CI522A interface module. The fieldbus communication between the controller and the modulebus in the S800 I/O station can be doubled (redundancy). The range of supported S800 I/O modules is shown in Table 2-1.

Table 2-1. S800 I/O modules supported by Advant Controller 450

Module type	Type designation
FCI	CI810xx, CI820, CI830
AI	AI801, AI810, AI820, AI830, AI835, AI890, AI895
AO	AO801, AO810, AO820, AO890, AO895
DI	DI801, DI810, DI811, DI814, DI820, DI821, DI830, DI831, DI885, DI890
DO	DO801, DO810, DO814, DO815, DO820, DO821, DO890
DP	DP820

For further information about S800 I/O please refer to the *S800 I/O System Product Guide*.

2.4 Time Tagging of Events and Alarms

The time tagging of digital input signals can be done in the system software of the controller or on certain digital input (DI) modules belonging to S100 I/O or S800 I/O. Time tagging on a DI module results in a high time accuracy. Signals created in AMPL can also be time tagged but with an accuracy corresponding to the PC program cycle time.

2.5 Pulse Counting and Positioning

Pulse Counting

Different S100 I/O and S800 I/O boards are used for pulse counting. Low pulse frequencies (lower than 40Hz) are counted without PC element support. For higher frequencies (up to 2.5 MHz), PC elements are connected to the boards.

Positioning

Positioning and length measurement uses a set of PC elements connected to the board DSDP 140A. Fast positioning creates substantial load in the controller CPU. Normally, max. 10 positioning axes per Advant Controller 450, can be used.

2.6 Switchgear Integration

Connection to the INSUM Motor Control Unit (MCU) is done via the LONWORKS Network. Each LONWORKS channel (on CI572 Communication Module) can connect one INSUM Motor Controller, including up to 64 MCU's. A series of PC element is used for sending/receiving data to/from the MCU's.

To minimize engineering efforts, a predefined type circuit is offered.

For configuration of the LONWORKS Network the configuration tool LNT505 is required in addition to the ordinary Advant Control Configuration tool. See Advant Engineering Products, Product Guide for further information.

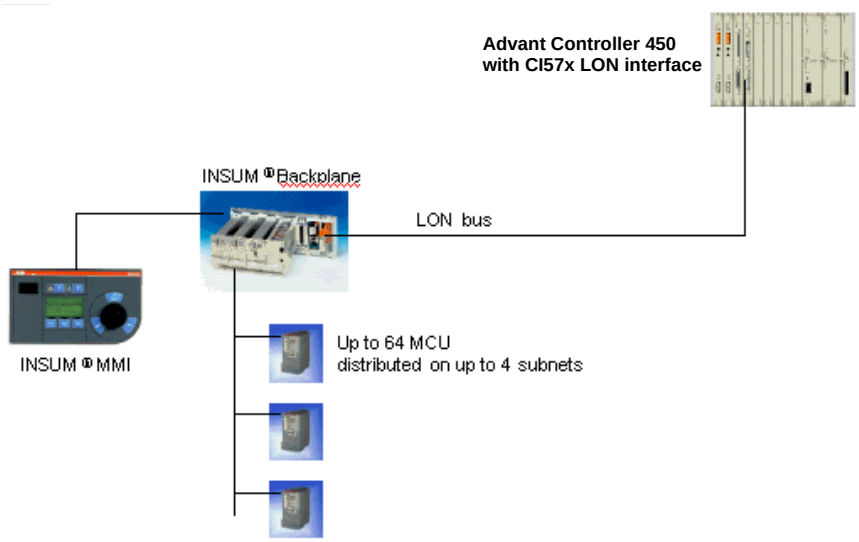

Figure 2-1. AC 400 Series configuration with INSUM Motor Controller

2.7 Drives Integration

Connection to ACS 600, DCS 600 and DCS 500B drive systems is done via Advant Fieldbus 100. Each fieldbus node connects up to 24 drives via a S800 I/O Fieldbus Communication Interface (FCI). A series of PC elements is used for sending/receiving data to/from the drives.

To minimize engineering efforts, a predefined type circuit is offered

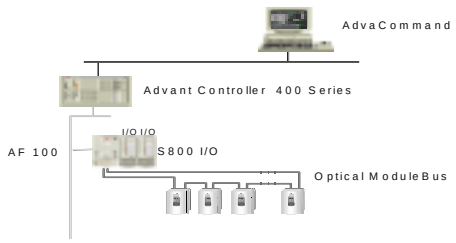

Figure 2-2. AC 400 Series configuration with drives

2.8 Variable Speed Drive Control

Converters for both d.c. and a.c. motor drives can be connected to Advant Controller 450 via Advant Fieldbus 100 or MasterFieldbus. For TYRAK, which has a built in modem for the MasterFieldbus, the following limitations apply:

- the max. no. of convertors connected to the same LDB is 9.
- the max. no. of convertors connected to one Advant Controller 450 is 64.

2.9 Communication

Detailed information about the various networks and buses that can be integrated in Advant Controller 450 is given in *Product Guide for Advant OCS with Master Software, Overview.*

Below is a list of communication functions in Advant Controller 450.

Control Network

- MasterBus 300
- MasterBus 300E

Fieldbus Communication

- Advant Fieldbus 100
- PROFIBUS-DP
- RCOM/RCOM+
- Master Fieldbus
- LONWORKS Network Interface.

External Communication

- EXCOM
- MultiVendor Interface (MVI)

  The following protocols are supported:

  – MODBUS (via CI532V02)

  – MODBUS (via CI534V02)

  – Siemens 3964(R) (via CI532V03)

  – Allen-Bradley DF1 (via CI534V04)

  – Free-programmable protocol (via CI535)

  – Free-programmable protocol (via CI538)
- GCOM
- HART data routing
  HART data can be routed between S800 I/O modules supporting HART and a configuration tool supported by the AMPL Control Configuration.

Telecontrol & SPA Bus

- RCS protocol RP570/RP571 Master
- RTU protocol RP570 Slave
- RTU protocol IEC870-5-101 unbalanced Secondary Station
- SPA Server protocol SPA Bus

Communication is done with PC elements. For further information see respective Product Guide.

2.10 AdvaCommand Support

Advant Controller 450 supports several functions in an Advant Operator Workplace.

- Subscription
- Order and presentation
- System Status Displays
- Status List
- Trend displays
- Event List.

For further information, please see the *Product Guide for Advant Operator Workplace with AdvaCommand.*

2.11 Local Operator Station MasterView 320

MasterView 320 provides functions for presentation of process information on user defined displays, for manual data entry via a keyboard, and for presentation of an event list with events generated by application programs in Advant Controller 450.

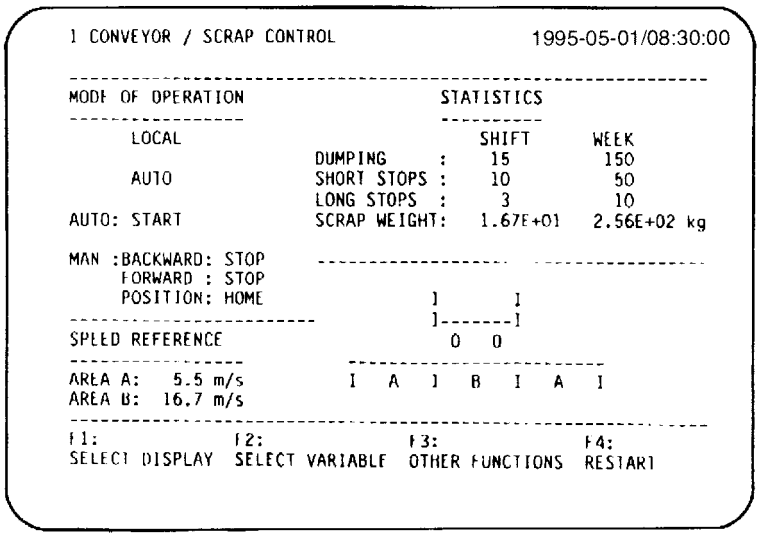

Figure 2-3. Example of display from MasterView 320

Hard-copy printout of displays and event list is possible.

Display Presentation and Operator Dialog

MasterView 320 is a VT100 or VT100 compatible terminal, 24 lines with 80 characters per line. 16 of the lines are available for user defined displays. The remaining eight lines are used by the system for display identity and description presentation, time and date, dynamic function key menu and a command entry line. Displays are generated and modified directly on the screen. Standard VT 100 attributes, such as reverse video, flashing, underscore and reduced intensity are supported. The static part of a display is built using text strings.

Depending on terminal, simple character oriented graphics are supported. Dynamic fields are defined for the presentation of information from variables in the data base. Integer and real values are presented in numerical form. Time is presented in the form HH:MM:SS. Boolean values can be presented with user defined text strings; ON/OFF, UP/DOWN and AUTO/MANUAL.
Each display is given an identity and a description; presented on the display's first line.
You can protect displays from unauthorized modification by a parameter in the database.
A simple operator dialog is engaged into through the function keys on the keyboard.
By setting a parameter value, you select one of the following languages: Danish, Dutch, English, Finnish, French, German, Italian, Norwegian, Portuguese, Spanish, and Swedish.

Event List

Event list is available via MasterView 320. It can be presented on the terminal screen and printed on a printer connected to the controller. A separate list is associated with each screen. The event generation is configured with PC programs, using PC element EVENT. Event texts are user defined. The time of each event is automatically incorporated, with a resolution determined by the scanning cycle of the PC program where the event is generated.

Hard Copy

A printer, connected to the same Advant Controller 450, can be used for hard-copy printouts from MasterView 320. The printout can be activated from the keyboard, or automatically from an PC program in the controller. The hard-copy function of MasterView 320 can be used for efficient report generation with the controller. All necessary calculations of report data is done with PC programs. The report is built with the normal display generation functions of MasterView 320. Once the report is defined, the video terminal is not required any more, only the hard-copy printer. Printout is then activated from PC programs. Thus reports can be generated at regular points in time or on special events.

2.12 Local Printer

With a printer, directly connected to the Advant Controller 450 via the submodule CI531, reports (generated in AMPL report function) or report/event lists from MasterView 320 can be printed.

2.13 Scope of Controller Functions

A large variety of configuration alternatives is possible with Advant Controller 450 and its I/O, both software and hardware. Software options are available as one or several program modules. Optional hardware units are I/O boards, communication units etc. Table 2-2 summarizes the various options and configuration alternatives applying to Advant Controller 450.

Table 2-2. Functions and configuration alternatives for Advant Controller 450

Function	Program module	Hardware	Peripherals
S100 I/O boards with Board Oriented Connection Units	QC07-BAS41	See Reference Guide	
Redundant S100 I/O boards with Board Oriented Connection Units	QC07-BAS41	DSAX 110 DSAX 110A DSAI 133 DSAI 133A DSTA 001 DSTA 001B DSTA 002 DSTA 002B	

Table 2-2. Functions and configuration alternatives for Advant Controller 450 (Continued)

Function	Program module	Hardware	Peripherals
S400 I/O units	QC07-BAS41	See (1)	MasterFieldbus
S800 I/O modules	QC07-BAS41	See S800 I/O Product Guide	Advant Fieldbus 100
Local time-tagging on DI-board with down to 0.5 ms resolution	QC07-BAS41	DI885, DI830, DI831 DSDI 110A DSDI 110AV1 DSDI 120A DSDI 120AV1	
PC elements for logic, arithmetic & data handling	QC07-BAS41		
PC elements for logic, arithmetic, data handling and process control	QC07-BAS41+ QC07-LIB41		
PC elements for logic, arithmetic, data handling and advanced process control (incl. self tuning adaptive control)	QC07-BAS41+ QC07-LIB41+ QC07-LIB42		
PC elements for Fuzzy Control	QC07-BAS41+ QC07-FUZ41+ QC07-OPF41		
Functional units	QC07-BAS41+ (QC07-LIB42)+ QC07-OPF41		AdvaCommand
Positioning	QC07-BAS41	DSDP 140A DSTD 150A or DSDP 140A DSTD 190	Pulse transmitter
Fast pulse counting and frequency measurement	QC07-BAS41	DSDP 150 DSTD 150A or DSDP 150 DSTD 190 or DSDP 170 DSTX 170	Pulse transmitter
Local operator station MasterView 320 (2)	QC07-BAS41+ QC07-LOS41	CI531 Modem	VT 100-compatible terminal
Local printer (2)	QC07-BAS41	CI531 Modem	Printer
External computer communication using EXCOM	QC07-BAS41	CI531 Modem	External computer with EXCOM.

Table 2-2. Functions and configuration alternatives for Advant Controller 450 (Continued)

Function	Program module	Hardware	Peripherals
MasterBus 300	QC07-BAS41	CS513 Transceiver	MasterNet
MasterBus 300E	QC07-BAS41	CS513 Transceiver	MasterNet
GCOM	QC07-BAS41	CI543	
Communication using RCOM/RCOM+	QC07-BAS41	CI532V01	
MultiVendor Interface	QC07-BAS41	CI532Vxx CI534Vxx	
Free-programmable MultiVendor Interface	QC07-BAS41	CI535 or CI538	Software development environment required
Telecontrol & SPA Bus	QC07-BAS41+ YC572	CI535V24 CI535V29 CI535V23 CI535V26 CI535V30	
MasterFieldbus	QC07-BAS41	CI570, TC570	S400 I/O units, TYRAK, SAMI
Advant Fieldbus 100	QC07-BAS41	CI522A TC512V1 TC513xx TC514xx TC515xx TC516 TC625 TC630	Advant Controller 70/110/160, S800 I/O, DCS 500B, DCS 600, ACS 600
PROFIBUS-DP	QC07-BAS41	CI541V1	
LONWORKS Network Interface	QC07-BAS41	CI572	INSUM2
Object Support via Advant Fieldbus 100	QC07-BAS41+ QC07-COM41		Advant Controller 110/160, AdvaCommand
Support for AdvaCommand, AdvaSoft for Windows, AdvaInform and MV 800/1 (Subscription, Order/Presentation, System Status, Status List, Trend, Event List)	QC07-BAS41+ QC07-OPF41	CS513 Transceiver	MasterNet
Table handling	QC07-BAS41		
On-line PC program editing	QC07-BAS41		On-line Builder (AdvaBuild, AMPL Control Configuration, AdvaCommand)

Table 2-2. Functions and configuration alternatives for Advant Controller 450 (Continued)

Function	Program module	Hardware	Peripherals
Connection to analog thyristor converters, variable speed control	QC07-BAS41+ QC07-LIB41	DSDC 111 DSTX 110	Thyristor converter
MasterBatch 200/1 support	QC07-BAS41+ QC07-BAT41	CS513 Transceiver	MasterNet
Intrinsic Safety support	QC07-BAS41	DSAI 130 DSAI 130A DSAI 133 DSAI 133A DSAO 120 DSAX 110 DSAX 110A DSDI 110A DSDI 110AV1 DSDO 115A DSDP 150	Intrinsic Safety Isolator modules. See S100 I/O Product Guide for more information.
HART Protocol support	QC07-BAS41	DSAI 133 DSAI 133A DSAX 110 DSAX 110A DSAO 120 DSAO 130 DSAO 130A	HART multiplexer See S100 I/O Product Guide for more information.
Support for DCS 500B, DCS 600, ACS 600 motor drives	QC07-BAS41	See Advant Fieldbus 100	Motor Drives DCS 500B, DCS 600, ACS 600
User Defined PC elements	QC07-BAS41+ QC07-UDP41+ (QC07-LIB41)+ (QC07-LIB42)		Engineering station
PROM back-up of application program (PC programs and data base)	QC07-BAS41	MB510 Flash-PROM card	Engineering station with PCMCIA card support

(1) A classic product and no longer included in standard offering.
(2)Modem TC562 is required for distances longer than 15 m (49 ft.)

Chapter 3 Software Components

Advant Controller 450 system software comprises a real-time operating system and an AMPL execution machine.

The functional extent of Advant Controller 450 is determined by adding optional software and hardware units to the basic unit. The software options are delivered as program modules which may be selected to create the desired functional configuration. Optional hardware units are I/O and communication modules etc.

The software system for Advant Controller 450 is built around one Basic program module to which Optional alternative program modules can be added. The Optional program modules can be combined in a number of combinations needed to solve the application task. A description of the program modules and a specification of their contents is given below. The Basic program module, QC07-BAS41, together with the optional software below are stored in one program card, placed on the CPU PM511V.

3.1 Basic Program Module, QC07-BAS41

The Basic program module has the following functional contents:

- Logic control and time delays
- Arithmetic
- Data and text handling
- Sequence control
- Calendar time functions
- Table handling
- Fast pulse counting and frequency measurement
- Positioning
- Reports
- Functional units, binary[1]
- Functional units, analog[1]
- Functional units, motor and valve control, group start[1]
- Support for MasterBus 300/300E
- Support for GCOM
- Support for RCOM/RCOM+

1. The PC elements and database parts of the functional units are included in the Basic program module. The presentation and dialog support require the optional Program Module QC07-OPF41. Special dedicated interface boards are not included in the system unit.

- Support for MultiVendor Interface
- Support for fieldbus communication (Advant Fieldbus 100, PROFIBUS-DP, LONWORKS Network, MasterFieldbus).
- Strain-gauge weighing support
- Support for motor drives
- Data Set/DAT communication
- Back-up of application program in flash-PROM card

Most of the above mentioned functions are realized with one or several PC elements.
The contents of the PC element library in the basic program module is shown in Table 3-1.

Table 3-1. PC elements in the basic program module QC07-BAS41

Type	PC element
Structure elements	PCPGM, CONTRM, FUNCM, MASTER, SLAVEM, BLOCK, SEQ, STEP
Logic elements	AND, OR, AND-O, OR-A, XOR, INV, SR, SR-D, SR-AA, SR-AO, SR-OO, SR-OA
Arithmetic elements	ADD, SUB, MUL, DIV, ADD-MR1, ADD-MR, DIV-MR, SQRT, ABS, LIM-N
Time delays	TON, TOFF, MONO, TON-RET, TRIGG, OSC-B
Calendar time elements	TIME, DATE, TIMER
Registers	SHIFT, SHIFT-L, FIFO, REG-RET, EXPAND, EXPAND-A, FIFO-RW, REG, REG-G
Multiplexers	MUX-I, MUX-N, MUXA-I, MUX-MI, MUX-MN, DEMUXA-M, DEMUX-MI
Code converters	CONV-BI, CONV-IB, CONV-AI, CONV-IA, CONV-SA, CONV
Counters	COUNT, COUNT-L
Comparators	COMP-I, COMP-R, COMP, MAX, MIN
Fault elements	FAULT
Printing and text generation elements	TEXT, PRINT
Elements for functional units	GENBIN-I, GENBIN-O, GENUSD-I, GENUSD-O, GEN-CON-I, GENCON-O, MOTCON, VALVECON, MMC-IND, MMC-ORD
Switches	SW, SW-C
Positioning elements	POS-A, POS-O, POS-L

Table 3-1. PC elements in the basic program module QC07-BAS41 (Continued)

Type	PC element
Pulse counting and frequency measurement elements	PULSE-S, COUNT-DP, FREQ-SP, FREQ-MP, PCU-I, PCU-O, PCU-COM, PCU-SS
Data handling elements	MOVE, MOVE-A
Event handling element	EVENT
Report element	REPORT
Elements for programmable module	FPM-COM, FPM-I, FPM-IA, FPM-O, FPM-OA
Weighing elements	SCALE, SCALEDOS
Table handling elements	TBL-R, TBL-RG, TBL-W, TBL-WG
Ramp generators	RAMP-S1
Supervision elements	ANALYSE, COM-STAT
MasterFieldbus communication elements	COM-MP51, MFB-OUT, MFB-IN, COM-CVI1, COM-CVO1
Advant Fieldbus 100 communication elements	DSP-R, DSP-S, DRI-CNV, DRI-R, DRI-S
PROFIBUS-DP communication elements	PB-DIAG, PB-R, PB-S
LONWORKS Network Interface communication elements	LON-R, LON-S
Data Set elements	SENDREQ

Besides the PC element library, the basic program module also includes a functional unit library. The functional units supplement the PC elements and they are primarily intended for realizing instrumentation functions. The contents of the functional unit library is shown in Table 3-2.

Table 3-2. Functional units in the base program module QC07-BAS41

Functional unit	Description
AI	Analog input signal, including AI, Temp. (Pt100), TC (thermocouple), and AIC (calculated AI).
AO	Analog output signal, including AO and AOC (calculated AO)
DI	Digital input signal, including DI and DIC (calculated DI)
DO	Digital output signal, including DO and DOC (calculated DO)

Table 3-2. Functional units in the base program module QC07-BAS41 (Continued)

Functional unit	Description
DAT	General data base value
TEXT	Text in data base
GENUSD	General user-defined device controller
GENBIN	User-defined on/off controller
GENCON	User-defined regulatory controller
SEQ	Sequence controller
GROUP	Device group controller
MOTCON	Motor controller
VALVECON	Valve controller
DRICONE	Engineered Drives Controller
DRICONS	Standard Drives Controller
MOTCONI	INSUM Motor Controller

3.2 Optional Program Module, QC07-LIB41

The Optional program module QC07-LIB41 extends the PC element library that is included in the Basic program module with PC element for supporting the function:

- Feedback control
- Connection to analog thyristor converters.

Feedback control is realized with PC elements. The contents of PC elements in QC07-LIB41 is shown in Table 3-3.

Table 3-3. Additional PC elements in program module QC07-LIB41

Type	PC element
Logic elements	THRESH-L
Arithmetic elements	MED-R, MAJ-R, LN, EXP
Multiplexers	MUXGR-MI, MUXGE-MI
Time controlled elements	OSC-SQW, OSC-SIN
Function generators	FUNG-1V, FUNG-2V, FUNG-T
Filter elements	FILT-1P, FILT-2P

Table 3-3. Additional PC elements in program module QC07-LIB41 (Continued)

Type	PC element
Feedback control elements	P-DEADB, P-1, INT, DER, PI, PIP, PDP, CON-PU1, RAMP
Analog thyristor converter elements	CVB-I, CVB-O

3.3 Optional Program Module, QC07-LIB42

The Optional program module QC07-LIB42 extends the PC element and functional units libraries that are included in the Basic program module with PC element for supporting the functions below:

- Regulatory control
- Functional units, PID loop control, PIDCON[1]
- Functional units, adaptive self- tuning PID loop control, PIDCONA[1]
- Self-tuning adaptive control, Novatune.

The functions are realized with the PC elements in Table 3-4.

Table 3-4. Additional PC elements in program module QC07-LIB42

Type	PC element
Elements for functional units	PIDCON, RATIOSTN, MANSTN, PIDCONA
Self-tuning controller	NOVATUNE

The PC elements PIDCON, RATIOSTN, MANSTN and PIDCONA are also part of the following functional units, which is shown in Table 3-5.

Table 3-5. Functional units in the program module QC07-LIB42

Functional unit	Description
PIDCON	Regulatory controller
RATIOSTN	Ratio station
MANSTN	Manual station
PIDCONA	Adaptive self-tuning regulatory controller

1. The PC elements and database parts of the functional units are included in QC07-BAS41 and QC07-LIB42. The presentation and dialog support require QC07-OPF41.

3.4 Optional Program Module QC07-FUZ41

The Optional program module QC07-FUZ41 extends the functionality of the controller with the FUZZYCON allowing the user to specify the control algorithm using Fuzzy Control, which is an applied science of Fuzzy Theory. Moreover, the function supports multi variable input and multi variable output, i.e. several controlled variables and manipulated variables can be handled simultaneously. To the operators, FUZZYCON exposes the same “look and feel” as other functions, for example PIDCON, with respect to object displays and dialogs. This is also true for other run time features and most of the engineering tasks.

Table 3-6. Additional PC element in program module QC07-FUZ41

Type	PC element
Element for Fuzzy Control	FUZZYCON

3.5 Optional Program Module, QC07-OPF41

The Optional program module QC07-OPF41 extends the functionality of the controller with support for operator station functions in for example Advant Operator Workplace.

The Optional program module QC07-OPF41 extends the functionality given by the Basic program module with the following functions:

- Functional units, binary[1]
- Functional units, analog[1]
- Functional units, PID loop control, PIDCON[1], PIDCONA[1]
- Functional units, motor and valve control, group start[1]
- Support for AdvaCommand Functions
  (Subscription, Order/Presentation, System Status, Status List, Trend, Event/Alarm)
- Log data storage
- Group alarm, a function in AdvaCommand Event and Alarm.

3.6 Optional Program Module, QC07-LOS41

Optional program module QC07-LOS41 extends the functionality of the controller with MasterView 320. A VT100 terminal (or compatible) is used as operator interface.
Four such terminals can be connected to an Advant Controller 450, thus providing four local operator workplaces. Optional program module QC07-LOS41 extends the functionality given by the Basic program module with the following functions:

- MasterView 320
- Reports for MasterView 320.

1. The PC elements and database parts are included in QC07-BAS41 and QC07-LIB42. The presentation and dialog support are included in QC07-OPF41.

3.7 Optional Program Module, QC07-BAT41

The Optional program module QC07-BAT41 extends the functionality of the controller with support for connecting it to the batch station MasterBatch 200/1.

MasterBatch 200/1 is connected to Advant Controller 450 through MasterNet.

3.8 Optional Program Module, QC07-UDP41

The Optional program module QC07-UDP41 makes it possible to execute user defined PC elements in the Advant Controller 450. The user defined PC element is created in AMPL Control Configuration (1.7 or a later product version) and built-up of a combination of normal PC elements from the standard PC element libraries of the Advant Controller 450. After the user defined PC element is installed in the Advant Controller 450 it can be used freely in all PC programs as a normal PC element.

3.9 Optional Program Module, QC07-COM41

The optional program module QC07-COM41 can provide AIS, DIS, MB, MI, MIL and MR objects in Advant Controller 110/160 to be operated from an operator station such as Advant Operator Workplace or AdvaSoft for Windows.

Following functions are supported:

- Acknowledgment of events
- Blocking of events and alarms
- Blocking of process data update
- Blocking of process data value

The function is realized with PC elements in Table 3-7.

Table 3-7. Additional PC elements in program module QC07-COM41

Type	PC element
Elements for object support	COM-AIS, COM-DIS, COM-M

Chapter 4 Hardware Components

4.1 Processor Module

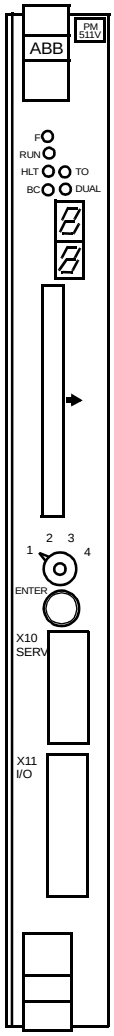

Figure 4-1. Front View of the Processor Module PM511V

The processor module, PM511V, has the following characteristics:

- It contains a Motorola MC68040 processor with dynamic read/write memory (RAM) with ECC (Error Correction Circuit). The memory houses the system software as well as the user built application and is not expandable.
- One port dedicated to connection of Advant Station 140.
- One port dedicated to connection of the S100 I/O bus extension.
- One dedicated slot for the program card.
- Two PM511V can be used in a redundant, hot stand-by, configuration. The redundant processor modules communicate via a built-in redundant control link.
- Two PM511V can be used for controlling a redundant S100 I/O bus extension.

The processor module exists in two versions which have the same type designation on the front, PM511V, and can be separated by the label on the component side of the module.

- PM511V08 with 8 Mbyte read/write memory (RAM)
- PM511V16 with 16 Mbyte read/write memory (RAM).

PM511V08 is upgradable to PM511V16 with a special kit containing 16 Mbyte RAM.

Redundant Processor Modules

If a failure is detected in the active unit, it is halted, and the backup unit takes over in less than 25 ms, totally bumpless. The two processor modules in a redundant configuration must have the same RAM-size.

4.2 Program Card

The controller system software is stored on a flash memory card of type PCMCIA.
This card is located in a slot on the CPU PM511V. It is accessed during start-up of the controller and supervised in run-time.

4.3 Submodule Carriers

The purpose of the submodule carrier is to carry communication interfaces and other submodules. There are two different submodule carriers available for Advant Controller 450. The submodule carriers fit into the subrack of Advant Controller 450. The submodule carriers have the following characteristics.

SC510 has two slots for submodules and no built-in processor. It can house all kinds of submodules.

SC520 has two slots for submodules and a built-in processor. It is primarily dedicated for CS513 when used for MasterBus 300 or MasterBus 300E. Empty slots, not used for CS513 can be used for other submodules.

4.4 Submodules

Communication interfaces and a few other functions are realized as submodules which fits into a slot on a submodule carrier. Modules can be exchanged while the system is running.
New modules can also be inserted live. Every unit has a red LED to indicate fault, see Table 4-1.

Table 4-1. Submodules

Submodule	Description
CI531	RS-232-C communication interface for printer, EXCOM or MasterView 320. Each interface holds two RS-232-C lines.
CS513	MasterBus 300/300E communication. Each interface holds one line.
CI532V01	RCOM/RCOM+ communication. Each interface holds two lines.
CI532V02	MODBUS communication with DB element MS. Each interface holds two lines.
CI532V03	Siemens 3964(R) communication. Each interface holds two lines.
CI534V02	MODBUS communication with DB element MVB. Each interface holds two lines.
CI534V04	Allen-Bradley DF1 communication with DB element MVB. Each interface holds two lines.
CI535V24	RCS protocol RP570 Master
CI535V29	RCS protocol RP571 Master
CI535V23	RTU protocol RP570 Slave
CI535V26	RTU protocol IEC870-5-101 Unbalanced
CI535V30	SPA Server protocol SPA Bus
CI535	Free-programmable MVI communication with DB element MS. Each interface holds two lines.
CI538	Free-programmable MVI communication with DB element MVB. Each interface holds two lines.
CI541V1	PROFIBUS-DP communication. Each interface holds one line.
CI572	LONWORKS Network communication, 1250 kbit/s. Each interface holds two lines.
CI543	GCOM communication. Each interface holds one line.
CI570	MasterFieldbus communication. Each interface holds one line with cable redundancy capabilities.
CI522A	Advant Fieldbus 100 communication. Each interface holds one line with cable redundancy capabilities.
MB510	Program card interface for extra system software or application backup
PU535	Free-programmable module

4.5 Subrack

Controller Subrack

The controller subrack of Advant Controller 450, RF533, uses FutureBus+ (IEEE 896) as the system bus. It is divided into three parts, as seen in Figure 4-2.

Underneath the subrack is always a fan unit RC527 attached. The subrack is also equipped with a supervision unit TC520. The supervision unit is a general status collector to which also other additional signals are connected:

- System bus signals RUN, LIVE, BAT, PFAIL
- Four general-purpose inputs 24 V
- One FANFAIL input
- One external system clock SYNC input (minute pulse)
- Two relay outputs controlled by RUN signal (Processor Module A and B)

.

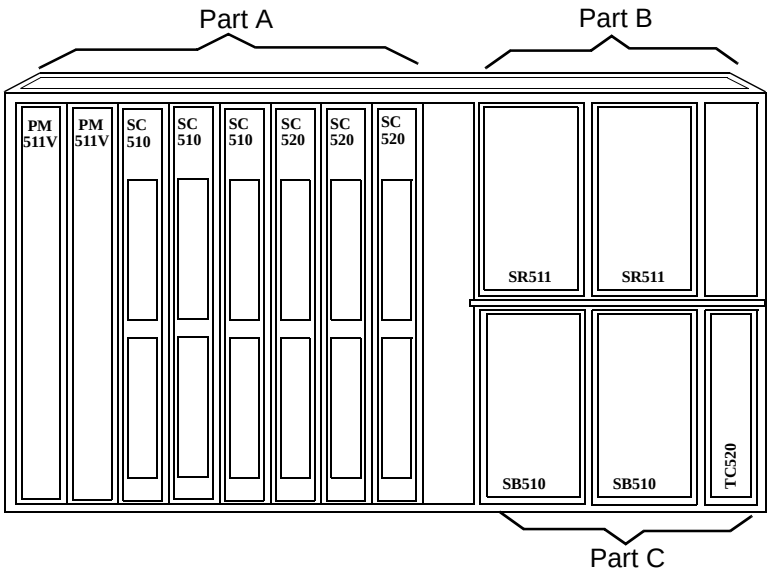

Figure 4-2. Example of a subrack RF533 for Advant Controller 450

Part A of the subrack contains 8 slots for FB+ modules such as processor modules and submodule carriers.

Part B and C contains 5 slots each for voltage regulators (SR511), battery chargers (SB510) and supervision unit (TC520). The modules in part B and C must be placed as shown in Figure 4-2.

S100 I/O Subrack

Please refer to the *Product Guide for S100 I/O*.

4.6 System Unit

The system unit for an Advant Controller 450 consists of the units in Table 4-2.

Table 4-2. System unit for Advant Controller 450

Units	Description
RF533	Controller subrack
RC527	Fan unit
SR511 (1)	Voltage regulator
TC520	Supervision unit

(1)One SR511 can feed all modules in part A below.

4.7 I/O Systems

S100 I/O System

The S100 I/O bus extension cable is physically connected directly to the CPU PM511V. The Reference Guide details the various I/O boards available for Advant Controller 450. Further information about S100 I/O is given in the *Product Guide for S100 I/O*.

Table 4-3. S100 I/O Bus Extensions

Having CPU	Needing S100 I/O Bus Extension	Then use Connection Kit
Single CPU 1 x PM511V	Single Bus Extension 1 x DSBC 176	Kit for single S100 I/O Bus Extension
Redundant CPU 2 x PM511V	Single Bus Extension 1 x DSBC 176	Kit for single S100 I/O Bus Extension Kit containing 2 x TK589, TK566
Redundant CPU 2 x PM511V	Redundant Bus Extension 2 x DSBC 174	Kit for redundant S100I/O Bus Extension

S800 I/O System

The S800 I/O Station is physically connected to an Advant Controller 450 via Advant Fieldbus 100. Table 2-1 lists the various I/O modules available for Advant Controller 450.
Further information about S800 I/O is given in the *Product Guide for S800 I/O*.

4.8 Communication

Below follows configuration examples for all buses in Advant Controller 450 showing how the buses are connected to the controller.

4.8.1 Control Network

MasterBus 300 or 300E

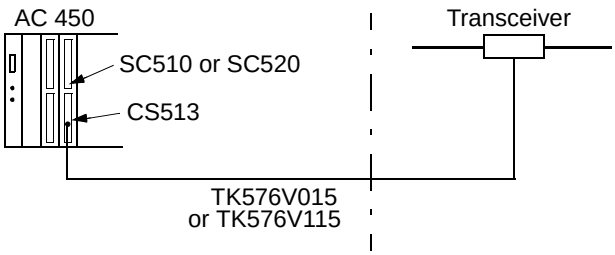

Figure 4-3. MasterBus 300/300E connected to Advant Controller 450

NOTE

Bus redundancy can be achieved by using two single buses.

4.8.2 Fieldbus Communication

Advant Fieldbus 100 using Coaxial Media

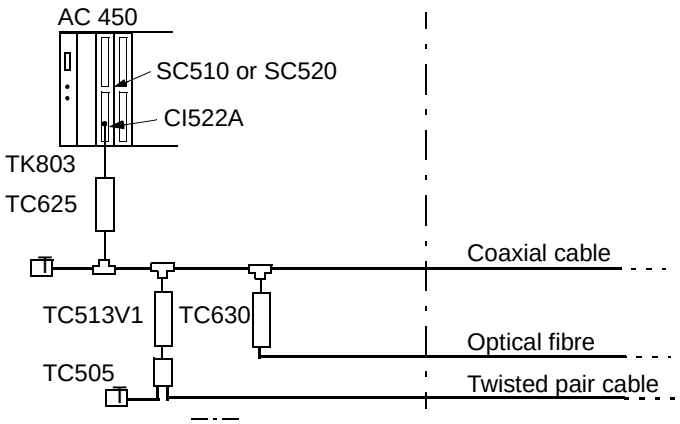

Figure 4-4. Advant Fieldbus 100 using Coaxial Media connected to Advant Controller 450

Advant Fieldbus 100 using Twisted Pair Media

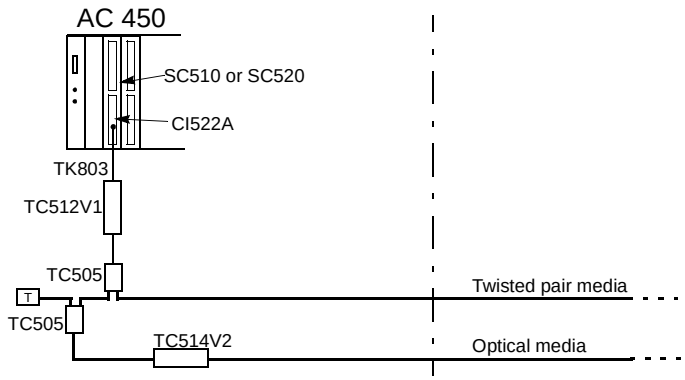

Figure 4-5. Advant Fieldbus 100 using Twisted Pair Media connected to Advant Controller 450

Advant Fieldbus 100 using Media Redundancy

Only twisted pair media is shown.

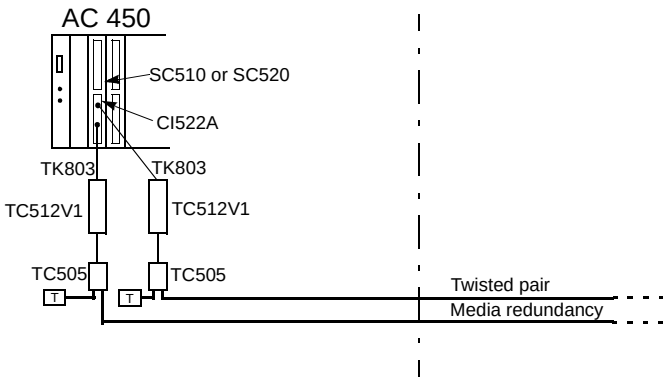

Figure 4-6. Advant Fieldbus 100 using Media Redundancy connected to Advant Controller 450

Advant Fieldbus 100 using Bus Redundancy

Only twisted pair media is shown.

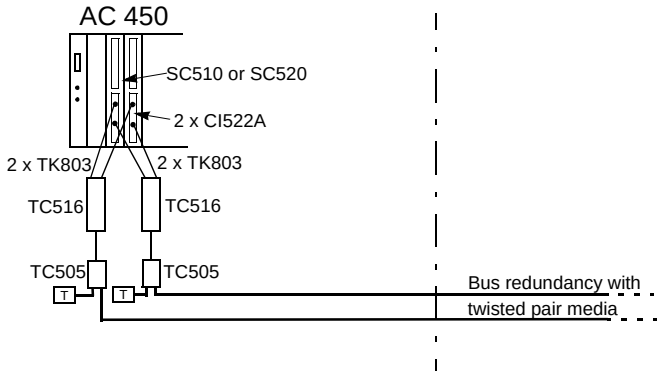

Figure 4-7. Advant Fieldbus 100 using Bus Redundancy connected to Advant Controller 450

NOTE

For connection to a coaxial bus 4 x TC 625 and 4 x TK516 are required instead of 2 x TC516 and 2 x TC505.

RCOM/RCOM+

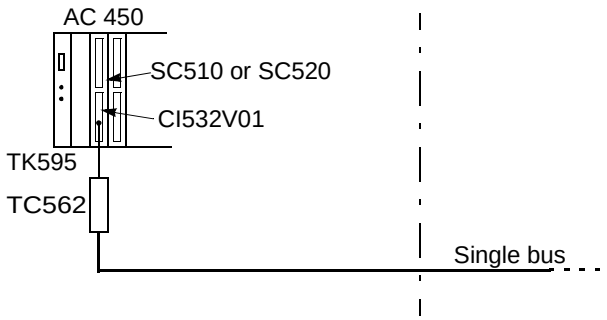

Figure 4-8. RCOM/RCOM+ connected to Advant Controller 450

NOTE

Bus redundancy can be achieved by using two single buses.

PROFIBUS-DP

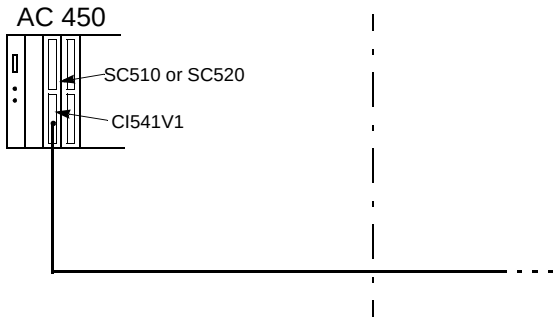

Figure 4-9. PROFIBUS-DP connected to Advant Controller 450

NOTE

The bus must be terminated at its ends. By selecting a connector with built-in termination this can be done conveniently.

NOTE

Field devices using the PROFIBUS-PA protocol can be connected to Advant OCS's PROFIBUS-DP solution via the external segment couplers KFD2-BR-Ex1.PA or KFD2-BR-1.PA from the company Pepperl+Fuchs, GmbH.

LONWORKS Network Interface

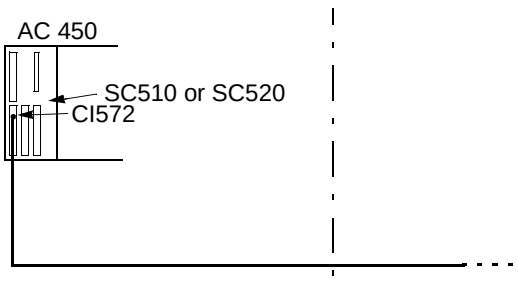

Figure 4-10. LONWORKS connected to Advant Controller 450

NOTE

The bus termination differs depending on used bus topology.
See *Advant Interface to LONWORKS User's Guide* for further information.

MasterFieldbus

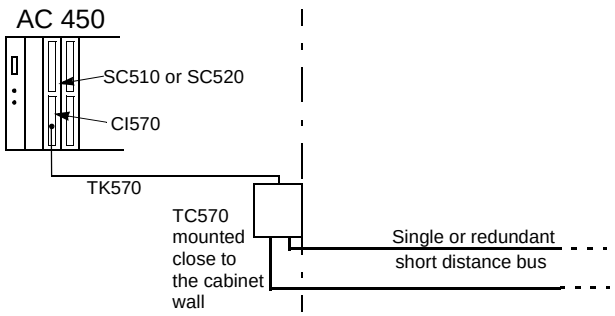

Figure 4-11. MasterFieldbus connected to Advant Controller 450

4.8.3 External Communication

EXCOM

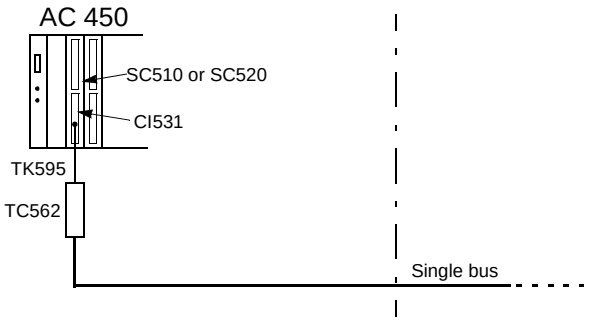

Figure 4-12. EXCOM connected to Advant Controller 450

MultiVendor Interface (MVI)

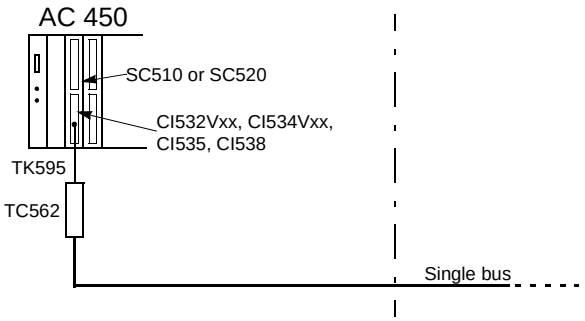

Figure 4-13. MultiVendor Interface connected to Advant Controller 450

GCOM

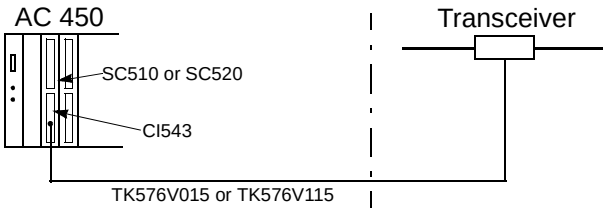

Figure 4-14. GCOM connected to Advant Controller 450

NOTE

Bus redundancy can be achieved by using two single buses.

4.8.4 Telecontrol & SPA Bus

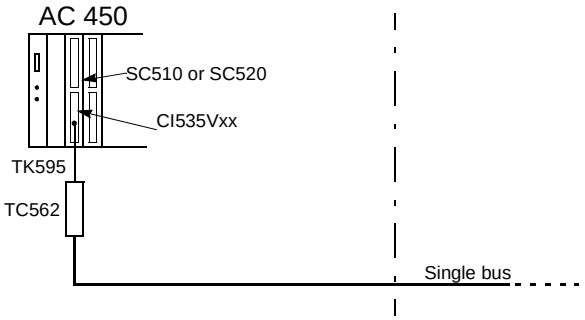

Figure 4-15. Telecontrol & SPA Bus connected to Advant Controller 450

4.9 Power Supply System

Advant Controller 450 with S100 I/O are integrated in the same series of cabinets and share the power supply system.

All essential functions in the power supply system are supervised and status is indicated in the cabinet on LEDs. On an Advant Operator Workplace the status indication will also appear on System Status Displays and faults will be reported in the System List.

The battery module SB522 powers the internal RAM memory and the real time clock in the Advant Controller 450. The battery module SB522 is capable of backing up these circuits for minimum 2 hours.

4.9.1 Mains Network Types

The power supply system can be connected to the following types of mains supply:

- 120/230 V a.c., 50 or 60 Hz.
- 24/48 V d.c. via a d.c./d.c. converter, providing galvanic isolation between the power line and Advant Controller 450.
- 24 V d.c. (without d.c./d.c. converter) the mains supply must be grounded in the Advant Controller 450 cabinet.

4.9.2 Redundancy, Mains Power Supply

The availability of the power supply system in Advant Controller 450 can be increased by duplicating the unstabilized power supplies and by using redundant voltage regulators.

The redundancy is achieved by using two mains supplies and two SR511 voltage regulators in parallel. Regulators and mains supplies can be replaced while the Advant Controller 450 is in full operation.

4.9.3 Configuration Alternatives

There are two configurations of the main power supply: with or without redundancy, as depicted in Figure 4-16 and Figure 4-17. When also taking the type of mains supply type into consideration there will be a total of six alternative configurations of the power supply. Please see Table 4-4 for an overview.

Table 4-4. Different power supply arrangements for Advant Controller 450 with S100 I/O

Power supply	Redundancy		Configuration	Remark
	No	Yes		
120/230 V a.c.	x		Figure 4-16	
24/48 V d.c.	x		Figure 4-16	
24 V d.c.	x		Figure 4-16	No galvanic isolation
120/230 V a.c.		x	Figure 4-17	
24/48 V d.c.		x	Figure 4-17	
120/230 V a.c.		x	Figure 4-17	Two different supply networks

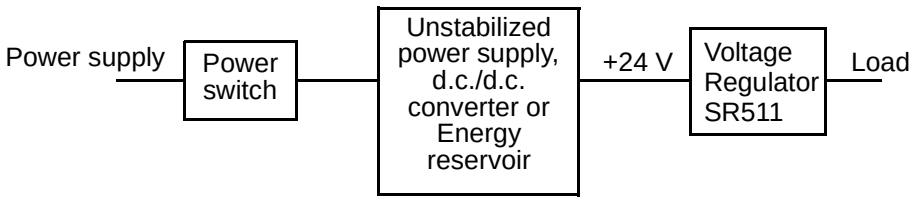

Figure 4-16. Block diagram of power supply solution without redundancy

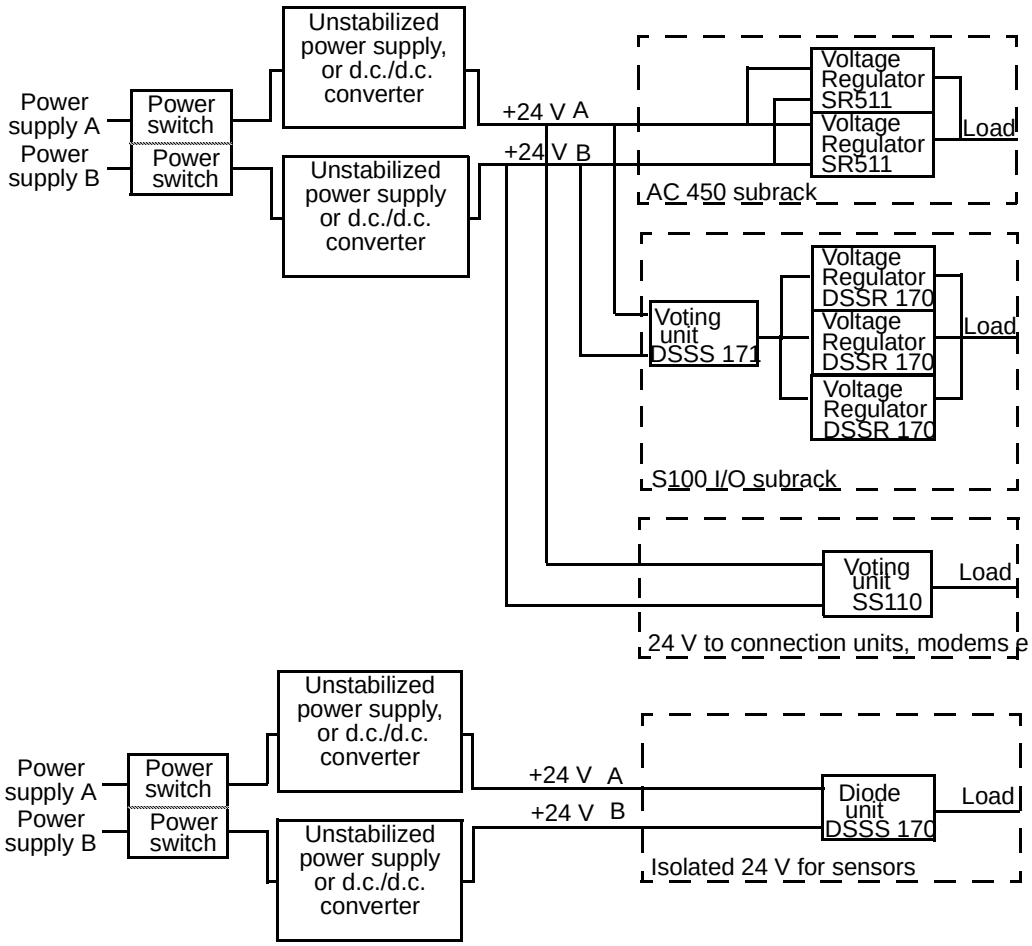

Figure 4-17. Configuration examples of redundant power supplies

4.10 ESD Protection

All cabinets containing a subrack are provided with a grounded wrist strap. When working with a circuit board the use of the wrist strap prevent sensitive components from being damaged by static electricity discharge.

4.11 CE Marked Equipment

In a CE marked equipment certain communication cables passing the bottom of the cabinet shall have the cable shield grounded via a capacitor. The capacitive decoupling device TX507 can handle up to four communication cables.

Following cables shall be grounded via TX507:

- Advant Fieldbus 100 with coaxial bus cable
- Advant Fieldbus 100 with twisted pair bus cable
- Master Fieldbus with electrical Long Distance Bus
- Profibus DP
- LONWORKS network interface

Chapter 5 Mechanical Design

5.1 Cabinet Design

Advant Controller 450 with S100 I/O is mounted in a cabinet in a standardized way. Depending on the mixture of I/O boards, modems, power supplies, etc. to be used, some variations can occur.

Figure 5-1 shows an example of the arrangement of a controller in two cabinets.

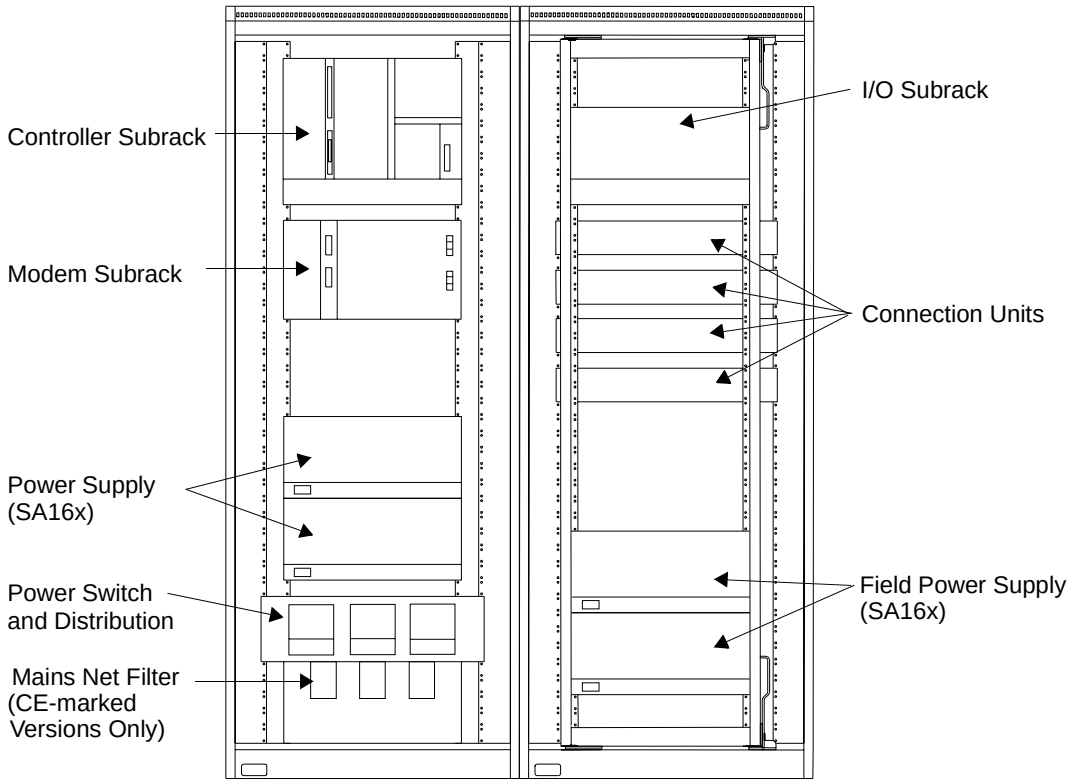

Figure 5-1. Typical Advant Controller 450 with S100 I/O

NOTE

Two different cabinet versions are used, RM500V1 and RM500V2. Please refer to Table 6-20 for definitions and dimensions.

5.2 Product Design

Rules for Standard Assembling in Cabinets

The standard way of assembling in RM500 cabinets is shown below as a set of assembling rules and a series of cabinet configurations. A standardized placing order will be used for the physical location of items (such as power supplies, modems, subrack etc.) in the cabinets.
Below follow some general assembling rules applying to Advant Controller 450 with S100 I/O:

- Place the cabinets side by side (close to each other with no plates between the cabinets).
- The delivery will be in a combination of single and double cabinets.
- An I/O subrack is not filled with more than 18 boards (17 boards if redundant S100 I/O bus extension is used), two empty slots will be spare for future expansion.
- The number of boards in an I/O subrack is limited either by the 18 (17) boards in the subrack or by the available space for connection units.
- In each double (single) cabinet space for 1 mounting bar (for connection units) is left for future expansion.

Advant Controller 450 with S100 I/O in RM500V1 Cabinets

- The delivery is assembled in up to six cabinets, for the controller subrack and the five possible I/O subracks that can be connected to the same electrical S100 I/O bus extension.
- An extra cabinet, in the configuration figures below showed as the cabinet no 7, can be added to the right of a given configuration, if necessary, to house connection units. For connections units in the extra cabinet, cables with extended length have to be used from the I/O subracks.
- With the cabinet housing the controller subrack to the left, the expansion direction is to the right.
- Cabinet no 1, 4 and 6 contain no hinged frame.
- I/O subracks **can not** be placed in cabinet no 6 or 7 as the S100 I/O bus extension cable exceeds 12 meters (39 ft.).
- Modems are always placed in cabinet no 1 in a modem subrack. For maximum four modems, mounting plates to the left of the controller subrack is used instead.
- All cabinets that share the same S100 I/O bus extension (max 12 m) are connected to the same power switch placed in the cabinet housing the controller subrack.
- Cabinet no. 1, 3 and 5 have their own power supplies (power switch in no 1).
- One set of power supplies for field equipment, if ordered, is placed in cabinet no 2.
- Connection units are placed only within the same single or double cabinet that houses the corresponding I/O subrack or in the next cabinet to the right.
- The boards are placed in the I/O subracks in order AI, AO, DO, DI starting in subrack 1.

NOTE

DI boards are the last group. Connection units for higher voltage than 24 V occupies more space than the corresponding units for 24 V. Expansion with the extra cabinet no 7 may be necessary.

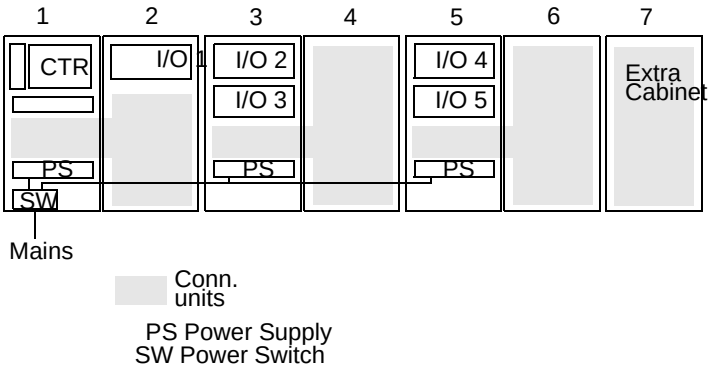

Figure 5-2. Maximum cabinet configuration for Advant Controller 450 with S100 I/O assembled in RM500V1 cabinets

Table 5-1. RM500V1 configurations for Advant Controller 450 with S100 I/O

Configuration	RM500V1 cabinet No	No. of I/O Subracks	Remark
A1	1 (+7)	0	
A2	1 - 2 (+7)	1	
A3	1 - 3	2	Only I/O 2 subrack in cabinet 3
A4	1 - 4 (+7)	2	Only I/O 2 subrack in cabinet 3
A5	1 - 4 (+7)	3	
A6	1 - 5	4	Only I/O 4 subrack in cabinet 5
A7	1 - 6 (+7)	4	Only I/O 4 subrack in cabinet 5
A8	1 - 6 (+7)	5	

Advant Controller 450 with S100 I/O in RM500V2 Cabinets

- The delivery is assembled in up to six cabinets, for the controller subrack and the five possible I/O subracks that can be connected to the same bus extension.
- With the cabinet housing the controller subrack to the left, the building direction is to the right.
- Cabinet no 2, 4 and 6 contain no hinged frame.
- Modems are always placed in cabinet no 1 in a modem subrack. For maximum four modems, mounting plates to the left of the controller subrack is used.
- All cabinets that share the same S100 I/O bus extension (max 12m) are connected to the same power switch placed in the cabinet housing the controller subrack.
- Cabinet no. 1, 3 and 5 have their own power supplies (power switch in cabinet no 1).
- One set of power supplies for field equipment, if ordered, is placed in cabinet no 2.
- Connection units are placed only within the same single or double cabinet that houses the corresponding I/O subrack or in the next cabinet to the right.
- The boards are placed in the I/O subracks in the order AI, AO, DO, DI starting in subrack no 1.

NOTE

DI boards are the last group. Connection units for higher voltage than 24 V occupies more space than the corresponding units for 24 V.

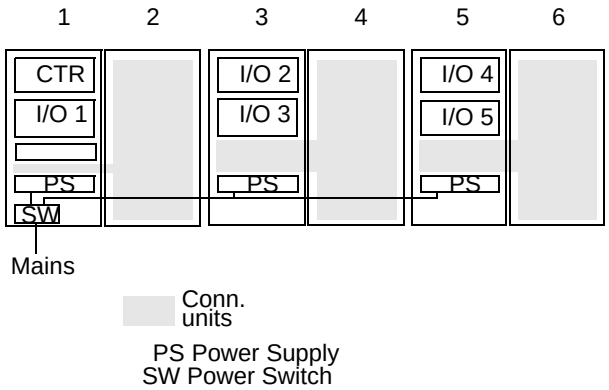

Figure 5-3. Maximum cabinet configuration for Advant Controller 450 with S100 I/O assembled in RM500V2 cabinets

Table 5-2. RM500V2 configurations for Advant Controller 450 with S100 I/O

Configuration	RM500V2 cabinet No	No. of I/O Subracks	Remark
B1	1	0	
B2	1	1	
B3	1 - 2	1	
B4	1 - 3	2	Only I/O 2 subrack in cabinet 3
B5	1 - 4	2	Only I/O 2 subrack in cabinet 3
B6	1 - 4	3	
B7	1 - 5	4	Only I/O 4 subrack in cabinet 5
B8	1 - 6	4	Only I/O 4 subrack in cabinet 5
B9	1 - 6	5	

Chapter 6 Technical Data and Performance

6.1 PC Program

The application program in AMPL can be structured in up to 99 PC programs. The PC programs are executed on three priority levels. Cycle times are normally selected in the range 10 ms - 2 s. The range can be extended to 5 ms - 32 s.

6.2 I/O Signals

The total number of I/O signals from the I/O systems S100, S400 and S800 is limited as shown in Table 6-1. I/O signals from other I/O devices connected via, for example, PROFIBUS-DP, are not included in the table.

Table 6-1. The I/O limits of Advant Controller 450

Channel type	Max. No.
AI channels (real and calculated analog inputs and analog inputs event)(1)	910
AO channels (real and calculated analog outputs)	963
DI channels (real and calculated digital inputs and digital inputs event)(1)	2340
DO channels (real and calculated digital outputs)	1489

(1)Calculated analog or digital channels are consumed if events from Advant Controller 55, Advant Controller 70 or Advant Controller 110/160 are handled in the controller (1 channel/ event).

6.3 I/O Boards

Any combination of I/O boards is possible, within the limits in Table 6-2 and Table 6-1.

Table 6-2. The max. I/O configuration of Advant Controller 450.

I/O system	Item	Max. No.
S100 I/O	Analog input boards	32(1)
	Analog output boards	32
	Digital input boards	48
	Digital output boards	48
	DSAI 133(2) DSAI 133A(2) DSAX 110 DSAX 110A DSDP 150 DSDP 170 DSDC 111(3) DSDP 140A(3)(4)	48 “ “ “ “ “ 24 “
S400 I/O	S400 I/O units per MasterFieldbus	16
S800 I/O	S800 I/O stations per Advant Fieldbus 100	79(5)
	S800 I/O modules per I/O-station	24(6)

(1) When you combine any of the following analog input boards, the total number of analog input channels is limited to 400: DSAI 146 with 31 channels, DSAI 155A with 14 channels
(2) Only when DSAI 133 and DSAI 133A are used in redundant configuration. When used in single configuration, DSAI 133 and DSAI 133A are to be considered an analog input board
(3) DSDC 111 and DSDP 140A occupy two I/O addresses
(4) The max. recommended number of DSDP 140A boards is 10
(5) If other stations than S800 I/O stations are used on the same Advant Fieldbus 100, the maximum number of S800 I/O stations must be reduced with a corresponding number of stations
(6) Without Optical Modulebus Expansion the maximum number is 12.

6.3.1 Connection Unit Dimensions

The width of the connection units are given in Table 6-3 below.

Table 6-3. The Width of the Connection Units

Connection Unit	Width in	
	mm	inch
DSTA 001A	240	9.4
DSTA 001B	240	9.4
DSTA 002A	240	9.4
DSTA 002B	240	9.4
DSTA 131	240	9.4
DSTA 133	240	9.4
DSTA 135	240	9.4
DSTA 137	470	18.5
DSTA 138	470	18.5
DSTA 145	240	9.4
DSTA 155	240	9.4
DSTA 155P	160	6.3
DSTA 156	240	9.4
DSTA 156B	120	4.7
DSTA 160	80	3.2
DSTA 170	160	6.3
DSTA 171	120	4.7
DSTA 180	240	9.4
DSTA 181	120	4.7
DSTD 108	120	4.7
DSTD 108L	120	4.7
DSTD 108LP	120	4.7
DSTD 108P	120	4.7
DSTD 109P	120	4.7
DSTD 110A	240	9.4

Table 6-3. The Width of the Connection Units (Continued)

Connection Unit	Width in	
	mm	inch
DSTD 120A	240	9.4
DSTD 145	470	18.5
DSTD 147	470	18.5
DSTD 148	470	18.5
DSTD 150A	240	9.4
DSTD 190	120	4.7
DSTD 190V1	120	4.7
DSTD 195	120	4.7
DSTD 196	120	4.7
DSTD 196P	120	4.7
DSTD 197	120	4.7
DSTD 198	120	4.7
DSTX 110	120	4.7
DSTX 170	240	9.4
DSTY 101	53	2.1

6.4 Functional Units

The number of functional units of each type are subject to the following limitations:

Table 6-4. The functional units limits of Advant Controller 450

Functional unit	Max. No.
DAT	32000
TEXT	32000
GENCON + GENBIN + GENUSD	528
SEQ	173
PIDCON	234
PIDCONA	203
RATIOSTN	330
MANSTN	420
MOTCON + VALVECON + GROUP (MMCX)	595

6.5 Communication

6.5.1 Data Set and Text Set

A data set can hold 1 to 24 DAT values. Each DAT value represents 32 Booleans, or 1 integer (16 or 32 bit), or 1 real number. The data base can accommodate up to 32000 DAT values.

Advant Controller 450 can accommodate up to 1000 data set definitions for communication on MasterBus 300 or MasterBus 300E. The data sets are also used for EXCOM communication. For communication on RCOM/RCOM+ and MultiVendor Interface there is a special kind of data sets available, MVI data sets. The Advant Controller 450 can accommodate max 1000 MVI data sets. Data sets are cyclically transmitted to their respective destinations, with a cycle time normally selectable in the range 0.5 to 64 s. Cycle times can be redefined to values between 50 ms and 1000 s. MVI data set and data set can also be transmitted on request.

A text set can hold the contents of one DB element TEXT. Text sets are only transmitted on request.

6.5.2 Data Set Peripheral (DSP)

A data set peripheral (used for communication on Advant Fieldbus 100) is a special kind of data set and can hold 1 to 8 DAT values. Each DAT value represents 32 Booleans, or 1 integer (16 or 32 bit), or 1 real number. The data base can accommodate up to 32000 DAT values. Advant Controller 450 can accommodate max 4000 data set peripherals for communication on Advant Fieldbus 100. Data set peripherals are cyclically transmitted to their respective destinations, with a cycle time selectable in the range 32 ms to 4096 ms.

6.5.3 Communication Buses

Various buses in accordance with Table 6-5 can be connected to the Advant Controller 450.

Table 6-5. Number of buses/channels that can be connected to Advant Controller 450

Bus type	Max number of buses	
MasterBus 300 (executed in main CPU)	2	Tot 2 (1)
MasterBus 300E (executed in main CPU)	2	
MasterBus 300 (executed in slave CPU)	6	Tot 6 (1)
MasterBus 300E (executed in slave CPU)	6	
GCOM	5	Tot 9
RCOM/RCOM+	9	
Multivendor Interface	9	
Telecontrol & SPA Bus	5	
MasterFieldbus	7	
Advant Fieldbus 100	8 (2)	Tot 8
PROFIBUS-DP	8	
LONWORKS Network	8	
EXCOM	2	

(1) MasterBus 300 in main CPU and MasterBus 300E in slave CPU can not be mixed in the same controller. MasterBus 300 in slave CPU and MasterBus 300E in main CPU can not be mixed within the same controller.

(2) If single bus is used: 1 submodule/bus. If redundant bus is used: 2 submodules/bus

Table 6-6. Submodules mounted in submodule carriers

Description	Submodule	No. of channels per submodule	Fits into submodule carrier	Max. No. of sub-modules(1)
RS-232-C communication	CI531	2	SC510, SC520	4(2)
MasterBus 300 (executed in main CPU)	CS513	1	SC510, SC520(3)	2(4),(5)
MasterBus 300E (executed in main CPU)	CS513	1	SC510, SC520(3)	2(4)(5)
MasterBus 300 (executed in slave CPU)	CS513	1	SC520	6(4)
MasterBus 300E (executed in slave CPU)	CS513	1	SC520	6(4)
PROFIBUS-DP	CI541V1	1	SC510, SC520	8(6)

Table 6-6. Submodules mounted in submodule carriers (Continued)

Description	Submodule	No. of channels per submodule	Fits into submodule carrier	Max. No. of sub-modules(1)
LONWORKS Network	CI572	2	SC510, SC520	4(6)
GCOM	CI543	1	SC510, SC520	5(7)
RCOM/RCOM+ communication Multivendor Interface: - MODBUS - Siemens 3964(R) - Allen-Bradley DF1 - Free-programmable MVI	CI532V01 CI532V02 or CI534V02 CI532V03 CI534V04 CI535 or CI538	2	SC510, SC520	5(7)(8) ,
Telecontrol & SPA Bus	CI535V23 CI535V24 CI535V26 CI535V29 CI535V30	1	SC510, SC520	5(7)
MasterFieldbus	CI570	1	SC510, SC520	7
Advant Fieldbus 100	CI522A	1	SC510, SC520	14(9)
Program Card Interface	MB510	-	SC510, SC520	4
Free-programmable module	PU535	-	SC510, SC520	12

(1) The total number of submodules may not exceed 14.
(2) 1 port for printer, 2 ports for EXCOM and 4 ports for MasterView 320.
(3) Only one CS513 on each SC520 when MasterBus 300/MasterBus 300E is executed in main CPU.
(4) MasterBus 300/300E in main CPU and in slave CPU can not be mixed within the same controller.
(5) The total number of MasterBus 300 and MasterBus 300E in main CPU is 2
(6) The maximum number of PROFIBUS-DP plus LONWORKS Network plus single/redundant Advant Fieldbus 100 is 8.
(7) The total number of submodules for MVI, RCOM, GCOM and Telecontrol & SPA Bus is 5.
(8) Max number of physical channels used are 9 (limited in software).
(9) 8 redundant Advant Fieldbus 100 give a maximum of 16 submodules but the available number of slots for submodules (on carrier modules) limits the maximum to 14.

6.6 Time Synchronization

Between nodes on the same MasterBus 300/300E control network, the accuracy is better than 3 ms.

External minute pulse can be connected to Advant Controller 450, giving an accuracy better than 2 ms. between the external clock and the internal clock in Advant Controller 450.

6.7 Time Tagging of Events (Alarms)

S100 I/O or S800 I/O

Time tagging of two DI signals on S100 I/O boards **or** two DI signals on S800 I/O modules.

The relative time error between events handled within one controller is max. 2 ms.
The relative time error between events handled within separate controllers are max. 4 ms, typically 3 ms.

S100 I/O and S800 I/O

Time tagging of one DI signal on S100 I/O board **and** one DI signal on S800 I/O module.

The relative time error between events handled within one controller is max. 3 ms.
The relative time error between events handled within separate controllers are max. 5 ms, typically 4 ms.

S800 I/O

Time tagging in the controller system software.

For S800 I/O the relative time error between events (DI signals) in one controller can be evaluated from the expression: Relative time error = a + b + c

a = scan cycle time of the FCI unit (5 - 100 ms, due to number of modules and types)
b = transmission cycle time of Advant Fieldbus 100 (set by the user)
c = scan cycle time of the PDC in Advant Controller 450 (set by the user)

Advant Controller 55/70/110/160

Time tagging in a controller Advant Controller 55/70/110/160. It is possible to receive events from Advant Controller 70/110/160 using Advant Fieldbus 100, or from Advant Controller 55/110/160 using RCOM/RCOM+.

See Table 6-7 for relative time error between events for different configurations. All events connected to one Advant Controller 450.

Table 6-7. Relative time errors between events (DI signals)

Bus	Events generated by		Relative time error (ms)
	Controller	Module/Calculated	
Advant Fieldbus 100	AC 110/160	DI650	<2
	AC 110/160	Calculated in AMPL	<2 + Sct (1)
	AC 70	Calculated in AMPL	<2 + Sct (1)
RCOM/RCOM+	AC 110/160	DI650	<50 (2)
	AC 110/160	Calculated in AMPL	<50 + Sct (1)(2)
	AC 55	Calculated in AMPL	<50 + Sct (1) (2)

(1) Sct means scan cycle time of reading I/O signals in the Advant Controller 55, 70, 110 or 160.
(2) This value is valid for a fixed RCOM connection where there is a continuous clock synchronization over the bus (at least once per minute). If dial-up phone lines are used the error is also dependent of the elapsed time since the previous call (clock synchronization).

6.8 Trend Data Storage

The Trend data storage capacity of Advant Controller 450 is shown in Table 6-8.

NOTE

The CPU load and the RAM requirements must also be considered.

Table 6-8. Data logging capabilities

Aspect	Limit/Value
Max. No. of logs	15
Max. No. of variables / log	127
Max. No. of storable values(1) / variable (common to all variables in the log)	32767 (the free amount of RAM usually sets a lower limit)
Log sampling intervals (in discrete steps)	sec: 1, 2, 3,.. 30 min: 1, 2, 3, .. 30 h: 1, 2, 3, .. 24 week: 1

(1)Each value requires 5 byte of memory.

6.9 CPU Load Calculation

To estimate the CPU load in Advant Controller 450, the following should be considered:

- About 4% of the total capacity of Advant Controller 450 should normally be reserved for cyclically executed basic system functions; priority handling, system supervision etc.
- About 20% of the total capacity should be reserved for event controlled functions, AdvaCommand functions, communication etc.
- The remaining 76% capacity is then available for cyclically executed functions, AMPL programs, process I/O, logs and data set communication.

The formula for calculating the CPU load for several identical functions is:

CPU load in% = (N x T / Tc) x 100 where

N = number of functions (for example, control loops), T = function execution time (ms) and Tc = function cycle time (ms).

When calculating the CPU load, the system has duties other than merely executing PC programs. For example, the processing of analog signals involves the following operations:

- Conversion of analog input signals from transducer signals to process related units.
- Linearization of input value.
- Checking of input value against limit values.
- Handling of error conditions.
- Conversion of analog output signals from a process quantity to an actuator signal and checking of limits.

Table 6-9 provides some typical values of execution times, to be used for load estimates. They are primarily intended to check if a system will be close to the maximum load or not. The examples chosen represent functions of normal complexity. Table 6-10 provides some examples of system load. The loads calculated are based on the execution times in Table 6-9.

Table 6-9. Execution times

Type	Description	Execution time (ms)
DI (1)	1 DB element DI 2 PC elements (AND gate w. 4 inputs)	0.005 (interrupt) 0.02 (cyclic)
DO	1 DB element DO, 2 PC elements AND(4)	0.02
AI	1 DB element for normal AI input, a Pt100 or thermoc. input (incl limit check)	0.25
AO	1 DB element for a normal AO output (incl. limit check)	0.2

Table 6-9. Execution times (Continued)

Type	Description	Execution time (ms)
PI loop	A simple analog control loop consisting of: 1 DB element AI, 1 DB element AO, 1 PC element PI, 2 arithmetic and 3 logic PC elements	0.5
PID loop	An advanced process control loop consisting of: 1 DB element AI, 1 DB element AO and 1 PID-CON-loop. Arithmetic and logic PC elements	0.8
Adaptive PID loop	An advanced adaptive control loop consisting of: 1 DB element AI, 1 DB element AO and 1 PIDCONA-loop. Some arithmetic and logic PC elements	1.0
PID loop pulsed output	2 DB elements AI, 2 DB elements DO, 1 PIDCON loop, 1 PC element CON-PU1 and Some arithmetic and logic PC elements	1.0
Ratio station	1 DB element AI and 1 RATIOSTN	0.4
Motor control 1	1 DB element DO and 1 MOTCON	0.4
Motor control 2	1 DB element AI, 1 DB element DO, 1 MOTCON and logic PC elements	0.7

(1) If digital inputs change frequently the load from interrupt-detected changes can be extensive. Each change takes about 0.6 ms to handle. Example: If a DI changes its state once a second on the average, this will give rise to a 0.06% additional load per channel.

Table 6-10. Examples of CPU load

Description	PC cycle time (ms)	CPU load (%)
50 DI	50	2
500 DI	250	4
50 DO	50	2
500 DO	250	4
50 AI	1000	1
30 PIDCON	1000	2.5
30 PIDCONA	1000	3
10 PIDCON	2000	0.5
50 Motor controls 1	1000	2
50 Motor controls 2	1000	3.5

6.9.1 CPU Load from Data Set Communication

The CPU load from data set communication can be estimated from the examples in Table 6-11 and Table 6-12. Full data sets (with 24 DAT values) are assumed. However, the length of the data sets has little effect on the load in Advant Controller 450.

Table 6-11. CPU load with MasterBus 300 executed in main CPU

No. of data sets/s	Load on sending AC 450	Load on receiving AC 450
4	0.8%	0.7%
8	1.7%	1.5%
16	3.3%	2.9%

NOTE

The capacity of MasterNet must also be considered when calculating the data set communication performance.

Table 6-12. CPU load with MasterBus 300 executed in slave CPU (SC520)

No. of data sets/s	Load on sending AC 450	Load on receiving AC 450
4	0.2%	0.4%
8	0.5%	0.8%
16	0.9%	1.5%

NOTE

The capacity of MasterNet must also be considered when calculating the data set communication performance.

6.9.2 CPU Load from Data Set Peripheral Communication

The CPU load from data set peripheral communication can be estimated from the examples in Table 6-13. Full data set peripherals (8 DAT values) are assumed. However, the length of the data sets has little effect on the load in Advant Controller 450.

Table 6-13. The CPU load caused by data set peripheral communication (cycle time of scan task = 512 ms)

No. of DSP/s	Load on sending AC 450	Load on receiving AC 450
25	0.4%	0.4%
100	1.0%	1.1%
200	1.7%	1.9%

NOTE

The capacity of Advant Fieldbus 100 must also be considered when calculating the data set peripheral communication performance.

6.10 Read/Write Memory (RAM) Requirements

Read/write memory (RAM) is required for internal use by the Advant Controller 450 system software and for storage of data and application programs. Use Table 6-14 for calculating memory available for application with different system software sets and for an approximation of the RAM requirements.

Table 6-14. Calculation of RAM requirement

Object type	Remark	Total	Factor (kbytes)	RAM req.
AI/AO signals	S100 I/O		x 0.3	
	S400 I/O (MP 51 not included)		x 0.3	
	S800 I/O		x 0.27	
DI/DO signals	S100 I/O		x 0.26	
	S400 I/O (MP 51 not included)		x 0.26	
	S800 I/O		x 0.14	
S800 I/O station	No. of S800 I/O stations on AF 100		x 0.4	
Calculated signals	For presentation and event handling in AdvaCommand (including signals via Advant Fieldbus 100)		x 0.3	
PIDCON	Excluding I/O signals		x 1.5	
PIDCONA	Excluding I/O signals		x 8.5	
MANSTN	Excluding I/O signals		x 0.8	
RATIOSTN	Excluding I/O signals		x 1.0	
GENCON	Excluding I/O signals		x 0.5	
GENBIN	Excluding I/O signals		x 0.5	
GENUSD	Excluding I/O signals		x 0.5	
VALVECON	Excluding I/O signals		x 0.6	
MOTCON	Excluding I/O signals		x 0.8	
GROUP	Excluding I/O signals(1)	1	x 3.0	
SEQ	Excluding I/O signals		x 1.0	
DAT	No. of DB elements		x 0.02	
TEXT	No. of DB elements		x 0.14	
Table handling	No. of tables(2)		x 4.9	

Table 6-14. Calculation of RAM requirement (Continued)

Object type	Remark	Total	Factor (kbytes)	RAM req.
MasterView 320	Basic requirements for QC07-LOS41	1	x 240	
	No. of displays(3)		x 2	
	No. of MasterView 320 with event lists(4)		x 9	
AdvaCommand, IMS Station or MV800/1	Basic requirement for QC07-OPF41	1	x 799	
	No. of trend data storage logs(5)		x 12	
	Group alarm, No. of group objects		x 0.13	
	No. of group members		x 0.09	
MasterBatch 200/1	Basic requirement for QC07-BAT41	1	x 418	
	No. of SECCONx1.7+OPCONx6.0+ TANKCONx1.8		x 1	
	No. of processes(6)		x 25	
Profibus DP	No. of Profibuses		x 1.2	
	Number of Profibus slaves		x 0.8	
LONWORKS Network	No. of LONWORKS Communication Modules (CI572)		x 65	
	No. of LONWORKS Devices		x 0.2	
	No. of LONWORKS variables (input and outputs)		x 0.06	
	No. of LONWORKS multiple network variables		x 0.33	
	No. of LONWORKS Event Treat		x 0.14	
No. of MasterBus 300/300E, RCOM/RCOM+, GCOM and MultiVendor Interface			x 8	
Telecontrol & SPA Bus	See respective Product Guide			
User Defined PC elements	Basic requirements for QC07-UDP41	1	x 132	
	Storage of user defined PC elements(7)	1	x 150	
Space for storage of User Diskette contents(7)			x 100	
Basic requirements for QC07-LIB41		1	x 32	
Basic requirements for QC07-LIB42		1	x 479	

Table 6-14. Calculation of RAM requirement (Continued)

Object type	Remark	Total	Factor (kbytes)	RAM req.
Basic requirements for QC07-FUZ41		1	x 40	
Basic requirements for QC07-COM41		1	x 33	
Basic requirements for QC07-BAS41		1	x 2207	
Spare RAM area(8)		1	x 40	40
Approximative total RAM requirement in kbytes (9)				

(1) The figures are calculated for 8 steps (MOTCON not included).
(2) The figures are calculated for 1 table with 10 rows and 100 values per row.
(3) The figures are calculated for 40 text strings with 20 characters and 30 dynamic values.
(4) The figures apply to 100 events per list.
(5) The figures are calculated for 1 log with 10 variables, each with 240 stored values. Each value takes approximately 5 byte.
(6) The figures are calculated for 50 storage vessels, 4 sections and 20 operations with 6 recipe variables each.
(7) This is a recommended starting value. Adjustment of this figure might be necessary to do when the real need is known.
(8) Recommended value for most systems.
(9) Must be less than the RAM size of the processor module (8 or 16 Mbyte).

6.11 Program Module Size on Program Card

When stored **on the program card**, the program modules occupy the following memory areas.

Table 6-15. Program module memory area on program card

Program module	Memory area (kbyte)
QC07-BOB41	9
QC07-BAS41	1410
QC07-LIB41	32
QC07-LIB42	405
QC07-OPF41	550
QC07-LOS41	205
QC07-BAT41	279
QC07-UDP41	85
QC07-COM41	20
QC07-FUZ41	40

6.12 Controller Subrack

The subrack, RF533, is divided into three parts, as shown in Figure 6-1.

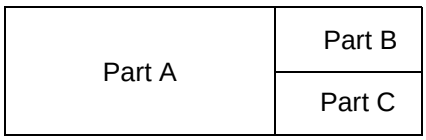

Figure 6-1. The division of the controller subrack

The number of slots in the controller subrack is shown in Table 6-16.

Table 6-16. The No. of slots in the controller subrack

Part	No. of slots
Part A	8
Part B	5
Part C	5

Part A can be filled with modules from Table 6-17 while part B and C has dedicated slots for the modules and units in Table 6-18.

Table 6-17. Modules that can go into part A of the controller subrack

Description	Consists of	Max modules(1)
Processor module	PM511V	2
Submodule carrier without CPU	SC510	7
Submodule carrier with slave CPU for MB 300/300E	SC520	6
Module for AccuRay QCS	PM511V	(2)

(1) The total number of modules in part A may not exceed 8
(2) Please refer to AccuRay QCS documentation

Table 6-18. Modules placed in part B and C of the controller subrack

Description	Consists of	Max no of modules	Slots / module	Placed in part
Voltage regulator	SR511	2	2	B
Back-up power supply	SB510/511	2	2	C
Supervision unit	TC520	1	1	C

The submodule carriers can be equipped with submodules from Table 6-6.

6.13 Cabinet RM500

Advant Controller 450 with S100 I/O is installed in RM500 cabinets. There are two different cabinet versions, RM500V1 and RM500V2, with different foot prints. Dimensions, Table 6-19.

Table 6-19. RM500 cabinets dimensions

Cabinet Version	Width(1)		Depth(2)		Height(3)	
	mm	inches	mm	inches	mm	inches
RM500V1	800	31.5	512	20.1	2125	83.7
RM500V2	700	27.6	637	25.1	2225	87.6

(1) Side plates (20 mm or 0.8” each) are **not** included
(2) Door and back plate are included
(3) Roof is included

RM500V1 cabinets are provided with double doors (double door consists of two equal sized doors). RM500V2 cabinets are provided with only single doors. RM500 cabinets are available for different environmental protection classes, see Table 6-20.

Table 6-20. RM500 cabinet protection classes

Type	Protection class RM500
Ventilated, EMC-proof (1)	IP 21
Ventilated (2)	IP 41
Sealed	IP 54
Sealed with heat exchanger (3)	IP 54

(1) Standard cabinet without filter on ventilation openings. Filter is available as an option.
(2) Ventilation openings are covered with metallic net to prevent insects to enter the cabinet. A heater is included to heat the cabinet when the controller is not in use.
(3) Available as a standard sealed cabinet with heat exchanger as an option.

6.13.1 Mounting Bars for Connection Units

Connection units are fit to mounting bars in the rear of the cabinet. Mounting bars are available in the length of 19” or 24”. Each mounting bar normally carries two or more connection units for S100 I/O boards. Information about how many mounting bars can be used in different cabinets of RM500 type are given in Table 6-20.

Chapter 7 Environmental Immunities

7.1 Environmental Considerations

General

The Advant Controller 450 is designed for a demanding industrial environment. Alternative cabinets is available for different degrees of protective rating (IP21, IP41, IP54). Interference from electrical sources is suppressed by suitable solid design and particular installation rules. The building where the system is to be stored or installed should provide an environment such that established environmental conditions are not normally exceeded.

The environmental conditions which Advant Controller 450 are designed to withstand, during storage, transport as well as during operation, are specified in a separate environmental data sheet. Limit values are given to: Corrosive gases, Temperature, Vibration, Moisture, ElectroMagnetic Compatibility, etc.

For further information about the environmental immunity, please refer to the Environmental Immunities chapter in the *Product Guide for Advant OCS with Master Software, Overview.*

Temperature

It is important to note the temperature within cabinets and in the surrounding environment. Lower temperatures mean increased system reliability and availability.

To avoid overheating, when ambient temperatures are high, take into consideration the heat dissipated in the cabinet. This is particular important with sealed cabinets (IP54) with considerable number of circuit boards and ambient temperature at levels approaching 40 ^{o}C. It might be necessary to mount heat exchangers on the cabinet to bring down the temperature to levels below limits given in the environmental data sheet.

Chapter 8 Ordering Price List Structure

Depending on the desired I/O configuration one or several price lists must be used when ordering an Advant Controller 450 with S100 I/O.

Advant Controller 450 with S100 I/O

See *this Product Guide*

One copy of this price list must always be used since it contains the controller.

S100 I/O

See *Product Guide for S100 I/O*

Use this price list for each physically distributed cluster of S100 I/O subracks via the optical bus extension. 1 - 5 copies of the price list can be used for the same controller.

S800 I/O

See *Product Guide for S800 I/O*

S800 I/O can only be ordered as separate parts. Use only one copy of the price list.

NOTE

The width for the Connection Units are given in Table 6-3.

NOTE

If more than one price list are required when ordering an Advant Controller 450 with S100 I/O, **do not** exceed any configuration limitation for the controller, for example maximum number of boards or signals for the categories AI, AO, DI and DO.

8.1 Basic Software Licenses

In Table 8-5 the software basic functions licenses are listed. One or more licenses shall be ordered if the corresponding functions will be used when the controller is running at the customer‘s site.

License for I/O signals

With I/O signals in the licenses means all physical I/O signals directly connected to the controller.

If two physical I/O signals are used in a redundancy configuration both signals must be calculated except when the configurations 2xDSAI 133 + DSTA 002A or 2xDSAI 133A + DSTA 002B and 2xDSAX 110 + DSTA 001A or 2xDSAX 110A + DSTA 001B are used.

When the number of I/O signals needed are calculated the necessary licenses must be ordered, for example if the calculated number of I/O signals is 725 the 3 licenses (for 0-208, 209-400, 401-800 I/O signals) are required.

License for CPU redundancy

This license must be ordered if the Advant Controller 450 shall be provided with redundant CPUs.

PROFIBUS-DP licenses

If PROFIBUS-DP shall be used in the controller this license must be ordered.
One license must be bought for each PROFIBUS-DP used in the controller.

Advant Interface to LONWORKS Network licenses

If LONWORKS Network shall be used in the controller, this license must be ordered.
One license must be bought for each CI572 communication module used in the controller.

8.2 Assembled Delivery or Loose Part Delivery

The item **Assembly and test** in Table 8-1 determines if the controller shall be mounted in cabinets or not. If this item is not ordered the delivery will be a loose part delivery.

Note also that in Table 8-1 the items for CE-marking are different for an assembled delivery and for a loose part delivery.

8.3 Loose Part Delivery and CE-marking

If an Advant Controller 450 is ordered as a loose part delivery and the intention is to mount the equipment in other cabinets than RM500, certain considerations must be taken to make it follow the provisions of the EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC.

- The cabinet or series of cabinets mounted side by side must be EMC-proof.
- Protection against line conducted radio emissions is obtained by means of a mains net filter placed in the cabinet close to the incoming mains cable.
- Communication cable shields must have a capacitive grounding at the point where they enter the cabinet.

The conditional EC - Declaration of Conformity, which accompanies the loose part delivery, must be signed by the person responsible for assembling the controller in cabinets.

8.4 Non Standard Program Modules

The item **Loading of BU/BA specific program module** in Table 8-7 gives a possibility to add a non standard program module to the standard modules on the system software program card. Certain conditions must be fulfilled and a special reference number must be used when ordering. Please contact our regional Sales Department for further information.

8.5 Heat Exchanger

With sealed cabinets (protection class IP54) it can be necessary to use a heat exchanger to keep the temperature low in the cabinet. To make power loss calculations, all necessary information, like power loss for each board/module/unit in the cabinet and figures for maximum power loss in the cabinet, is found in the *Advant Controller 450, User's Guide.*

8.6 Reference Guide

Please see the current price list.

8.6.1 General Requirements

Table 8-1. General and Normative Requirements

Description	Consists of	Article No.
CE-marking, Cabinet Mounted Delivery.	- EC Declaration of Conformity - CE mark - Mains Filter	3BSE019968R1
CE-marking, Loose Part Delivery.	- Conditional EC Declaration of Conformity	3BSE019969R1
Assembly and test of subracks		3BSE016033R1

8.6.2 System Units

Table 8-2. System Units

Description	Consists of	Article No.
System unit to fit in RM500 cabinet with single 5 V regulator, and basic program QC07-BAS41, version 4.0 (no license included).	RF533 SR511 TC520 RC527 RA102 QC07-BAS41	3BSE020007R1

Table 8-3. Redundant Central Unit

Description	Consists of	Article No.
Processor module with 8 Mbyte RAM	PM511V08	3BSE011180R1
Processor module with 16 Mbyte RAM	PM511V16	3BSE011181R1

Table 8-4. Redundant 5V Regulator

Description	Consists of	Article No.
Regulator 24 V/5 V, 35 A	SR511	3BSE000863R1

8.6.3 Software Licenses

Table 8-5. AdvaControl Basic Software Licenses

Description	Consists of	Article No.
Basic functions license for up to 208 physical I/O signals **Incremental license** for 209 - 400 physical I/O signals **Incremental license** for 401 - 800 physical I/O signals **Incremental license** for 801 - 1600 physical I/O signals **Incremental license** for more than 1600 physical I/O signals		3BSE018447R1 3BSE013125R1 3BSE013126R1 3BSE013127R1 3BSE013128R1
Basic CPU redundancy license		3BSE013129R1
Basic PROFIBUS-DP license for one bus		3BSE016034R1
Basic Advant Interface to LONWORKS Network license for one module		3BSE019973R1

8.6.4 Software Options

Table 8-6. Optional Standard Program Modules

Description	Consists of	Article No.
Program module containing additional PC element library for process control, version 4.0	QC07-LIB41	3BSE019990R4
Program module containing additional PC element library for advanced process control, version 4.0	QC07-LIB42	3BSE019992R4
Program module containing PC element for Fuzzy Control, version 4.0	QC07-FUZ41	3BSE020006R4
Program module for AS 500OS, AS 500IMS, MV 800/1 and AdvaSoft for Windows support including Trend Data storage, version 4.0	QC07-OPF41	3BSE019994R4
Program module for local operator station, MasterView 320, version 4.0	QC07-LOS41	3BSE019996R4
Program module for MasterBatch 200/1 support, version 4.0	QC07-BAT41	3BSE019998R4

Table 8-6. Optional Standard Program Modules (Continued)

Description	Consists of	Article No.
Program module for support of User defined PC elements, version 4.0	QC07-UDP41	3BSE020002R4
Program module for object support via Advant Fieldbus 100, version 4.0	QC07-COM41	3BSE020004R4

8.6.5 Special Applications

Table 8-7. Optional Program Modules for Special Applications

Description	Consists of	Article No.
Program module for PPS 200 support, version 1.0	QC02-APM02	3BSE007929R1
Loading of BU/BA specific program module according to separate quotation		3BSE010624R1

Table 8-8. Telecontrol and SPA Bus

Description	Consists of	Article No.
Program module for HPC563 RTU, RCS and SPA server support, version 3.2 latest revision	YC572	3BSE022222R3
FCB description files for Telecontrol	3.5” diskette	3BSE022442R1
RCS protocol RP570 Master	CI535V24	3BSE022158R1
RCS protocol RP571 Master	CI535V29	3BSE022159R1
RTU protocol RP570 Slav	CI535V23	3BSE022160R1
RTU protocol IEC870-5-101 Unbalanced	CI535V26	3BSE022161R1
SPA Server protocol SPA Bus	CI535V30	3BSE022162R1
RTU OPTION User’s Guide	Document	3BSE022163R101
RTU OPTION System Messages Description	Document	3BSE022164R101
RTU OPTION Appendix RP570 to User’s Guide	Document	3BSE022172R101

Table 8-8. Telecontrol and SPA Bus (Continued)

Description	Consists of	Article No.
RTU OPTION Appendix IEC870-5-101 to User's Guide	Document	3BSE022173R101
RCS OPTION User's Guide	Document	3BSE022165R101
RCS OPTION System Messages Description	Document	3BSE022166R101
SPA SERVER OPTION User's Guide	Document	3BSE022167R101
SPA SERVER OPTION System Messages Description	Document	3BSE022168R101

8.6.6 System Software Back-up Card

Table 8-9. System software Back-up Card

Description	Consists of	Article No.
System software back-up card (SSWBUC) with identical software contents as the program card for the controller system software	PCMCIA card with system software	3BSE009724R1

8.6.7 Items for AccuRay QCS

Table 8-10. Items for AccuRay QCS

Description	Consists of	Article No.
Program module for AccuRay QCS support, version 3.0.	ARQCS	3BSE019818R3
Processor module with 16 Mbyte RAM	PM511V16	3BSE011181R1
Submodule for Accuray 1190 interface	CI532V09	3BUP001190R1
Submodule	CI545V1	3BUP001191R1

8.6.8 Hardware Options

Table 8-11. Submodule Carriers

Description	Consists of	Article No.
Carrier module without processor	SC510	3BSE003832R1
Carrier module with processor, used for MasterBus 300 and MasterBus 300E	SC520	3BSE003816R1

Table 8-12. S100 I/O Electrical Bus Extension

Description	Consists of	Article No.
Interconnection kit for connection of two PM511V to one S100 I/O bus extension	2xTK589 TK566	3BSE013897R1

Table 8-13. S100 I/O Optical Bus Extension

Description	Consists of	Article No.
Optical modem	TC560V1	3BSE014164R1
Terminator	TX560	3BSE005881R1
Interconnector	TK560	3BSE005880R1
Connection cable, 1.8m (5.9 ft.) for connection between PM511V or TK566 and TC560V1	TK580	3BSC950057R1
Connection cable, 0.7m (2.3 ft.) for connection between modems TC560V1	TK580V007	3BSC950057R2

Table 8-14. Program Card Interface and back-up flash-PROMs

Description	Consists of	Article No.
Program card interface (1)	MB510	3BSE002540R1
Flash-PROM card for back-up of application program 2Mbyte	PCMCIA card	3BSC630036R1
Flash-PROM card for back-up of application program 4 Mbyte	PCMCIA card	3BSC630036R2
Flash-PROM card for back-up of application program 10 Mbyte	PCMCIA card	3BSC630036R3

(1) MB510 not required for system software in a standard Advant Controller 450.

Table 8-15. Free-programmable Module

Description	Consists of	Article No.
Free-programmable module (language C) (1)	PU535	3BSE003831R1

(1) The software development environment is not included and can no longer be purchased. Please contact ABB Automation Products AB Dept. LF for information about software development for the module.

8.6.9 Communication

Table 8-16. MasterBus 300 and MasterBus 300E

Description	Consists of	Article No.
Bus controller for MasterBus 300 for connection to one MasterBus 300 bus cable	CS513 (strapped for MasterBus 300)	3BSE004772R1
Bus controller for MasterBus 300E for connection to one MasterBus 300E bus cable	CS513 (strapped for MasterBus 300E)	3BSE004773R1
Transceiver set for one MasterBus 300 or MasterBus 300E connection	MB300K01	5730030-VN
Cable L=5 m (16.7 ft.) to connect CS513 to transceiver unit	TK576V050	3BSC950055R1
Cable L=15 m (49 ft.) to connect CS513 to transceiver unit	TK576V115	3BSC950056R1
Tool kit for transceiver installation	MB300K02	5751029-2

Table 8-17. GCOM

Description	Consists of	Article No.
Bus controller for GCOM for connection to one GCOM bus cable	CI543	3BSE010699R1
Transceiver set for one GCOM connection	MB300K01	5730030-VN
Cable L=5 m (16.7 ft.) to connect CI543 to transceiver unit	TK576V050	3BSC950055R1
Cable L=15 m (49 ft.) to connect CI543 to transceiver unit	TK576V115	3BSC950056R1
Tool kit for transceiver installation	MB300K02	5751029-2

Table 8-18. Advant Fieldbus 100 for coaxial cable

Description	Consists of	Article No.
Bus controller for Advant Fieldbus 100 for one single bus and single bus cable	CI522A TC625 TK803	3BSE018448R1
Bus controller for Advant Fieldbus 100 for one single bus and redundant bus cables	CI522A 2xTC625 2xTK803	3BSE018449R1
Bus controller for Advant Fieldbus 100 for one redundant bus	2xCI522A 4xTC625 4xTK803	3BSE018450R1
Advant Fieldbus 100 connector kit Drop cable TK516 length = 40 cm (15,7”). For connection of one TC513, TC625 or TC630 to a coaxial bus line. Note: BNC connectors fit RG11 cable	TK516 2 BNC connectors BNC T-connector 2 red +2 blue marking rings	3BSE006251R1
Advant Fieldbus 100 terminator kit	1x75Ω BNC terminator plug 1x ditto w. ground lead	3BSE006244R1

Table 8-19. Advant Fieldbus 100 for twisted pair cable

Description	Consists of	Article No.
Bus controller for Advant Fieldbus 100 for one single bus and single bus cable	CI522A TC512V1 TK803	3BSE018451R1
Bus controller for Advant Fieldbus 100 for one single bus and cable redundancy	CI522A 2xTC512V1 2xTK803	3BSE018452R1
Bus controller for Advant Fieldbus 100 for one redundant bus	2xCI522A 2xTC512V1 4xTK803	3BSE018453R1
Cable adaptor, for connection of one TC512 or TC513 to 150 ohm twisted pair cable	TC501V150 TC505	3BSE009616R1

Table 8-20. Modems for Advant Fieldbus 100

Description	Consists of	Article No.
Conversion modem from coaxial to twisted pair or from twisted pair to coaxial cable	TC513V1	3BSE018405R1
Conversion modem from twisted pair to optical or from optical to twisted pair cable	TC514V2	3BSE013281R1
Repeater modem from twisted pair to twisted pair cable	TC515V2	3BSE013284R1
Conversion modem from coaxial to optical or from optical to coaxial cable	TC630	3BSE002253R1
Cable adaptor, for connection of one TC512, TC513 or TC516 to 150 ohm twisted pair cable	TC501V150 TC505	3BSE009616R1
Advant Fieldbus 100 connector kit Drop cable TK516 length = 40 cm (15,7”). For connection of one TC513, TC625 or TC630 to a coaxial bus line. **Note!** BNC connectors fit RG11 cable	TK516 2 BNC connectors BNC T-connector 2 red +2 blue marking rings	3BSE006251R1

Table 8-21. MasterFieldbus

Description	Consists of	Article No.
Bus controller for MasterFieldbus, for one bus, single or redundant bus cable	CI570 TC570 TK570	3BSE003565R1
Modem for MasterFieldbus, coaxial cable	DSTC 452	5751017-A
Optical modem for MasterFieldbus 2 Mbit/s	DSTC 454	5751017-F
Optical modem for MasterFieldbus 375 kbit/s	DSTC 454L	5751017-R

Table 8-22. Details for MasterFieldbus

Description	Consists of	Article No.
Passive terminator	DSTC 406	57520001-DX
Coaxial terminator 75 ohm BNC		5217423-14
Over-voltage protector incl. inline BNC connector	DSTC 451	56852000-A
Mounting plate for overvoltage protector DSTC 451		2172507-749

Table 8-23. Details for PROFIBUS-DP

Description	Consists of	Article No.
Communication interface for PROFIBUS-DP, one channel	CI541V1	3BSE014666R1

Table 8-24. Details for LONWORKS network interface

Description	Consists of	Article No.
Communication interface for LONWORKS network, two channels 1250 kbit/s	CI572	3BSE017712R1

Table 8-25. Connection of MasterView 320, Printer and Excom

Description	Consists of	Article No.
Communication module for RS-232-C Communication interface for 2 channels. Used without modems up to line 15 m (49 ft.)	CI531	3BSE003825R1
Modem for RS-232-C 24 V d.c. Short distance modem for cable length: 15 < L < 1000 m at 19200 bit/s. 15 < L < 12000 m at 1200 bit/s WxHxD = 55x100x128 mm (2.2x3.9x5.4 inch)	TC562	3BSC630049R1
Connection cable between CI531 and modem TC562, length = 3 m (10 ft.)	TK595	3BSE006830R1

Table 8-26. Multi Vendor Interfaces

Description	Consists of	Article No.
Bus controller for RCOM/RCOM+ for connection of two buses to AC 450. Used without modems up to 15 m (49 ft.) bus length.	CI532V01	3BSE003826R1
Bus controller for MODBUS for connection of two buses to AC 450. Used without modems up to 15 m (49 ft.) bus length.	CI532V02	3BSE003827R1
Bus controller for MODBUS for connection of two buses to AC 450. Used without modems up to 15 m (49 ft.) bus length.	CI534V02	3BSE010700R1
Bus controller for Siemens 3964(R) for connection of two buses to AC 450. Used without modems up to 15 m (49 ft.) bus length.	CI532V03	3BSE003828R1
Bus controller for Allen-Bradley DF1 for connection of two buses to AC 450. Used without modems up to 15 m (49 ft.) bus length.	CI534V04	3BSE010702R1
Free-programmable module A MVI module programmable in C(1)	CI535	3BSE003830R1
Modem for CI532Vxx, CI534Vxx, CI535 or CI538 24 V d.c. Short distance modem for cable length: 15 < L < 1000 m at 19200 bit/s. 15 < L < 12000 m at 1200 bit/s WxHxD = 55x100x128 mm (2.2x3.9x5.4 inch)	TC562	3BSC630049R1
Connection cable between CI532Vxx, CI534Vxx, CI535 or CI538, and modem TC562, length 3m (10 ft.).	TK595	3BSE006830R1

(1) The software development environment is not included and can no longer be purchased. Please contact ABB Automation Products AB Dept. LF for information about software development for the module.

Table 8-27. Miscellaneous Communication Equipment

Description	Consists of	Article No.
Capacitive decoupling device, for grounding of 4 cables	TX507 4 ferrite cores	3BSE009892R1
Capacitive decoupling device, for grounding of 8 cables	2 x TX507 8 ferrite cores	3BSE009914R1
Capacitive decoupling device, for grounding of 12 cables	3 x TX507 12 ferrite cores	3BSE009915R1
Capacitive decoupling device, for grounding of 16 cables	4 x TX507 16 ferrite cores	3BSE009916R1
Modem for RS-232-C Short distance modem for cable length <10km (6.25 miles) 120/230 V a.c.	DSTC X008	5751030-1
Connection cable for connection between CI53x and DSTC X008, length = 3m (10.2 ft.)	TK577	3BSE004650R1
Mounting plate for up to 2 modem units type TC512, TC513, TC560, TC561, TC562, TC570, TC625 and TC630	RA543	3BSE004691R1
19" modem subrack for up to 9 modem units type TC512, TC513,TC560, TC562, TC570, TC625 and TC630, TC625 and TC630	RF541	3BSE003912R1
Voting unit for TC562, TC514V1 or TC515V1 if redundant power supplies are used	SS110	3BSE007698R1

8.6.10 Printers

Table 8-28. Printers

Description	Consists of	Article No.
Alpha-numeric graphic printer, 80/137 ch./line, 360 ch./s, for connection 120 V a.c. Serial Interface, cable included	EP537-1	3BSC630116R1
Alpha-numeric graphic printer, 80/137 ch./line, 360 ch./s, for connection, 230 V a.c. Serial Interface, cable included	EP538-1	3BSC630117R1

Table 8-28. Printers (Continued)

Description	Consists of	Article No.
Ribbon cable with connectors for connecting EP532 or 533 to modem DSTC X008, 0.5 m (20”)	DSTK156V0.5	26390638-A
Cable assembly RS-232C DE9 socket to DB25 pin For connection of printer to CI531, length 15 m (49 ft.)	TK520V150	3BSC950019R2

8.6.11 Power Supply System

Table 8-29. Power Supply in RM500V1 Cabinet, 120V a.c. Mains

Description	Consists of	Article No.
Single a.c. mains supply (SA167K01) for controller subrack and I/O subrack 1 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA167 SX554 SX540 TK402V014	3BSE003573R1
Red. a.c. mains supply (SA167K03) for controller subrack and I/O subrack 1 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	2xSA167 2xSX554 2xSX540 2xTK402V014 TK451	3BSE003579R1
a.c. mains supply (SA161K10) for I/O subrack 2 Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA161 SX554 TK402V051	3BSE008781R1
a.c. mains supply (SA167K13) for I/O subrack 2 and 3 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA167 SX554 TK402V051	3BSE008785R1
a.c. mains supply (SA161K11) for I/O subrack 4 Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA161 SX554 TK402V060	3BSE008782R1
a.c. mains supply (SA167K14) for I/O subrack 4 and 5 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA167 SX554 TK402V060	3BSE008786R1

Table 8-30. Power Supply in RM500V1 Cabinet, 230V a.c. Mains

Description	Consists of	Article No.
Single a.c. mains supply (SA168K01) for controller subrack and I/O subrack 1 Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA168 SX554 SX540 TK402V014	3BSE003574R1
Red. a.c. mains supply (SA168K03) for controller subrack and I/O subrack 1 Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	2xSA168 2xSX554 2xSX540 2xTK402V014 TK451	3BSE003580R1
a.c. mains supply (SA162K10) for I/O subrack 2 Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA162 SX554 TK402V051	3BSE008783R1
a.c. mains supply (SA168K13) for I/O subrack 2 and 3. Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA168 SX554 TK402V051	3BSE008787R1
a.c. mains supply (SA162K11) for I/O subrack 4. Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA162 SX554 TK402V060	3BSE008784R1
Single a.c. mains supply (SA168K14) for I/O subrack 4 and 5. Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA168 SX554 TK402V060	3BSE008788R1

Table 8-31. Power Supply in RM500V1 Cabinet, 24/48V d.c. Mains

Description	Consists of	Article
Single d.c. mains supply for Controller subrack and I/O subrack 1. Input: 18.5-30V d.c. Output: 24V, 20 A, d.c., regulated (<1%)	SD150 SX554 SX555	3BSE004446R1
Red. d.c. mains supply for Controller subrack and I/O subrack 1. Input: 18.5-30 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	2xSD150 2xSX554 2xSX555 TK451	3BSE004448R1
Single d.c. mains supply for controller subrack and I/O subrack 1. Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 SX550 TK582V014	3BSE003585R1

Table 8-31. Power Supply in RM500V1 Cabinet, 24/48V d.c. Mains (Continued)

Description	Consists of	Article
Red. d.c. mains supply for controller subrack and I/O subrack 1 Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	2xSD150 2xSX554 2xSX550 2xTK582V014 TK451	3BSE003587R1
d.c. mains supply for I/O subrack 2 and 3 or 4 and 5. Input:18.5-30V d.c. Output: 24V, 20A, d.c., regulated (<1%)	SD150 SX554	3BSE004447R1
d.c. mains supply for I/O subrack 2 and 3. Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 TK582V051	3BSE008789R1
d.c. mains supply for I/O subrack 4 and 5. Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 TK582V060	3BSE008839R1

Table 8-32. Power Supply in RM500V1 Cabinet, 24V d.c. Mains (without d.c./d.c. converter)

Description	Consists of	Article No.
Single d.c. mains supply without d.c./d.c. conversion (DSSB170K04) for controller subrack and I/O subrack 1 Energy reservoir Capacity: 3 ms at 25 A d.c.	DSSB 170 SX555 SX557	3BSE003589R1
Single d.c. mains supply without d.c./d.c. conversion (DSSB170K05) for I/O subrack 2 and 3 or 4 and 5. Energy reservoir Capacity: 3 ms at 25 A d.c.	DSSB 170 SX557	3BSE003590R1

Table 8-33. Power Supply in RM500V2 Cabinet, 120V a.c. Mains

Description	Consists of	Article No.
Single a.c. mains supply (SA167K05) for controller subrack and I/O subrack 1 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA167 SX554 SX540 TK402V035	3BSE004407R1
Red. a.c. mains supply (SA167K07) for Controller subrack and I/O subrack 1 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	2xSA167 2xSX554 2xSX540 2xTK402V035 TK451	3BSE004413R1

Table 8-33. Power Supply in RM500V2 Cabinet, 120V a.c. Mains (Continued)

Description	Consists of	Article No.
a.c. mains supply (SA161K10) for I/O subrack 2 Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA161 SX554 TK402V051	3BSE008781R1
a.c. mains supply (SA167K13) for I/O subrack 2 and 3 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA167 SX554 TK402V051	3BSE008785R1
a.c. mains supply (SA161K11) for I/O subrack 4 Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA161 SX554 TK402V060	3BSE008782R1
a.c. mains supply (SA167K14) for I/O subrack 4 and 5 Input: 120 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA167 SX554 TK402V060	3BSE008786R1

Table 8-34. Power Supply in RM500V2 Cabinet, 230V a.c. Mains

Description	Consists of	Article No.
Single a.c. mains supply (SA168K05) for controller subrack and I/O subrack 1 Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA168 SX554 SX540 TK402V035	3BSE004408R1
Red. a.c. mains supply (SA168K07) for controller subrack and I/O subrack 1 Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	2xSA168 2xSX554 2xSX540 2xTK402V035 TK451	3BSE004414R1
a.c. mains supply (SA162K10) for I/O subrack 2 Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA162 SX554 TK402V051	3BSE008783R1
a.c. mains supply (SA168K13) for I/O subrack 2 and 3 Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA168 SX554 TK402V051	3BSE008787R1

Table 8-34. Power Supply in RM500V2 Cabinet, 230V a.c. Mains (Continued)

Description	Consists of	Article No.
a.c. mains supply (SA162K11) for I/O subrack 4 Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA162 SX554 TK402V060	3BSE008784R1
a.c. mains supply (SA168K14) for I/O subrack 4 and 5 Input: 230 V a.c., 50/60 Hz Output: 24 V, 25 A, d.c., unregulated	SA168 SX554 TK402V060	3BSE008788R1

Table 8-35. Power Supply in RM500V2 Cabinet, 24/48V d.c. Mains

Description	Consists of	Article No.
Single d.c. mains supply for controller subrack and I/O subrack 1 Input: 18.5-30 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 SX555	3BSE004440R1
Red. d.c. mains supply for controller subrack and I/O subrack 1 Input: 18.5-30 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	2xSD150 2xSX554 2xSX555 TK451	3BSE004424R1
Single d.c. mains supply for controller subrack and I/O subrack 1 Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 SX550 TK582V043	3BSE004419R1
Red. d.c. mains supply for controller subrack and I/O subrack 1 Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	2xSD150 2xSX554 2xSX550 2xTK582V043 TK451	3BSE004421R1
d.c. mains supply for I/O subrack 2 and 3 or 4 and 5 Input: 18.5-30 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554	3BSE004447R1

Table 8-35. Power Supply in RM500V2 Cabinet, 24/48V d.c. Mains (Continued)

Description	Consists of	Article No.
d.c. mains supply for I/O subrack 2 and 3 Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 TK582V051	3BSE008789R1
d.c. mains supply for I/O subrack 4 and 5 Input: 30-60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 SX554 TK582V060	3BSE008839R1

Table 8-36. Power Supply in RM500V2 Cabinet, 24V d.c. Mains (without d.c./d.c. converter)

Description	Consists of	Article No.
Single d.c. mains supply without d.c./d.c. conversion (DSSB170K06) for controller subrack and I/O subrack 1. Energy reservoir Capacity: 3 ms at 25 A d.c.	DSSB 170 SX554 SX557	3BSE004423R1
Single d.c. mains supply without d.c./d.c. conversion (DSSB170K05) for I/O subrack 2 and 3 or 4 and 5. Energy reservoir Capacity: 3 ms at 25 A d.c.	DSSB 170 SX557	3BSE003590R1

Table 8-37. Extra Power Supply in RM500 Cabinet for Field Equipment

Description	Consists of	Article No.
Single a.c power supply Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA161 SX554 TK402V027	3BSE003591R1
Single a.c power supply Input: 120 V a.c., 50/60 Hz Output: 48 V, 5 A, d.c., unregulated	SA171 SX554 TK402V027	3BSE003593R1
Single a.c power supply Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA162 SX554 TK402V027	3BSE003592R1
Single a.c power supply Input: 230 V a.c., 50/60 Hz Output: 48 V, 5 A, d.c., unregulated	SA172 SX554 TK402V027	3BSE003594R1

Table 8-37. Extra Power Supply in RM500 Cabinet for Field Equipment (Continued)

Description	Consists of	Article No.
Red. a.c power supply Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	2xSA161 2xSX554 DSSS170 2xTK402V027 2xTK457V030	3BSE003596R1
Red. a.c power supply Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	2xSA162 2xSX554 DSSS170 2xTK402V027 2xTK457V030	3BSE003597R1
Single d.c. power supply Input: 18.5 - 30 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150	3BSC610028R1
Single d.c. power supply Input: 30 - 60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	SD150 TK582V027	3BSE003595R1
Red. d.c. power supply Input: 18.5 - 30 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	2xSD150 DSSS 170	3BSE004443R1
Red. d.c. power supply Input: 30 - 60 V d.c. Output: 24 V, 20 A, d.c., regulated (<1%)	2xSD150 DSSS 170 2xTK582V027	3BSE003600R1

Table 8-38. Miscellaneous Power Supply Equipment in RM500 Cabinet

Description	Consists of	Article No.
Power distribution unit for modems, back-up power supply etc. 250 V a.c., 20A	SX542	3BSE004255R1
Power distribution unit with isolation transformer, 230 V a.c., 300VA	SV540	3BSE004264R1
Power distribution unit with isolation transformer, 120 V a.c., 300VA	SV541	3BSE004265R1
Power distribution unit with isolation transformer and change-over function, 230 V a.c., 300VA	SV542	3BSE005001R1
Power distribution unit with isolation transformer and change-over function, 120 V a.c., 300VA	SV543	3BSE005002R1

Table 8-38. Miscellaneous Power Supply Equipment in RM500 Cabinet (Continued)

Description	Consists of	Article No.
Power distribution unit for expansion of SX540	SX541	3BSE004254R1
Power distribution unit for expansion of SX550	SX551	3BSE004259R1

Table 8-39. Battery System in RM500 Cabinet

Description	Consists of	Article No.
Backup power supply (SB510K01) for a.c./d.c. 120-230V (mains)	SB510 TK405	3BSE004450R1
Backup power supply (SB511K01) for d.c. 20-60 V (mains)	SB511 TK404	3BSE004451R1
Battery unit NiCd adapted for RM500 Cabinet	SB522 TK460	3BSE016019R1

Table 8-40. Mains Supply Filter

Description	Consists of	Article No.
Mains supply Filter 250 V a.c./d.c., 20 A		3BSC740007R1
Mains supply Filter 250 V a.c./d.c., 55 A		3BSC740008R1
Mains supply Filter 24/48 V d.c., 80 A		3BSC740009R1
Mounting plate for three filter 20 A		3BSE016510R1
Mounting plate for two filter 55 A and one 20 A		3BSE016511R1
Mounting plate for two filter 80 A and one 20 A		3BSE016512R1

8.6.12 S100 I/O System

Table 8-41. S100 I/O Subracks for RM500 Cabinets

Description	Consists of	Article No.
Subrack with single 5V regulator	DSRF 197 DSSR 122	3BSE019999R1
Subrack with redundant 5V regulator	DSRF 200(1) 3xDSSR 170	3BSE020178R1
Voting unit for voting of 24V A or B when redundancy	DSSS 171	3BSE005003R1

(1)Voting unit DSSS 171 has to be used if redundant 24V (24VA and 24VB) will be connected to the subrack.

Table 8-42. Cables for S100 I/O bus extension

Description	Consists of	Article No.
Connection kit for **single** S100 I/O bus extension to I/O subrack For subrack no. 1 TK575: 2.5 m (8.3 ft.)	DSBC 176 DSTC 176 DSTK 227L0,1 TK575	3BSE019956R1
Connection kit for **single** S100 I/O bus extension to I/O subrack For subrack no. 2 and 4 TK517V040: 4 m (11.7 ft.)	DSBC 176 DSTK 227L0,1 TK517V040	3BSE019957R1
Connection kit for **single** S100 I/O bus extension to I/O subrack For subrack no. 3 and 5 DSTK 195: 0.6 m (2 ft.)	DSBC 176 DSTK 227L0,1 DSTK 195	3BSE019958R1
Connection kit for **redundant** S100 I/O bus extension to I/O subrack For subrack no. 1 TK575: 2.5 m (8.3 ft.)	2xDSBC 174 2xDSTC 176 DSTK 233L0.3 2xTK575	3BSE019959R1
Connection kit for **redundant** S100 I/O bus extension to I/O subrack For subrack no. 2 and 4 TK517V040: 4 m (11.7 ft.)	2xDSBC 174 DSTK 233L0,3 2xTK517V040	3BSE019960R1
Connection kit for **redundant** S100 I/O bus extension to I/O subrack For subrack no. 3 and 5 DSTK 195: 0.6 m (2 ft.)	2xDSBC 174 DSTK 233L0,3 2xDSTK 195	3BSE019961R1

Table 8-43. Analog Input Sets for S100 I/O

Description	Consists of	Article No.
16 channels, resolution 12 bit, differential 0 to ±10 V or 0 to ±20 mA, shunt 250 Ω 0.1% CMV 100 V, CMRR > 100 dB (50 Hz) **16 channels, resolution 12 bit**, differential 0 to ±10 V or 0 to ±20 mA, shunt 250 Ω 0.1% CMV 50 V, CMRR > 100 dB (50 Hz)	DSAI 130 DSTA 131 DSTK 221L3 or DSAI 130A DSTA 131 DSTK 221L3	3BSE019910R1
8 channels differential + 8 channels single ended, each channel separately fuse-protected, resolution 12 bit, 0 to ±10 V or 0 to ±20 mA shunt 250 Ω 0,05%, for 2-wire transmitters CMV 100 V, CMRR > 100 dB (50 Hz). **8 channels differential + 8 channels single ended**, each channel separately fuse-protected, resolution 12 bit, 0 to ±10 V or 0 to ±20 mA shunt 250 Ω 0,05%, for 2-wire transmitters CMV 50 V, CMRR > 100 dB (50 Hz).	DSAI 130 DSTA 133 DSTK 221L3 or DSAI 130A DSTA 135 DSTK 221L3	3BSE019911R1
32 channels, resolution 12 bit, single-ended 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05%	DSAI 133 2 x DSTA 002A DSTK 222L3 or DSAI 133A 2 x DSTA 002B DSTK 222L3	3BSE019912R1
31 (+1 ref.) channels for Pt100. 3-wire, resolution 12 bits, -100/ +320 or -200/ +640 °C	DSAI 146 DSTA 145 DSTK 229SL3	3BSE019913R1
14 (+2 ref. +1 compens.) channels for thermocouples, resolution 12 bits, measurement ranges for **floating thermocouples** of type B, C, E, J, K, R, S, T	DSAI 155A DSTA 156 DSTK 225SL3 or DSAI 155A DSTA 156B DSTK 225SL3	3BSE019914R1
Connection unit for compensation of the cold junction. Used between the thermocouples and DSTA 156/156B	DSTA 155 or DSTA 155P	57120001-KD 3BSE018323R1

Table 8-44. Redundant Analog Input Sets for S100 I/O

Description	Consists of	Article No.
With redundancy: 32 channels, resolution 12 bits, single- ended 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05%	2 x DSAI 133 2 x DSTA 002A 2 x DSTK 222L3 or 2 x DSAI 133A 2 x DSTA 002B 2 x DSTK 222L3	3BSE019915R1

Table 8-45. Analog Output Sets for S100 I/O

Description	Consists of	Article No.
4 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA, galvanic isolation	DSAO 110 DSTA 160 DSTK 223L3	3BSE019916R1
8 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA	DSAO 120 DSTA 170 DSTK 223L3	3BSE019917R1
16 channels, resolution 8 bits, 0 to +10 V or 0 to +20 mA	DSAO 130 DSTA 180 DSTK 221L3	3BSE019918R1
8 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA, galvanic isolation	DSAO 120A DSTA 171 DSTK 221L3	3BSE020419R1
16 channels, resolution 12 bits, 0 to +20 mA	DSAO 130A DSTA 181 DSTK 221L3	3BSE020420R1

Table 8-46. Analog Input/Output Sets for S100 I/O

Description	Consists of	Article No.
8 input channels, resolution 12 bits, single-ended, 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% **8 output channels, resolution 12 bits**, 0 to +20 mA or 0 to +10 V (over shunt 500 Ω 0.1% on DSTA 001A or DSTA 001B)	DSAX 110 DSTA 001A DSTK 223L3 or DSAX 110A DSTA 001B DSTK 223L3	3BSE019919R1

Table 8-47. Redundant Analog Input/Output Sets for S100 I/O

Description	Consists of	Article No.
With redundancy: 8 input channels, resolution 12 bits, single-ended, 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% **With redundancy: 8 output channels, resolution 12 bits**, 0 to +20 mA or 0 to +10 V (over shunt 500 Ω 0.1% on DSTA 001A or DSTA 001B)	2 x DSAX 110 DSTA 001A 2 x DSTK 223L3 or 2 x DSAX 110A DSTA 001B 2 x DSTK 223L3	3BSE019920R1

Table 8-48. Pulse Input and Positioning Sets for S100 I/O

Description	Consists of	Article No.
Positioning set for one positioning loop Pulse encoder input: 3 ch., ±15mA, max. 80 kHz DI/DO: 24 V d.c. AO: resolution 11 bits, 0 to ±10 V or 0 to ±20 mA	DSDP 140A DSTD 190 DSTK 225SL3	3BSE019921R1
Positioning Set for one positioning loop Pulse encoder input: 3 ch., ±15mA,max. 80 kHz DI/DO: 24 V d.c. AO: resolution 11 bits, 0 to ±10 V or 0 to ±20 mA Disconnectible screw terminal blocks	DSDP 140A DSTD 150A DSTK 225SL3	3BSE019922R1
Pulse counting set 12 ch., 5/12/24 V d.c. max. 10 kHz	DSDP 150 DSTD 190 DSTK 225SL3	3BSE019923R1
Pulse counting set 12 ch., 5/12/24 V d.c. max. 10 kHz Disconnectible screw terminal blocks	DSDP 150 DSTD 150A DSTK 225SL3	3BSE019924R1
Pulse counting set 4 measuring systems each containing: Pulse encoder input: 2 ch. + strobe 5/12/24 V or ±15 mA, max. 2.5 MHz DI: 24 V d.c. DO: 24 V, 250 mA d.c.	DSDP 170 DSTX 170 DSTK 228SL3	3BSE019925R1

Table 8-49. Digital Input Sets for S100 I/O

Description	Consists of	Article No.
32 channels, 24 V d.c., controlled by scanning or interrupt, pulse extension, time-tagging with 1 ms resolution	DSDI 110A DSTD 190 DSTK 221L3 or DSDI 110AV1 DSTD 190V1 DSTK 221L3	3BSE019926R1
32 channels, 24 V d.c., controlled by scanning or interrupt, pulse extension, time-tagging with 1 ms resolution, Disconnectible screw terminal blocks	DSDI 110A DSTD 150A DSTK 221L3 or DSDI 110AV1 DSTD 150A DSTK 221L3	3BSE019927R1
4 x 8 channels, input voltage according to connection unit, controlled by scanning or interrupt, pulse extension, time-tagging with 1 ms resol.	DSDI 110A or DSDI 110AV1 and DSTK 226L3	3BSE019928R1
- Connection unit for 8 channels, 24 V d.c. all channels galvanically isolated	DSTD 195	3BSE004724R1
- Connection unit for 8 channels, 24 V d.c. (48 V d.c over open input)	DSTD 196 or DSTD 196P	3BSE004725R1 3BSE018332R1
- Con. unit for 8 channels, 110 V d.c. or 120 V a.c.	DSTD 197	3BSE004726R1
- Connection unit for 8 channels, 230 V a.c.	DSTD 198	3BSE004727R1
32 channels, 48 V d.c., controlled by scanning or interrupt, pulse extension., time-tagging with 1 ms resol.	DSDI 120A DSTD 190 DSTK 221L3 or DSDI 120AV1 DSTD 190V1 DSTK 221L3	3BSE019929R1
32 channels, 48 V d.c., controlled by scanning or interrupt, pulse extension, time-tagging with 1 ms resolution, disconnectible screw terminal blocks	DSDI 120A DSTD 150A DSTK 221L3 or DSDI 120AV1 DSTD 150A DSTK 221L3	3BSE019930R1

Table 8-49. Digital Input Sets for S100 I/O (Continued)

Description	Consists of	Article No.
Terminal unit for distribution of 24V d.c. to DSTD 108, DSTD 195/197/198	DSSX 166	5347049-CR
Voting unit to DSTD 108, DSTD 195/196/198 if redundant 24V is used	SS110	3BSE007698R1

Table 8-50. Digital Output Sets for S100 I/O

Description	Consists of	Article No.
32 channels, 24-250 V a.c./d.c.	DSDO 115 DSTK 226L3 or. DSDO 115A DSTK 226L3	3BSE019931R1
Connection unit with 8 relay channels Input: 24 V d.c. Output: 24-250 V a.c./d.c.(1)	DSTD 108 or DSTD 108P	5716 0001-ABD 3BSE018333R1
Connection unit with 8 relay channels Input: 24 V d.c. Output: 24-250 V a.c./d.c.(2)	DSTD 108L or DSTD 108LP	5716 0001-ABW 3BSE018335R1
Connection Unit with 8 static Outputs, 24 V d.c. 2 A.	DSTD 109P	3BSE018327R1
32 channels, 24 V d.c., short-circuit proof transistor outputs, max 150 mA **32 channels, 24 V d.c.**, short-circuit proof transistor outputs, max 500 mA	DSDO 115 DSTD 190 DSTK 221L3 or DSDO 115A DSTD 190V1 DSTK 234L3	3BSE019932R1
32 channels, 24 V d.c., short-circuit proof transistor outputs with disconnectible screw terminal blocks, max 150 mA	DSDO 115 DSTD 110A DSTK 221L3 or DSDO 115A DSTD 110A DSTK 221L3	3BSE019933R1
16 channels, 24/48 V d.c., transistors outputs, max. 1 A	DSDO 120 DSTD 120A DSTK 220L3,2	3BSE019934R1

(1) Relay data: Load current: max. 3 A, min. 0.1 A at 24 V or 2.5 VA.
Breaking capacity a.c. max 720 VA at cos F > 0.4 d.c. max. 44 W at L/R <40 ms

(2) Relay data: Load current: max. 200 mA, min. 1 mA or 0.05 VA.
Breaking capacity a.c. 5 VA at cos F > 0.4, d.c. 5 W at L/R <40 ms

Table 8-51. Connection of Thyristor Converters

Description	Consists of	Article No.
Set for connection of one controlled thyristor converter to AC 400 Series	DSDC 111 DSTX 110 DSTK 224L3	3BSE019935R1

Table 8-52. S100 I/O boards for HART Protocol Interface

Description	Consists of	Article No.
32 channels, resolution 12 bit, single-ended 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05%	DSAI 133 2xDSTA 002A DSTK 231L5 or DSAI 133A 2xDSTA 002B DSTK 231L5	3BSE019936R1
With redundancy: 32 channels, resolution 12 bits, single- ended 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05%	2xDSAI 133 2xDSTA 002A DSTK 222L3 DSTK 231L5 or 2xDSAI 133A 2xDSTA 002B DSTK 222L3 DSTK 231L5	3BSE019937R1
16 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA	2xDSAO 120 2xDSTA 170 DSTK 232L5	3BSE019938R1
16 channels, resolution 12 bits, 0 to +20 mA	DSAO 130A DSTA 181 DSTK 240L5	3BSE020425R1
8 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA	DSAO 120 DSTA 170 DSTK 232L5	3BSE019939R1

Table 8-52. S100 I/O boards for HART Protocol Interface (Continued)

Description	Consists of	Article No.
8 input channels, resolution 12 bits, single-end., 0 to+10V or 0 to+20mA, shunt 250Ω 0.05% **8 outp. chann., resol. 12 bits**, 0 to +20 mA or 0 to +10 V (over shunt 500 Ω 0.1% on DSTA 001A or DSTA 001B)	DSAX 110 DSTA 001A DSTK 230L5 or DSAX 110A DSTA 001B DSTK 230L5	3BSE019940R1
With redundancy: 8 input channels, resolution 12 bits, single-ended, 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% **8 outp. channels, resol. 12 bits**, 0 to +20mA or 0 to+10V (over shunt 500Ω 0.1% on DSTA 001A or DSTA 001B)	2xDSAX 110 DSTA 001A DSTK 230L5 DSTK 223L3 or 2xDSAX 110A DSTA 001B DSTK 230L5 DSTK 223L3	3BSE019941R1

Table 8-53. S100 I/O for Intrinsic Safety Isolator support (without connection units)

Description	Consists of	Article No.
16 channels, resolution 12 bit, differential 0 to ±10 V or 0 to ±20 mA, shunt 250 Ω 0.1% CMV 100 V, CMRR > 100 dB (50 Hz) Cable length: 10m (32.8 ft.) **16 channels, resolution 12 bit**, differential 0 to ±10 V or 0 to ±20 mA, shunt 250 Ω 0.1% CMV 50 V, CMRR > 100 dB (50 Hz) Cable length: 10m (32.8 ft.)	DSAI 130 DSTK 225SL10 or DSAI 130A DSTK 225SL10	3BSE019942R1
16 channels, resolution 12 bit, differential 0 to ±10 V or 0 to ±20 mA, shunt 250 Ω 0.1% CMV 100 V, CMRR > 100 dB (50 Hz) Cable length: 15m (49.2 ft.) **16 channels, resolution 12 bit**, differential 0 to ±10 V or 0 to ±20 mA, shunt 250 Ω 0.1% CMV 50 V, CMRR > 100 dB (50 Hz) Cable length: 15m (49.2 ft.)	DSAI 130 DSTK 225SL15 or DSAI 130A DSTK 225SL15	3BSE019944R1

Table 8-53. S100 I/O for Intrinsic Safety Isolator support (without connection units) (Continued)

Description	Consists of	Article No.
32 channels, resolution 12 bit, single-ended 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% Cable length: 10m (32.8 ft.)	DSAI 133 DSTK 222SL10 or DSAI 133A DSTK 222SL10	3BSE019943R1
32 channels, resolution 12 bit, single-ended 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% Cable length: 15m (49.2 ft.)	DSAI 133 DSTK 222SL15 or DSAI 133A DSTK 222SL15	3BSE019945R1
8 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA Cable length: 10m (32.8 ft.)	DSAO 120 DSTK 223SL10	3BSE019946R1
8 channels, resolution 12 bits, 0 to ±10 V or 0 to ±20 mA Cable length: 15m (49.2 ft.)	DSAO 120 DSTK 223SL15	3BSE019947R1
8 input channels, resolution 12 bits, single-ended, 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% **8 output channels, resolution 12 bits** 0 to +20 mA. Cable length: 10m (32.8 ft.)	DSAX 110 DSTK 223SL10 or DSAX 110A DSTK 223SL10	3BSE019948R1
8 input channels, resolution 12 bits, single-ended, 0 to +10 V or 0 to +20 mA, shunt 250 Ω 0.05% **8 output channels, resolution 12 bits**, 0 to +20 mA. Cable length: 15m (49.2 ft.)	DSAX 110 DSTK 223SL15 or DSAX 110A DSTK 223SL15	3BSE019949R1
Pulse Counting Set 12 ch., 5/12/24 V d.c. max. 10 kHz Cable length: 10m (32.8 ft.)	DSDP 150 DSTK 225SL10	3BSE019950R1
Pulse Counting Set 12 ch., 5/12/24 V d.c. max. 10 kHz Cable length: 15m (49.2 ft.)	DSDP 150 DSTK 225SL15	3BSE019951R1
32 input channels, 24 V d.c., controlled by scanning or interrupt, pulse extension, time-tagging with 1 ms resolution Cable length: 10m (32.8 ft.)	DSDI 110A DSTK 225SL10 or DSDI 110AV1 DSTK 225SL10	3BSE019952R1

Table 8-53. S100 I/O for Intrinsic Safety Isolator support (without connection units) (Continued)

Description	Consists of	Article No.
32 input channels, 24 V d.c., controlled by scanning or interrupt, pulse extension, time-tagging with 1 ms resolution Cable length: 15m (49.2 ft.)	DSDI 110A DSTK 225SL15 or DSDI 110AV1 DSTK 225SL15	3BSE019953R1
32 output channels, 24-250 V a.c./d.c. Cable length: 10m (32.8 ft.)	DSDO 115 DSTK 225SL10 or DSDO 115A DSTK 225SL10	3BSE019954R1
32 output channels, 24-250 V a.c./d.c. Cable length: 15m (49.2 ft.)	DSDO 115 DSTK 225SL15 or DSDO 115A DSTK 225SL15	3BSE019955R1

Table 8-54. Mounting Bars for Connection Units

Description	Consists of	Article No.
Mounting bars for connection units - length = 24”, (3 modules height) - length = 19”, (3 modules height)	 RA121 RA120	 3BSE005465R1 3BSE005464R1

8.6.13 Cabinets

Table 8-55. RM500V1 Cabinets With=800 mm (31.5”), Depth=512 mm (20.2”)

Description	Consists of	Article No.
Single cabinet ventilated IP21, height: 2125 mm (83.7”) for cabinet no. 1, 4, 6 or 7	RM501	3BSE016045R1
Single cabinet ventilated IP21, height: 2125 mm (83.7”) for cabinet no. 2, 3 or 5	RM511	3BSE016054R1
Single cabinet ventilated IP41, height: 2125 mm (83.7”) for cabinet no. 1, 4, 6, or 7	RM502	3BSE016046R1
Single cabinet ventilated IP41, height: 2125 mm (83.7”) for cabinet no. 2, 3 or 5	RM512	3BSE016055R1
Single cabinet sealed IP54, height: 2125 mm (83.7”) for cabinet no. 1, 4, 6 or 7	RM503	3BSE016047R1
Single cabinet sealed IP54, height: 2125 mm (83.7”) for cabinet no. 2, 3 or 5	RM513	3BSE016056R1

Table 8-56. RM500V2 Cabinets
Width=700 mm (27.6”), Depth=637 mm (25.1”), Height=2225 mm (87.6”)

Description	Consists of	Article No.
Single cabinet ventilated IP21, for cabinet no. 1, 3 or 5	RM507	3BSE016051R1
Single cabinet ventilated IP21, for cabinet no. 2, 4 or 6	RM517	3BSE016060R1
Single cabinet ventilated IP41, for cabinet no. 1, 3 or 5	RM508	3BSE016052R1
Single cabinet ventilated IP41, for cabinet no. 2, 4 or 6	RM518	3BSE016061R1
Single cabinet sealed IP54, for cabinet no. 1, 3 or 5	RM509	3BSE016053R1
Single cabinet sealed IP54, for cabinet no. 2, 4 or 6	RM519	3BSE016062R1

Table 8-57. RM500 Cabinet Accessories

Description	Consists of	Article No.
End panel for RM500V1 cabinets with H = 2125 mm (83.7“)		3BSE016253R1
End panel for RM500V2 cabinets with H = 2225 mm (87.6”)		3BSE016254R1
Shield plate for shielding between RM500V1 cabinets with H = 2125 mm (83.7”)		3BSE016256R1
Shield plate for shielding between RM500V2 cabinets with H = 2225 mm (87.6”)		3BSE016257R1
Locking device, for one door		3BSE016258R1
Heat exchanger air/air, 230 V.a.c for RM500V1 cabinets with H = 2125 mm (83.7”)		3BSE016263R1
Heat exchanger air/air, 120 V.a.c for RM500V1 cabinets with H = 2125 mm (83.7”)		3BSE016266R1
Heat exchanger air/air, 230 V.a.c for RM500V2 cabinets with H = 2225 mm (87.6”)		3BSE016264R1
Heat exchanger air/air, 120 V.a.c for RM500V2 cabinets with H = 2225 mm (87.6”)		3BSE016267R1

8.6.14 Documentation

Table 8-58. Documentation

Title	Description	Article No.
Advant OCS User Documentation on CD-ROM	CD-ROM containing all manuals listed below in this table.	3BSE008143R1101
World Wide Web Access to Advant OCS Documentation One year, single user subscription	Internet access to a WWW containing all manuals listed below in this table.	3BUR001228R0001
World Wide Web Access to Advant OCS Documentation One year, five user's license subscription	Internet access to a WWW containing all manuals listed below in this table.	3BUR001503R0001
Advant Controller 450	User´s Guide containing a description of Advant Controller 450 and its functions (incl.information about configuration, installation, commissioning, fault tracing, maintenance etc.)	3BSE002415R701
Installation Rules	User's Guide describing the installation rules for Advant OCS, to ensure correct function in environments where disturbances are present	3BSE009178R0001
S100 I/O Hardware	Reference manual describing the S100 I/O hardware	3BSE002413R301
HART Protocol Interface	User's Guide describing how to include and use the HART protocol with S100 I/O	3BSE008619R0001
Intrinsic Safety Support S100 I/O with series 2000	User's Guide describing how to include and use the Intrinsic Safety System with S100 I/O	3BSE018949R101
PC Elements Advant Controller 400 Series	Reference Manual describing PC elements in Advant Controller 410/450	3BSE002418R601
Fuzzy Control with FUZZYCON	User's Guide describing how to implement the PC element FUZZYCON	3BSE012693R0001
User Defined PC elements	User's Guide describing how to design new PC elements by combining elements from standard libraries	3BSE009739R0001

Table 8-58. Documentation (Continued)

Title	Description	Article No.
Object Support via Advant Fieldbus 100	User's Guide describing how to use the program module QC07-COM41	3BSE014762R0001
Data Base Elements Advant Controller 400 Series	Reference Manual describing DB elements in Advant Controller 410/450	3BSE014819R401
AMPL Application Building	Reference Manual on the AMPL programming language	3BSE003841R0001
AMPL Configuration Advant Controller 400 Series	Reference Manual for configuration and application programming of AC 410/450 systems using AS 100 engineering stations, incl. command descriptions. Commands for diskette handling is in the User's Guide of the tool concerned	3BSE002417R601
MasterView 320	User's Guide for MasterView 320, containing descriptions, operation instructions, linkages to AMPL programs, descriptions of error messages and a table of ASCII codes	3BSE003836R0001
MasterFieldbus and S400 I/O	User's Guide on MasterFieldbus and the S400 I/O hardware system. Contains technical descriptions, instructions for installation, commissioning fault tracing and technical data. This manual also describes MP 51 as a distributed unit; the engineering required in AC 410/450, MP 200/1 and the programming	3BSE003837R0001
MasterNet	User's Guide describing how to configure, install and maintain MasterNet communication networks; MasterBus 200 and MasterBus 300/300E. For information about MasterGate 230/1 communication stations, see the manuals concerned	3BSE003839R0301
GCOM Multidrop	User's Guide containing information for the user about GCOM multidrop bus protocol	3BSE000165R0001

Table 8-58. Documentation (Continued)

Title	Description	Article No.
Advant Fieldbus 100	User's Guide for AF 100, containing a technical description, technical data and instructions for installation, commissioning and fault tracing	3BSE000506R801
PROFIBUS-DP	User's Guide containing a technical description, technical data and instructions for installation, commissioning and fault tracing	3BSE016040R101
Advant Interface to LONWORKS	User's Guide containing a technical description, technical data and instructions for installation, commissioning and fault tracing	3BSE020250R101
RCOM Advant Controller 400 Series	User's Guide containing a technical description, instructions for installation, start-up, design and fault tracing of Remote COMmunication in AC 410/450.	3BSE000532R101
MultiVendor Interface - MODBUS with CI532V02 Advant Controller 400 Series	User's Guide containing a technical description, instruction for installation, start-up, design and fault tracing for MVI/MODBUS in Advant Controller 410/450	3BSE000533R0001
MultiVendor Interface - MODBUS with MVB+CI534V02 Advant Controller 400 Series	User's Guide containing a technical description, instruction for installation, start-up, design and fault tracing for MVI/MODBUS in Advant Controller 410/450	3BSE010719R101
MultiVendor Interface - Siemens 3964(R) Advant Controller 400 Series	User's Guide containing a technical description, instruction for installation, start-up, design and fault tracing for MVI/Siemens 3964(R) in Advant Controller 410/450	3BSE000535R0001
MultiVendor Interface - Allen-Bradley DF1 Advant Controller 400 Series	User's Guide containing a technical description, instruction for installation, start-up, design and fault tracing for MVI/Allen-Bradley DF1 in Advant Controller 410/450	3BSE013712R0001

Table 8-58. Documentation (Continued)

Title	Description	Article No.
EXCOM	User's Guide containing a description of EXCOM, the necessary hardware and installation instructions. It describes all available services and their parameters. It also covers the subject of declaration of necessary variables, data types, etc.	3BSE003835R0001
MP 280 Application Notes	Gives examples of AMPL applications	7650060-201
MasterPiece 200 Positioning System	User's Manual on positioning in MasterPiece 200/1 or Advant Controller 410 or 450, containing technical descriptions, instructions for engineering, installation, programming, commissioning and maintenance. The manual also takes up basic positioning theory, information about pulse transmitters and technical data on the function	7650069-201
Functional Unit Part 1 Common Properties	User's Guide giving an introduction to the concept of Functional Units in Advant OCS	3BSE003849R201
Functional Unit Part 2 AI, AO, DI, DO	User's Guide describing the functional units AI, AO, DI, and DO	3BSE003850R0001
Functional Unit Part 3 SEQ, GROUP	User's Guide describing the functional units SEQ and GROUP	3BSE003851R0001
Functional Unit Part 4 PIDCON, RATIOSTN, MANSTN	User's Guide describing the functional units PIDCON, RATIOSTN, and MANSTN	3BSE003852R0001
Functional Unit Part 5 GENXXX	User's Guide describing the functional units GENCON, GENBIN, GENUSD, and GENNOV	3BSE003853R0001
Functional Unit Part 6 MOTCON, VALVECON	User's Guide describing the functional units MOTCON and VALVECON	3BSE003854R0001
Functional Unit Part 7 PIDCONA	User's Guide describing the functional unit PIDCONA	3BSE002433R0101
Functional Unit Part 8 DRICONS	User´s Guide describing the functional unit DRICONS	3BSE012570R0101

Table 8-58. Documentation (Continued)

Title	Description	Article No.
Functional Unit Part 9 DRICONE	User´s Guide describing the functional unit DRICONE	3BSE013947R0001
Functional Unit Part 10 MOTCONI	User´s Guide describing the functional unit MOTCONI	3BSE018916R101
FCB Type Circuits Drives Objects	User´s Guide describing FCB type circuit for ACS 600 single drives.	3BSE013131R0201
Interference-free Electronics. Design and Applications	Interference-free electronics; how to design circuit boards, electronic devices and systems with high immunity to interference. It also deals with process adaptation, communication and power supply with immunity to interference.	3BSE000877R101
AC 450 Terminal Diagram Form package	Including Terminal Diagram Forms on paper A4 and in IGES format on 3.5” diskettes.	3BSE020423R101
Orderspecific Preliminary Documentation	Assembly drawing & Circuit diagram in IGES format. List of Apparatus & Internal wiring table in Excel format. Will be sent by Lotus Notes earliest 4 weeks before delivery time.	3BSE018003R1
Orderspecific Released Documentation	Assembly drawing & Circuit diagram in IGES format. List of Apparatus & Internal wiring table in Excel format. Will be sent by Lotus Notes earliest 1 week after Acknowledged delivery time.	3BSE018006R
Updating of Released Documentation	Only adding of standard items from SEAPR pricelist. Information needed with layouts.	3BSE018007R1
Upgrading the MasterPiece 200/1	User’s Guide describing how to upgrade a MasterPiece 200/1 with a central unit (CPU, memory, communication interfaces etc.) to AC 450.	3BSE006727R0101

8.6.15 Software Utilities

Table 8-59. Software Utilities

Description	Packaging	Article No.
FUZZYCON FCB Type Circuits. Contains type circuits for FUZZYCON.	3.5” diskette	3BSE016313R1
FUZZYCON OS Process Displays. Contains process displays on operator station for FUZZYCON.	DDS Cassette	3BSE016314R1
Advant Drives Integration, Product Software MD 101. Contains the type circuit DRIS3_A0 for ACS 600 single drive.	3.5” diskettes	3BSE014030R1
Advant Switchgear Integration Contains the type circuits, LNT tool project file and XIF file to support the integration of ABB INSUM in Advant Controller 400 Series.	CD-ROM	3BSE020008R1

3BSE 015 953R201 Rev B

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