Technical Information

TI 33K01B10-50E

A Guide for Upgrading CENTUM V and CENTUM-XL to CENTUM VP (for Vnet/IP)

[Release 5]

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Preface

This document describes how to upgrade an existing CENTUM V or CENTUM-XL system to the latest CENTUM VP (Vnet/IP).

Trademarks

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Abbreviated Terms

The abbreviations and acronyms of Yokogawa products that are mentioned in this document are listed in Glossary.

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1. The Need for Upgrade

Many CENTUM V and CENTUM-XL systems – Yokogawa DCSes – have been sold worldwide since 1983 and 1988, respectively, and quite a few of these systems have been in operation for more than ten years. However, along with the years that have passed since the systems were introduced, the efficiency of plant operation is decreasing for the following reasons:

- System failure occurs more often due to aging.
- Functions become obsolete.
- System maintenance cost increases.

Accordingly, there is increasing demand among customers for a low-cost system upgrade method that can improve company competitiveness.

1.1 System Deterioration Due to Aging

System deterioration can generally be predicted by the so-called bathtub curve as shown in the following figure:

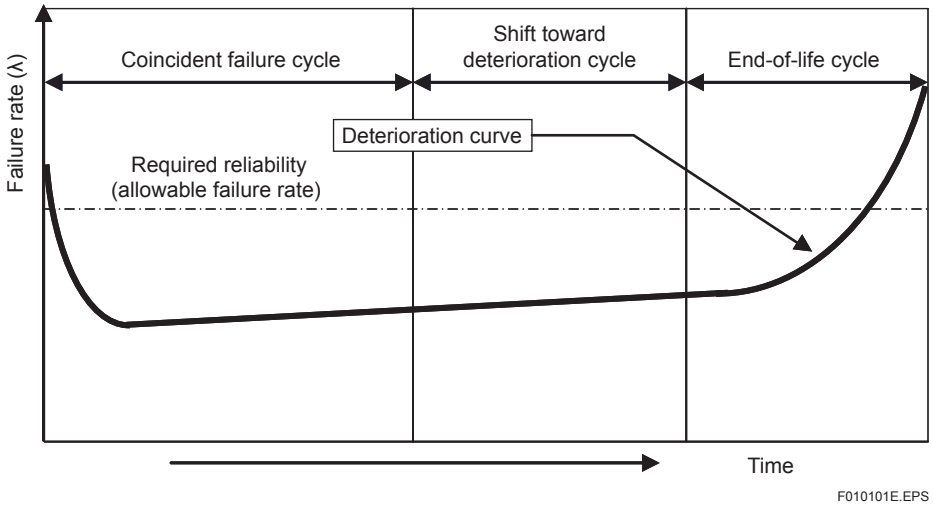


Figure System Deterioration Due to Aging

The failure rate of a system can be taken as a combination of the component parts' failure rates.

- Temperature:
  Failure rate doubles as the temperature rises by 10 °C.
- Humidity:
  Corrosive of exposed parts accelerates under a humidity of 60 % or more.
- Corrosive gas:
  Corrosive and other reactions occur in the exposed parts.
- Dust:
  Short circuits and corrosion are caused.

The failure rate of a system can be taken as the integration of failure rates of its component parts as follows.

Failure rate of system = $\sum \lambda i \times Ni$ (λ: failure rate of a part; N: number of parts used)

It is empirically ascertained that the ambient conditions largely affect the failure rate of a part as aforementioned, and the deterioration rate of a system is the sum of the deterioration rates of its parts.

To minimize the fall in plant operation rate (business loss) caused by aging, costly spare parts and maintenance checks are necessary.

1.2 Following to the Change

It is often the case that technology not established at the introduction of an existing system comes into practice later and its application to plant control significantly improves plant efficiency. To remain competitive in a boarder-less global market, it is necessary for businesses to follow the innovation speed of computer technology, because technology becomes obsolete as soon as it is introduced.

Production sites are required to be hot-linked with the corporate decision-making systems to facilitate the swift incorporation of market changes into production. This necessitates production systems to be linked with the plant information management system (PIMS) and corporate decision-making systems such as the enterprise resource planning (ERP) and manufacturing execution system (MES), and the links to be so flexible and agile to allow unparalleled swift responses to market changes. In addition, to increase the competitiveness of each user's enterprise there is demand for production systems to implement advanced control to improve efficiency of steady-state operations, advanced operation support functions to improve efficiency of non-steady-state operations, and plant resource management (PRM) to improve efficiency of facility management.

1.3 Increasing System Maintenance Cost

Recently, the technologies for DCSs' basic parts such as CPUs, ICs, and hard disk drives are innovating at incredibly fast speeds. Parts manufacturers consequently discontinue old products quicker than ever while catching up with the technology innovations, reviewing the sales strategies and parts productions, and putting their energies into manufacturing their workhorses.

TIP

Dividing the parts into groups corresponding to the individual DCS components using them and analyzing suppliers discontinuation trends, revealed that the revision-and-discontinuation cycles and supply periods are short for the parts used in human interfaces such as hard disk drives, floppy disk drives, and CPUs. In contrast, parts used in I/O show longer revision-and-discontinuation cycles and supply periods.

To achieve long-term steady operation of its DCSs, regardless of the ever-shortened supplying periods of basic parts, Yokogawa maintains supply of spare parts by implementing various measures including redesign with substitute parts and long-term stocks. Despite these efforts, price revisions for spare parts are becoming inevitable because the costs of long-term spare parts supply tend to increase significantly due to the overwhelming amount of discontinuations by parts suppliers.

The maintenance cost for a system demonstrates a propensity to escalate because of increases in parts failure rates due to deterioration over time and in prices of spare parts.

2. Style of Upgrade

In principle, the method of upgrading is by batch-upgrade from the currently installed CENTUM V and CENTUM-XL systems to the latest CENTUM VP (Vnet/IP, FIO).

To upgrade the FCS of CENTUM-XL, use the Cabinet Utility Kit (ACUKT2). To upgrade from CENTUM V, please contact the Yokogawa operation desk.

2.1 Batch-upgrade to Vnet/IP, FIO

For HMI, upgrade the existing operator station (COPSV or EOPS, etc.) to the human interface station (HIS) of CENTUM VP. In this HIS, use VI702 as the interface card for connecting to Vnet/IP.

For the control station, upgrade the existing CFCS2 or EFCS, etc. to FFCS-V (*1). Replace the conventional station control nest (SCN) with a new field control unit (FCU), replace the I/O nestwith a node unit, and replace the SIO-system I/O card with a FIO-system I/O card, respectively.

The currently installed SC cards and field wiring can be used as is.

*1: FFCS-V is an FCS for V-net/IP and FIO of CENTUM VP. At the time of upgrade, use AFV30 as an FCU.

The following figure shows an example of batch-upgrade of CENTUM-XL to CENTUM VP (Vnet/IP, FIO).

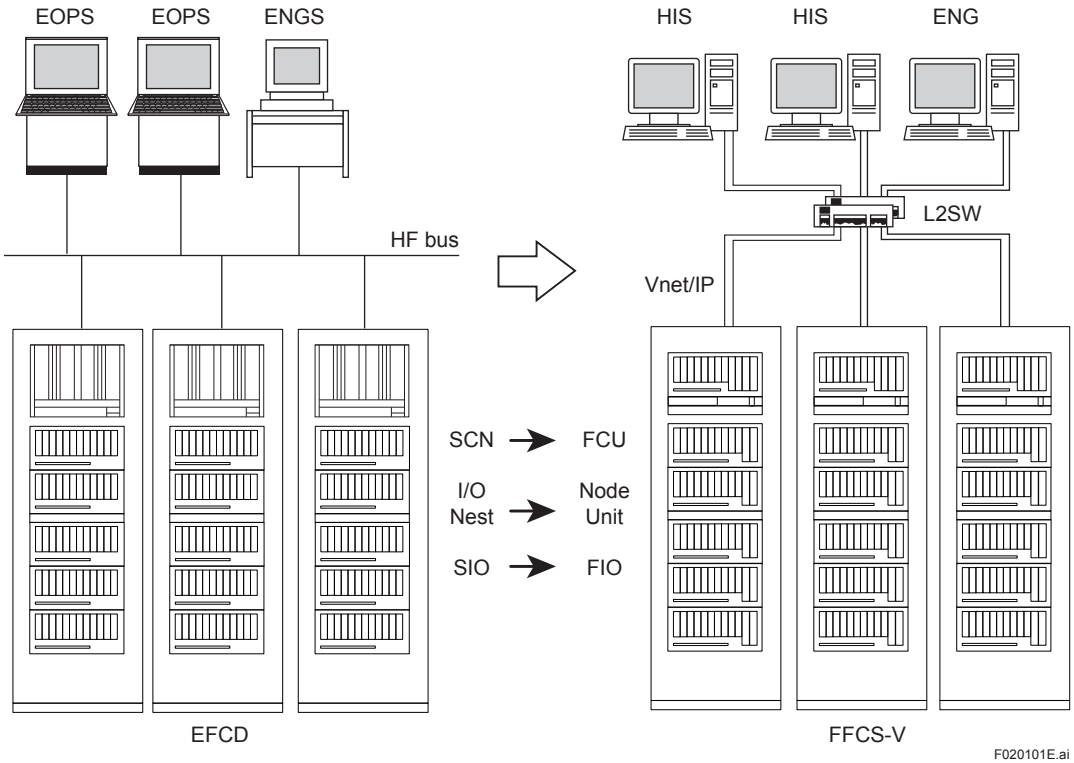


Figure An example of batch-upgrade from CENTUM-XL to CENTUM VP (Vnet/IP, FIO)

3. Scope of Upgrade

3.1 Applicable Existing System

Hardware

FCS

When upgrading in the following control stations, make sure to replace the SCN / I/O nest / SIO-system I/O cards with the FCU / Node unit / FIO-system I/O modules of CENTUM VP.

- CENTUM V: CFCS2, CFCD2, CFSS, CFSD, CFMS2, CFCDE
- CENTUM-XL: EFCS, EFCD, EMCS, EMCD, EFMS, EFCE

After the upgrade, you can continue to use the following devices and you are not required to change their existing field wiring:

- SC card and SC nest
- Terminal board, terminal block, relay board
- Wiring between I/O card and SC nest, I/O card terminal board, terminal block, wiring between relay boards
- Field device and wiring
- FCS cabinet, part of the fans and power source / bus assembly

Package Software

If the following package software is used in the existing system, the applications must be rebuilt during upgrade:

- SEBOL
- Recipe management
- FUZZY (*1)
- STC
- PREDICTROL (*1)
- XL-Batch
- External recorder output
- Subsystem communications
- Voice output
- Super window
- Extended function key

*1: These functions are not supported on CENTUM VP.

Application Software

Yokogawa offers an application software conversion.

SEE ALSO Refer to Section 4.5 “Application Software Conversion” for details.

Custom Software

There are three ways to upgrade custom software:

- Use package software – for subsystem communication, report generation, and the like, use the standardized software packages to achieve the same functions.
- Use third-party applications – for ITV Web cameras and other multimedia-related functions, use Windows system’s multimedia functions and the respective third-party applications.
- Reconfigure the functions – for custom functions that cannot be substituted by standardized software packages and third-party applications, reconfiguration is required.

3.2 Non-applicable Existing System

The following equipment can not be upgraded. Their recommended substitute products are shown in the table.

Component

Table Recommended Substitute Products

Equipment out of scope of upgrade	Recommended substitute	Remarks
CFGW, EFGW (*1)	FFCS-V + ALR111/121 communication module	Subsystem communication package (for serial communication, e.g., RS-232C, RS-485)
	FFCS-V + ALE111 communication module	Subsystem communication package (for Ethernet)
CGWU, ECGWZ, ECGW2, ECGW3	ACG, general purpose PC	Communications software should be restructured with Exaopc.
EFUS, EFUD	FFCS, FFCD	
CFBS2	FFCS, FFCD	
EMCS, EMCD	FFCS, FFCD, APCS	
CCMS, ECMP	General-purpose PC	Application software should be restructured with Exaquantum, Exaopc packages, etc.
XLAIS	General-purpose PC	Exapilot package
YEWLINK	Optical repeater	

*1: If CFGW or EFGW is used in the existing system, FIO's communication modules (ALR111/ALR121 and ALE111 cards) should be added to the field control station (FCS). Application software should also be regenerated.

I/O Card

Table Recommended substitute device

Equipment of scope of upgrade	Recommended substitute device	Remarks
RS4	ALR111	Use new cables that support different shape connectors. (*2)

*1: If the CFGW and EFGW are already incorporated in the existing system, FIO's communication modules (ALR111/ALR121 and ALE111 cards) should be included in the field control station (FCS). Application software should also be regenerated.
*2: For details, see GS 33M50J10-40E for Cables.

4. Procedure and Details of Upgrade

4.1 Upgrade Procedure

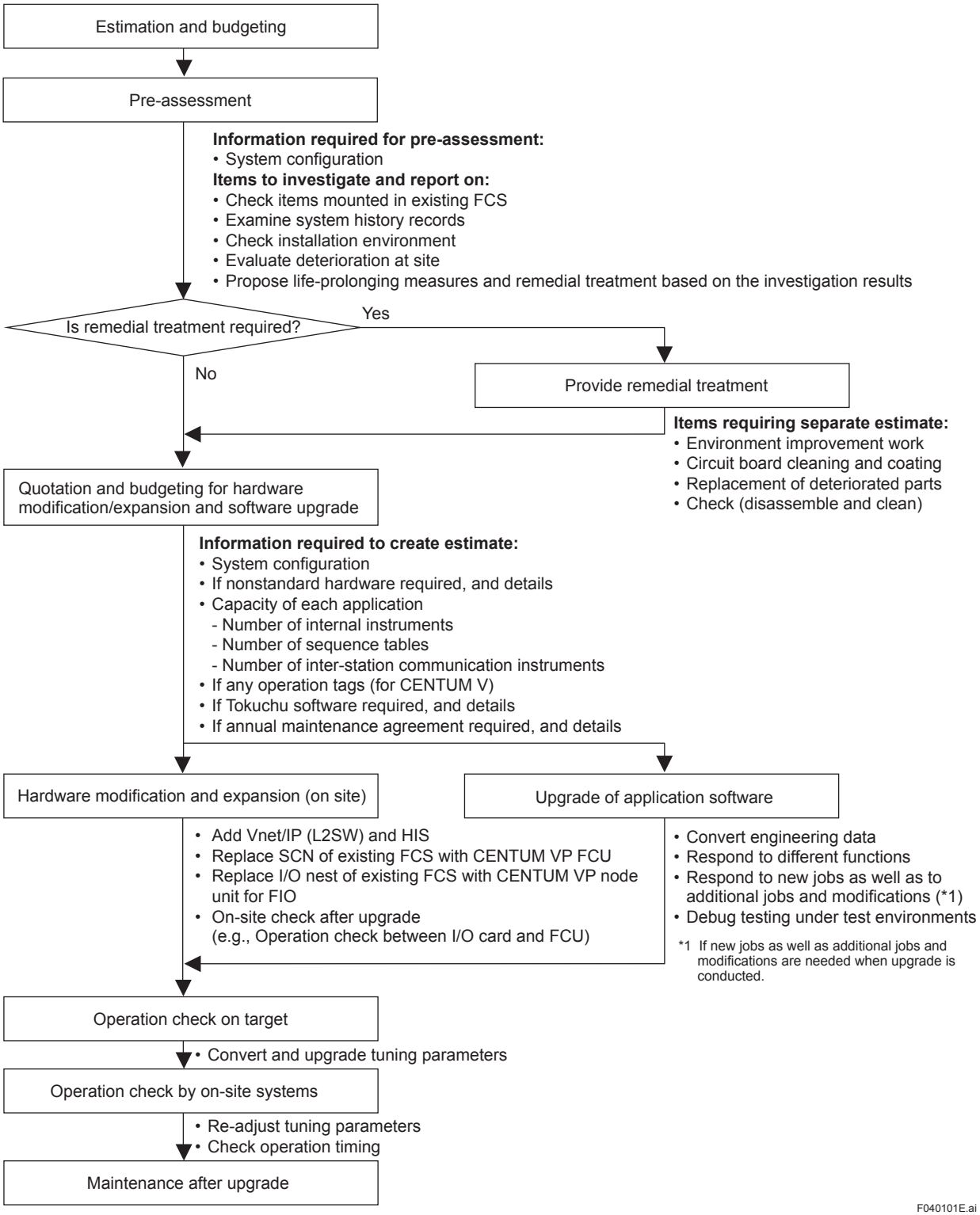


Figure Upgrade Procedure

4.2 Details of Pre-assessment

A pre-assessment is required before upgrade.

Purpose of Pre-assessment

This pre-assessment is conducted to assure safety and reliability of existing I/O cards and SC cards to be used in upgraded system. It includes assessment/observation of the following items, reports of the results, and proposal of required remedy plans.

Flow of Work

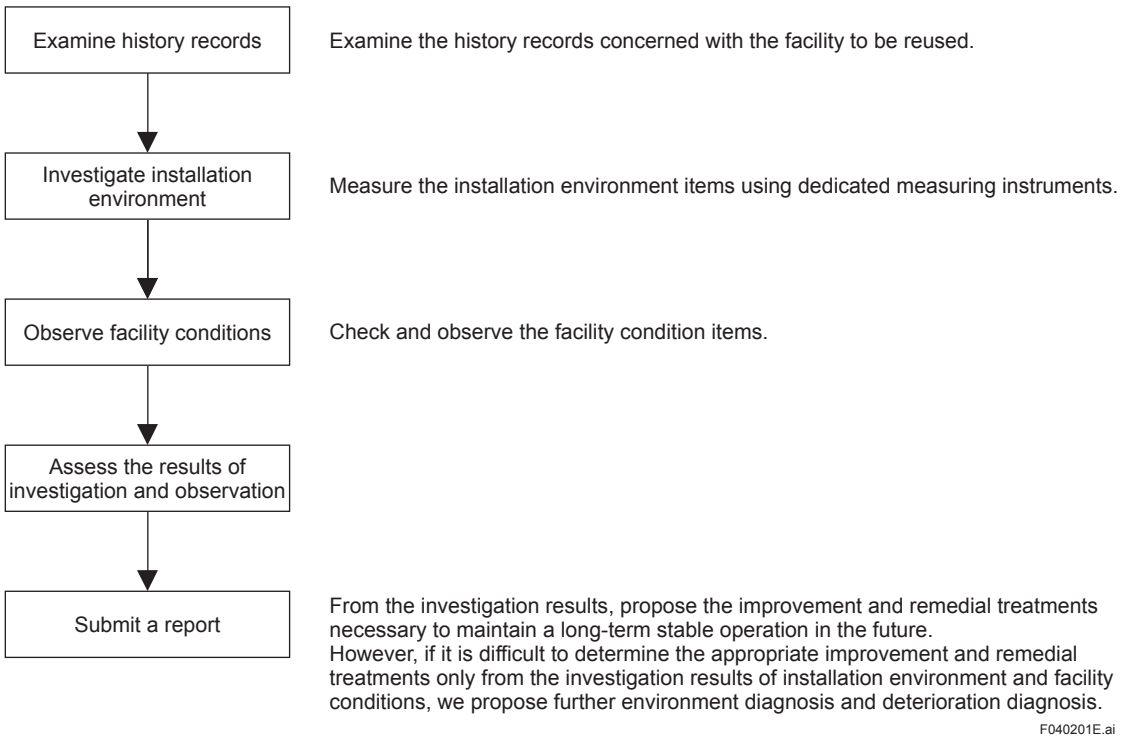


Figure Flow of Work

History Check

- Check if problems occur due to improper installation environment.
- Check when to replace parts.
- Check if problems occur due to deterioration.

Installation Environment Check

Temperature, humidity, amount of dust in the air, and corrosive gas concentration (H_2S, SO_2, Cl_2)

Facility Conditions Check

- Check inside and outside of the cabinet or other housing for dust accumulation on the filters and fans, as well as corrosion on terminal screws.
- Check the card surface for dust accumulation.
- Check the print patterns for peeling and corrosion.
- Check soldered points for creep.
- Check the surfaces of parts for corrosion in IC leads.
- Check contact areas (fouling of gold plate connectors, holes due to corrosion).
- Check the red stamp for condensation.
- Check coated areas for discoloration and cracks (*1).

*1: Only for cards with coating treatment.

Note: Electrical wiring and signal wiring (to connect I/O signals to field devices) are not checked by Installation Environment Check.

Contents of Report

We propose remedial treatments required for long-term, stable operation of the existing equipment.

Table Check Points and Remedial Treatments

Check Points	Remedial Treatments	Description
• Examine history records for occurrence of problems derived from stress • Check temperature, humidity, dust, and corrosive gas • Diagnose usual environmental conditions • Check age of service of the parts with defined life span	Overhaul	Disassemble a product to clean card and unit. Then check the functions to see if they are normal.
	Wash and/or coat cards	Disassemble a product to wash card by pure water. Then coat it with resin to prevent corrosion.
	Environmental improvement	Improve operation atmosphere by using environmental improvement unit.
	Replacement of deteriorated parts	Replace parts with defined life span (*1) listed in the product instruction manual (IM) or the parts which deteriorate for a long time more than ten years (*2).
	Partial replacement	When there are too much trouble and/or deterioration, or when it is difficult to replace parts, replace a product such as unit, card, cable, etc.

*1: Parts with defined life span are fan, capacitor, fuse, filter and relay.
*2: The existing equipment items to be used continuously and their relevant parts are listed in the table below.

Table Existing Equipments and Their Parts

Upgrade	Existing Equipment	Parts Excluding Parts with Defined Life Span	Remedial Treatment
Upgrade CPU only	I/O card	Fuse, adjustable resister, connector, printed circuit	Card cleaning and coating
	I/O power supply	Adjustable resister	Deteriorated part replacement (overhaul)
	I/O nest	Aluminum electrolytic capacitor, connector, printed circuit	Cleaning, coating, unit replacement
Upgrade CPU only or Upgrade both CPU and I/O	Unit power supply for XL	Adjustable resister	Deteriorated part replacement (overhaul)
	Bus assembly	Connector, printed circuit	Unit replacement
	Power distribution board	Aluminum electrolytic capacitor, circuit breaker	Deteriorated part replacement
	Alarm unit for XL	Fuse, aluminum electrolytic capacitor, switch, photocoupler	Deteriorated part replacement
	SC card	Fuse, adjustable resister, aluminum electrolytic capacitor, photocoupler	Deteriorated part replacement (overhaul), card replacement
	SC nest	Connector, printed circuit	Unit replacement
	Terminal board, terminal block, relay board	Aluminum electrolytic capacitor, connector, printed circuit	Deteriorated part replacement, unit replacement
	KS cable	Connector	Cable replacement
	Power supply cable	Connector	Cable replacement

4.3 Remedial Treatment

We decide whether proposed treatment based on the result of pre-assessment is necessary or not after consultation with our customer, and provide necessary treatment.

Please note that separate quotation is required to provide treatment.

4.4 Hardware Modification and Addition

HIS and Vnet/IP (*1) that are installed newly are not described herein, since they are identified as the CENTUM VP product.

*1: Vnet/IP Interface Card, cable and network switch.

4.4.1 Modifying FCS

For the conventional FCS, upgrade the SCN/IO nest to FCU/Node unit of CENTUM VP.

To upgrade from CENTUM-XL, use the Cabinet Utility Kit (ACUKT2). This kit contains a set of parts required for the specified update. For actual upgrade work, you also need FCU (AFV30), Node Unit for FIO and associated cables besides this Kit.

SEE ALSO For ACUKT2, refer to Cabinet Utility Kit (GS 33K50K21-50E).

When upgrading from CENTUM V, the ACUKT2 is not yet configured for such upgrade. For more information, contact the sales department of Yokogawa Electric Corporation.

The following table shows the major components of ACUKT2.

Table Parts contained in ACUKT2

Name	Model name	Quantity	Remark
Distribution Board Frame with HKU	–	1	–
Main Distribution Board	–	1	–
Fan Power Supply Unit	–	2	–
Roof Fan Interface Board and Cover	–	1 for each	–
SC Fan Interface Board and Cover	–	1 for each	–
DC-power Distribution Board	–	1	–
Relay Terminal	–	1	–
Node Fan Unit	ANFAN	–	Optional
Upright Distribution Unit	–	–	Optional
Cable	–	–	–

The following figure shows an upgrade example of EFCD with ACUKT2.

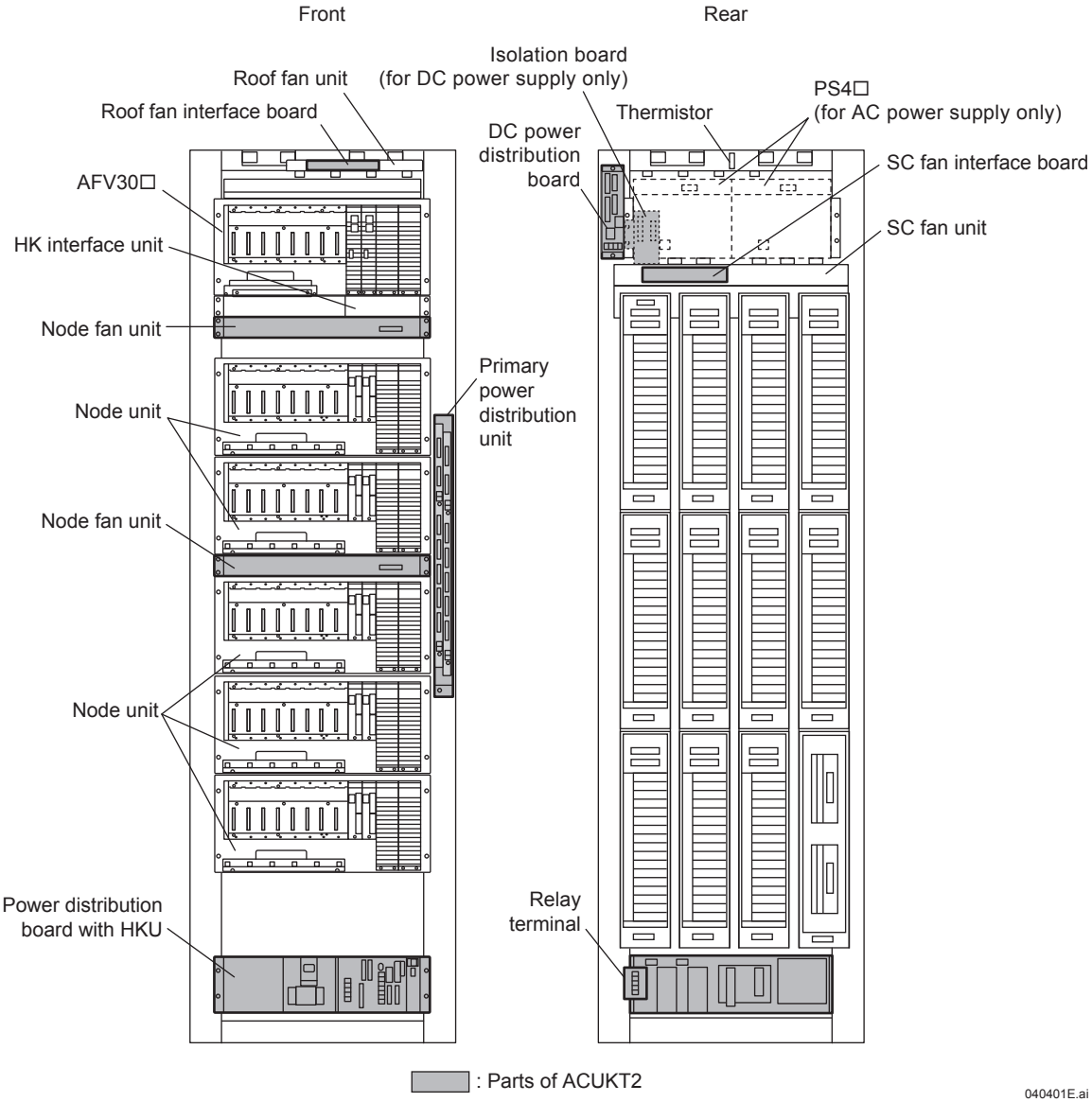


Figure An example of EFCD upgrade with ACUKT2

The following figure shows an example of a of three types of ACUKT2 connection with the HK bus.

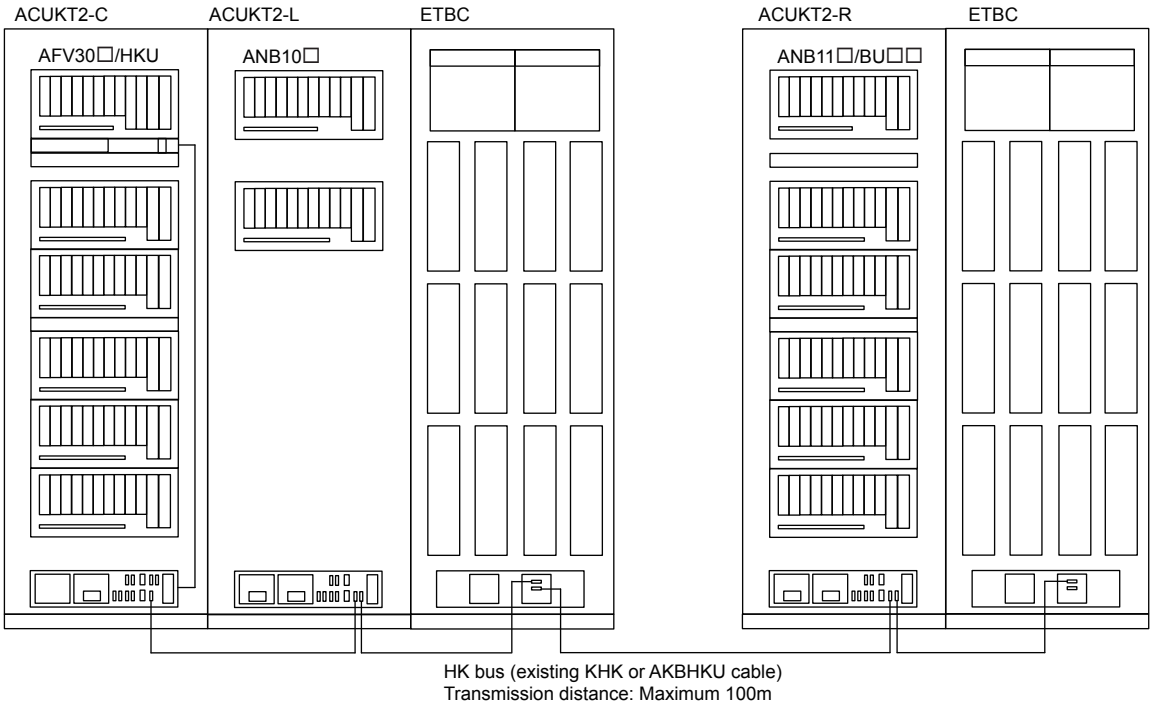


Figure 3 Types of ACUKT2

Since the capacity and performance of FCS are remarkably improved, it is now possible to integrate more than one unit of old FCS into one set of FFCS-V when upgrading from CENTUM V and CENTUM-XL. However, note that some additional engineering work may arise since the station/node number must be replaced.

4.4.2 On-site Modification

FCS

Follow these steps to upgrade an FCS of the CENTUM XL system by using the ACUKT2:

1. Remove the front door of the FCS cabinet.
2. Confirm the destination of cables for the SCN, fan, and I/O nest. Then disconnect the cables.
3. Remove the SCN, fans, and I/O nests in turn from upper to lower.
4. Remove the cable that connects the CPL (coupler) of the HF bus to the existing SCN because it will be not used any more.
5. Removed the CPL and PDB (Power Distribution Board).
6. Replace the existing Power Distribution Board with HKU, Roof Fan Interface Board, SC Interface Board, DC-power Distribution Board and Primary Power Distribution Unit with the new ones.
7. Mount the FCU, Node Unit and Node Fan.
8. Connect the cables around the FCU and Power Distribution Board.
9. Connect the cables for the fans and node units.
10. Connect the Vnet/IP cable.
11. Put back the front door of the FCS cabinet.

The following figure shows the front side of the FCS beofre and after the hardware upgrade.

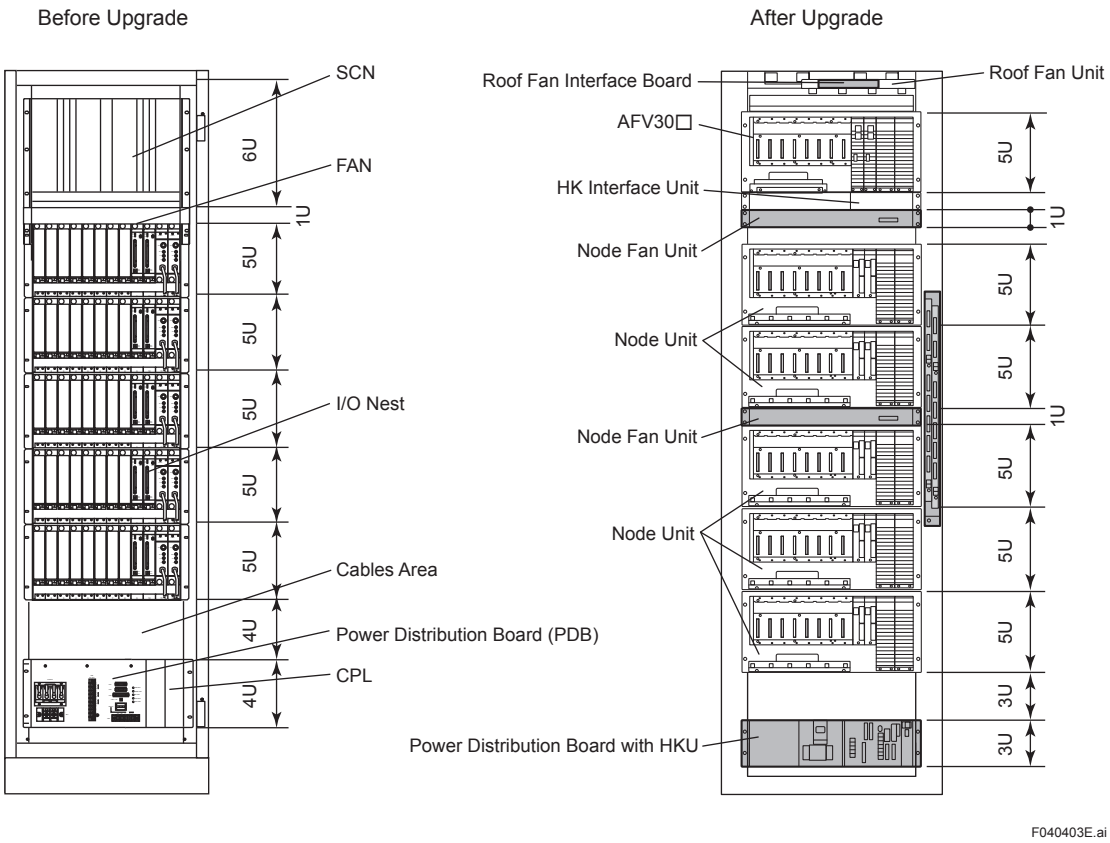


Figure Front side of the FCS before and after hardware upgrade

4.4.3 Upgrading the Existing I/O Card Unit

Upgrade of the existing I/O card unit shall be carried out into the I/O modules as shown below.

Table I/O modules after upgrade

Model of existing I/O cards & multiplexer cards	Model of I/O modules for Upgrade	KS interface adapter
MAC2 (Analog input/output: 8 points each)	AAB841	ATM4A
PAC (Pulse train input: 8 points; Analog output: 8 points)	AAP849	–
VM1 (Analog input: 16 points)	AAV141	ATK4A
VM2 (Analog input 8 points, Analog output 8 points)	AAB841	ATV4A
VM4 (Analog output: 16 points)	AAV542	ATK4A
PM1 (Pulse train input: 16 points)	AAP149	–
ST2 (DI: 16 points; DO: 16 points)	ADV859(*1)	–
ST3 (DI, 32 points)	ADV159(*1)	–
ST4 (DO, 32 points)	ADV559(*1)	–
ST5 (DI: 32 points; DO: 32 points)	ADV869(*1)	–
ST6 (DI, 64 points)	ADV169(*1)	–
ST7 (DO, 64 points)	ADV569(*1)	–
PB5 (Multi-point pushbutton input)	ADV159	–
RS4 (RS-232C communication card)	ALR111 (Cable also must be changed)	–
MX2 (Non-isolated, mV, TC, 32 points)	AAT145 (2 modules)	–
MX3 (Isolated, mV, TC, 16 points)	AAT145	–
MX4 (Non-isolated, voltage, 32 points)	AAV142 (2 modules)	ATK4A
MX5 (Isolated, voltage, 16 points) (AAV142, non-isolated)	(AAV142, non-isolated)	ATK4A
MX6 (RTD, 32 points)	AAR145 (2 modules)	–
MAC3 (Analog input/Output: 8 points each, for power supply)	(*2)	–
PB6 (Multi-point push button input, 16 points)	ADV159	–
LD1 (Loop display interface card, CLDU ~ MAC2)	(*3)	–
LCU (Loop communication card, ULDU: 4 units)	(*3) (*4)	–
LCS (Loop communication card, YS80: 8 units)	ALR121(*5)	–

*1: In the CENTUM VP, the input/output type is specified for each terminal (i.e., point) of a contact input/output module; an output type setting for an odd terminal may take effect on the next even terminal. For details, see GS 33K50F70-50E for Digital I/O Modules (for FIO).
*2: Simply updating to AAB841 is not enough for this setup. Interactive operation with a manual station is necessary.
*3: CLDU and ULDU cannot be used. Substitute with a YS instrument.
*4: Replace with the communication card of FIO plus YS1000.
*5: For connection between an LCS card and a star-type YS instrument, replacement with star type is not possible in updating to FIO. Since SCIU is currently under order stop, FIO needs to be formed as a daisy chain.

Precautions when upgrading the I/O card

- FIO (Fieldnetwork I/O) contact I/Os allow the designation of operation mode on a point-by-point basis. The operation mode, which varies with the type of I/O module, is selected by the IOM builder.
- Odd and even terminals in the pulse width output module and the status output/pulse-width output integrated module are identically defined for every two terminals. If different definitions are used, changes in wiring are required.
- If the following cards are used, their hardware specifications are changed to software specifications, so, the existing systems should be examined.
  - ST2/ST3/ST4/ST5/ST7 cards: Output values when the CPU in a field control station fails (hold/OFF)
  - PB5: Signal detection (rising/falling)
  - MX2/MX3: Presence or absence of burnup
- Instruments that allocate two-point consecutive DI/Os, such as switch instrument SIO-22 in CENTUM V and CENTUM-XL systems allow crossover allocations between cards, but, FIO in the CENTUM VP system does not provide those allocations. DI/O should be converted to %SW using a sequence table. Valve monitor functions and I/Os of a CI/CO cannot allow crossover allocations between cards either.

Precautions when upgrading the existing SC card

If the bus of FIO is used, SC cards can upgraded on a card-by-card basis. If the following cards are used, their hardware specifications are changed to software specifications, so, the existing systems should be examined.

- EP1: Load resistance (200 Ω/510 Ω/1 kΩ) and filter settings (ON/OFF)
- ET5/ER5/EM1/ES1: Disconnection processing (burnup, burndown, or none)
- EA5/EH5: Square-root input processing

4.4.4 Installation Specifications

Power Consumption, Calorific Value, and Rush Current

FCS

Power consumption and calorific value do not change by upgrade, but inrush current increases by about 10 % after upgrade.

If the power supply system is designed based on the Installation Plan of CENTUM V and CENTUM-XL, it does not need to be modified since the inrush current can be absorbed in the margin value as described therein.

SEE ALSO For more details, see Appendix 2, “Installation Conditions for CENTUM V and CENTUM-XL.”

FMS

Power consumption, heating values and inrush current do not change by upgrade.

4.5 Application Software Conversion

Application software is converted in the following procedure.

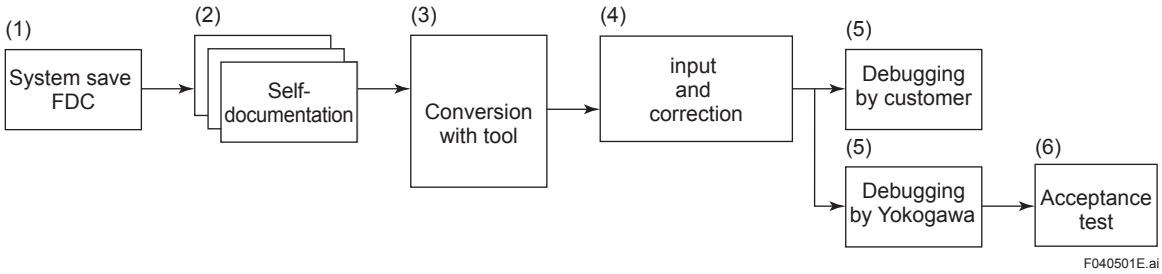
- Tool conversion work and input/correction work are performed by Yokogawa.
  Yokogawa does not perform rework and the subsequent work. The customer is required to perform rework such as rewriting computational expressions, and the subsequent work.

Debugging is performed either by Yokogawa or the customer.

- Debugging by the customer
  Yokogawa supports the debugging of the software by the customer to some extent.
- Debugging by Yokogawa
  Yokogawa performs the debugging and then performs the acceptance test.

4.5.1 Conversion Procedure

Yokogawa generally carries out Conversion in the following way.



Yokogawa performs for the customer the following two levels of conversion work.

- Performing work (1) to (4)
- Performing work (1) to (6)

The scope of the company's work depends on the contents of the contract with the customer.

4.5.2 Work by Upgrading Tool

When Yokogawa performs the conversion work, the current conversion tool is used to create files for converting the existing CENTUM V or CENTUM-XL systems to CENTUM VP.

4.5.3 Handling Tuning Parameters

Tuning parameter resetting may be required between the existing CENTUM V or CENTUM-XL and the CENTUM VP system. For tuning parameter differences between the existing systems and CENTUM VP, refer to Appendix 3, “Tuning Parameter Differences.”

Items to Be Specially Noted

- Two-item data changed to one-item data
  Example: Integrated value (K2, K3 → SUM), batch set value (K8*K9 → BSET)
- Normalized data changed to engineering unit data
  Example: Y-axis of 7PG (PG-L13), X-axis and Y-axis of 7CM-NL (FUNC-VAR), ratio, gain and feedforward gain of 7RS (RATIO)
- Changed algorithm
  Example: Derivative term D of PID

IMPORTANT

CENTUM VP’s PID function block tends to output its Derivative time calculation value larger, in a short period of time, than CENTUM V or CENUM-XL. It means that CENTUM VP is more responsive to the increase and decrease of an input value or a set point value that are identical.

Therefore, when CENTUM V or CENTUM-XL is upgraded to CENTUM VP, reviews of the PID parameters per loop are required. When a Derivative term is 0, the existing Proportional term and Integral term can be directly applicable. In case the Derivative term is something other than 0, considerations to the following points are required. For more details, please contact Yokogawa.

- Derivative terms of CENTUM V or CENTUM-XL, in most cases, can be directly applied to the loops where those values have only little effects.
- On the loops where Derivative terms have big influence, retuning of the PID parameters is required.
- Input noises may cause outputs to fluctuate when the Derivative terms are big. By using an input filter, the output fluctuation can be controlled.
- When the PID actions of CENTUM V or CENTUM-XL have to be inherited, equivalent PID actions of the existing system can be achieved by using the CENTUM VP’s applications such as CALCU blocks of FCS.

4.5.4 Functional Difference in the Data Item and Block Mode

Between CENTUM VP and CENTUM-XL, there are some functional differences in data items and block modes. Particularly when they are connected to any supervisory computer, re-examination taking also the operation into account comes to be necessary.

Functional difference that require reconstruction

Data items SV and MV

For SV data items of CENTUM-XL, apply either of SV/CSV/RSV depending on the function block mode in CENTUM VP.

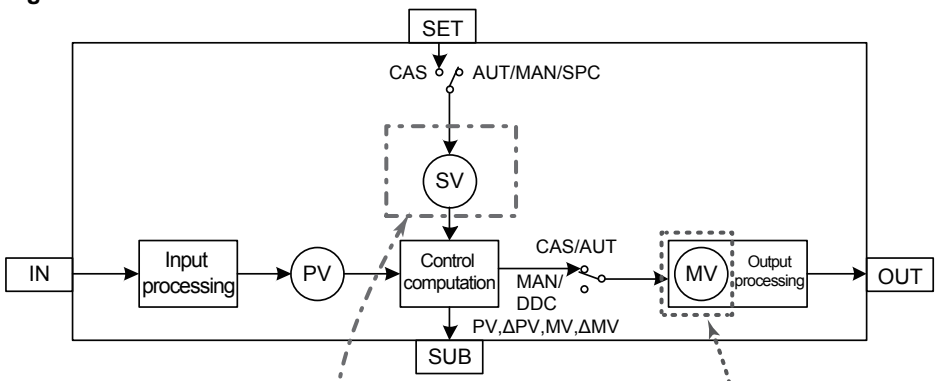
In addition, for MV data items of CENTUM-XL, apply either of MV/RMV depending on the function block mode in CENTUM VP.

As YOKOGAWA finds it hard to judge whether to proceed to reconstruction based only on the investigation of existing applications, the customer is advised to conduct a dynamic test taking also the operation into account.

Also, when the SPC mode or DDC mode of CENTUM-XL is used, it is necessary to undertake a dynamic test while connecting to any supervisory computer. (When this dynamic test cannot be performed with any supervisory computer, an appropriate test method shall be examined in the consultation.)

If there is a piece of application which performs SV-writing at the time of CAS mode, it is necessary to hold an additional consultation regarding the function taking also the loop configuration into account.

<Function block diagram of PID: CENTUM-XL>



<Function block diagram of PID: CENTUM VP>

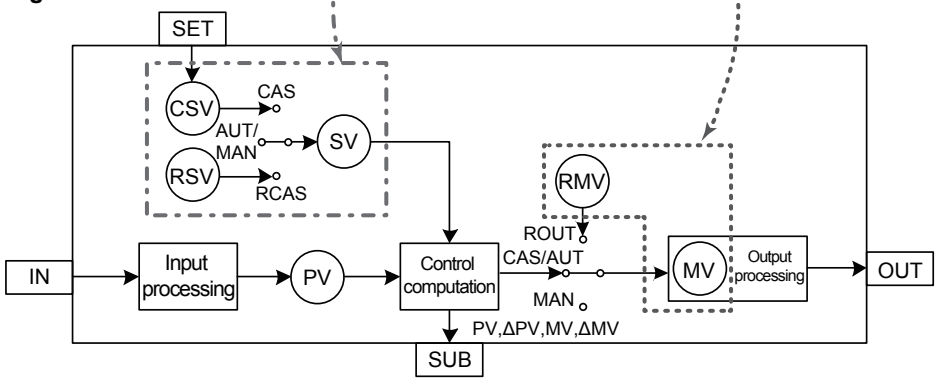


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Figure Difference between the data items for SV and MV

Backup Mode of CENTUM-XL and Tracking Mode of CENTUM VP

The backup mode (BUM mode) of CENTUM-XL is equivalent to the tracking mode (TRK mode) of CENTUM VP, but the way of transition differs between these modes.

In CENTUM-XL, the current mode will shift to the BUM mode from any of the MAN / AUT / CAS modes independently.

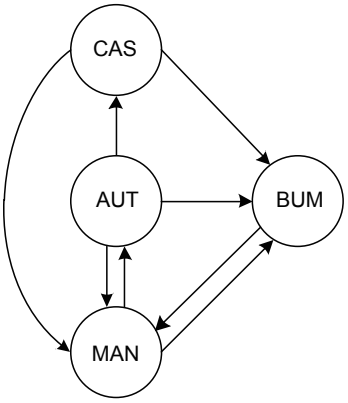
In CENTUM VP, every mode is a compound mode and both the TRK mode and any of the MAN/AUT/CAS modes can effect concurrently.

In CENTUM-XL, any application which uses the local / remote switchover contact input (RL terminal) or has been shifted to the BUM mode according to the sequence, it is necessary to re-examine whether the mode judgment on the tag of CENTUM VP is equivalent or not.

Customer is advised to conduct a dynamic test taking also the operation into account.

Correction of the subject part shall be carried out only after close discussion with the customer.

<Block mode diagram: CENTUM-XL>



<Block mode diagram: CENTUM VP>

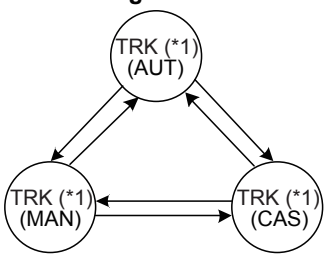


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Figure Difference in the block mode

*1: On CENTUM VP, both the TRK mode and any of the MAN/AUT/CAS modes can effect concurrently.

Example: Where the judgment condition is “Not AUT” in the sequence table of CENTUM-XL, the condition is met when the tag mode is BUM. However, where the judgment condition is “Not AUT” in the sequence table of CENTUM VP, even the same condition is not met when the tag mode is TRK(AUT).

Computer Backup Mode of CENTUM-XL and CENTUM VP

The computer backup mode (CBM / CBA / CBC mode) of CENTUM-XL is equivalent to that of CENTUM VP, but the way of transition differs between them.

In CENTUM-XL, the current mode will shift to the CBM / CBA / CBC mode which is independent from any of the MAN / AUT / CAS modes.

In CENTUM VP, every mode is a compound mode and either of the RCAS / ROUT modes and any of the MAN / AUT / CAS modes can effect concurrently.

CENTUM-XL performs WDT communication with the supervisory computer, and the system switch %SW0064 will be turned to ON if the supervisory computer fails (FAIL).
When %SW0064 is turned to ON, the system will change into the computer backup mode (CBM / CBA / CBC mode). However, CENTUM VP has no such corresponding function, it is necessary to newly build an equivalent application.

Where there is an application which has been changed into the SPC / DDC mode with CENTUM-XL, and if it performs WDT communication with the supervisory computer, re-examination whether the mode judgment on the tag of CENTUM VP is equivalent is required.

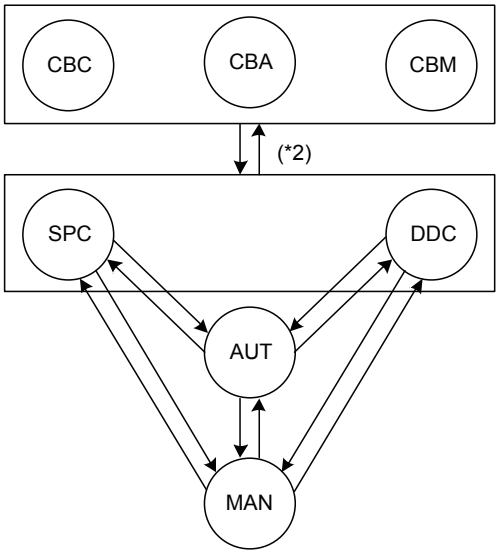
Customer is requested to conduct a dynamic test with the supervisory computer taking also the operation into account.

(When this dynamic test cannot be performed with any supervisory computer, an appropriate test method shall be discussed in the consultation.)

Correction of the subject part shall be carried out only after close discussion with the customer.

Example: Where the judgment condition is “Not AUT” in the sequence table of CENTUM-XL, the condition is met when the tag mode is CBA. However, where the judgment condition is “Not AUT” in the sequence table of CENTUM VP, even the same condition is not met if the tag mode is RCAS(AUT).

<Block mode diagram: CENTUM-XL>



<Block mode diagram: CENTUM VP>

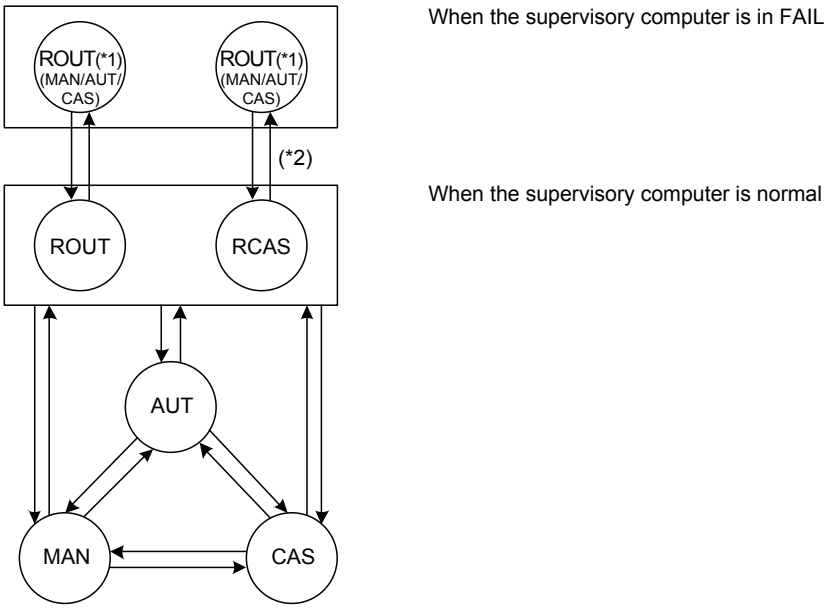


Figure Difference in the computer backup mode

*1: On CENTUM VP, either of the ROUT/RCAS modes and any of the MAN/AUT/CAS modes can effect concurrently.
*2: The current mode will be changed to any of the MAN/AUT/CAS (CBM/CBA/CBC in the case of CENTUM-XL) modes if the supervisory computer is in FAIL, however, it is possible to set to which mode the current mode is changed through detailed definition for each tag. On CENTUM VP, it is necessary to build a new application which changes into the computer backup mode if WDT communication with the supervisory computer is shut down.

4.6 On-site System Operations Check

Conduct on-site system final checks while adjusting tuning parameters and checking system operation timing.

4.7 Maintenance After Upgrade

Life of Parts Used in Upgraded Hardware

System hardware contains limited-life parts, which must be replaced periodically. For preventive maintenance, the table below lists the recommended replacement cycles.

Control equipment (AFV30□, ANB10□)

Table Limited-life Parts Used in Control Equipment

Part name	Part No.	Recommended replacement cycle	Applicable model		Replaceable by user(*2)	Remarks
			AFV30□	ANB10□		
Power Supply Module (100-120V AC)	PW481	8 years	X	X	X	Average ambient temp.(*1), 40°C or lower
Power Supply Module (220-240V AC)	PW482	8 years	X	X	X	Average ambient temp.(*1), 40°C or lower
Power Supply Module (24V DC)	PW484	8 years	X	X	X	Average ambient temp.(*1), 40°C or lower
Battery Pack	S9548FA	3 years	X	–	X	Average ambient temp.(*1), 30°C or lower
		1.5 years	X	–	X	Average ambient temp.(*1), 40°C or lower
		9 months	X	–	X	Average ambient temp.(*1), 50°C or lower
Electrolytic Capacitor (inside of Power Supply Module)	(PW481)	8 years	X	X		Overhaul of Power Supply Module is required.
	(PW482)	8 years	X	X		
	(PW484)	8 years	X	X		
Built-in Fuse in Power Supply Unit	S9109VK	8 years	X	X		For PW481, PW482
	A1546EF	8 years	X	X		For PW484
Fan Power Supply Unit (100-200, 220-240VAC)	S9618FA	8 years	(*3)	–	X	Average ambient temp.(*1), 40°C or lower
Fan Power Supply Unit (24V DC)	S9618FA	8 years	(*3)	–	X	Average ambient temp.(*1), 40°C or lower
Node Fan	AIP611	8 years	(*3)	–	X	For Node Fan Unit

*1: Average ambient temperature varies with the environment in which FCS is installed. Where FCS is installed in a cabinet, an average ambient temperature indicates that not outside but inside the cabinet.
*2: In the “Replaceable by user” column of this table, the parts marked with ‘X’ can be replaced by users. Do not replace those unmarked. Be sure to ask the Yokogawa service office to replace the parts unmarked.
*3: This is a part contained in the Cabinet Utility Kit, ACUKT2.

Maintenance Service

It is recommended that you make an Annual Maintenance Service Contract to assure long-term, stable use of upgraded equipment and existing I/O cards and SC cards to be used after upgrade.

If we have taken remedial action for your systems according to pre-assessment, you can choose one from two types of annual maintenance services: standard contract (for 9AM-to-5PM support) and full-service contract (for 24-hour support). These service contracts are also available for the CENTUM VP. If we haven’t, on-demand maintenance service is available.

5. System Functions After Upgrade

5.1 System Overview

5.1.1 Overall Control Functions

This section describes the enhancements of the overall control functions in FCS that is upgraded to FFCS-V, hereinafter referred to as “Upgraded FCS.”

Operation upon power failure and recovery

1. Power recovery mode

   If the power of a upgraded FCS fails, the operation of the CPU and I/O modules will stop. The following shows the start conditions and start actions when the power recovers.

Start condition		Start action
Initialization designation (MAN)	—	Initial cold start
Timer designation (TIM)	Long-time power failure (FCS power failure period ≥ momentary power failure detection time period)	
	Momentary power failure (FCS power failure period < momentary power failure detection time period	Restart
Continuous designation (AUT)	—	

2. Operation of I/O module upon power failure and recovery

   The CENTUM V and CENTUM-XL FCS’s have provided the same power supplies for I/O modules and FCUs, while in a upgraded FCS, when I/O modules are changed to FIOs with a separate power supply, it is necessary to consider an independent power failure.

   When FIO remote nodes are used, it is also necessary to consider power failure and recovery.

   As an operation of I/O modules when an independent power failure occurs in FCU, an output fallback function is provided. This function aims to hold the output of the output module at the current output value or forcibly change the module output to a specified value.

Execution Timing of Function Blocks

The execution timing of function blocks (or CENTUM instruments) differs as shown below depending on the type of FCS. In upgraded FCS, to execute function blocks in exactly the same timing as before the upgrade, control drawings must be created considering the execution order of the control drawings and the function blocks contained in the drawings.

Table Execution Timing

System	Scan period	Execution order of function blocks
CENTUM V CFCS2 CFSS	Standard: 1 sec High speed: 200 msec	At every scan period, executed in the following order: Update of internal timers and pulse counters →annunciator messages →feedback control instruments →sequence tables
CENTUM-XL EFCS EFCS-H2, H4	Standard: 1 sec High speed: 500 msec/200 msec	At every scan period, executed in the following order: Update of timers and pulse counters →switch instruments → batch status indicators →sequence table →feedback control instruments →annunciator messages
CENTUM VP RFCS5-V RFCS5-XL FFCS-V	Standard: 1 sec (fixed) Middle speed: 1 sec/500 msec/200 msec High speed: 500 msec/200 msec/ 100 msec/50 msec	At every scan period, executed in the following order: Function blocks →annunciator messages →SEBOL/ SFC Function blocks are executed in the order of control drawings; within a drawing, in the order of function block numbers.

Support of YS Instruments

The YS instrument blocks (installed via LCS card) supported in CENTUM V and CENTUM -XL systems are included in the standard software.

Support of LD1 and LCU

CLDU and ULDU cannot be used.

Substitute YS instruments for them.

Communication with Subsystem

It is recommended to substitute an ALR111 card for CFGW, EFGW and RS4 card.

IOP

Care should be exercised with regards to IOP because its behavior changes between before and after upgrade. Particularly, if any block includes calculation using a tag IOP or a sequence conditional on IOP, you need to review the IOP behavior.

5.1.2 Comparison of Function Blocks' Common Function

In the instruments of both CENTUM V and CENTUM-XL FCS, process input data are processed as 0 to 100% normalized data, whereas the data are processed converted into engineering quantity scales in the function blocks of upgraded FCS.

In addition, the input signal processing of upgraded FCS has no capability of line-segment conversion or compensation functions. To transplant from existing FCS's CENTUM instruments that use these functions to upgraded FCS, input signals must be preprocessed by using general-purpose calculation blocks.

Table Functions Common to Functional Blocks and Comparison of Corresponding Internal Instruments

CFCD2/CFSD EFCD-S1/EFCD-H2, H4			Upgraded FCS	
			Existence of function	Remarks
Input signal processing	Input signal conversion	No conversion	X (*1)	
		Square-root extraction	X (*1)	
		Pulse train input conversion	X (*1)	
		Line-segment conversion	—	Use FUNC-VAR block instead.
	Compensation		—	Use CALCU block instead.
	Digital filter		X	
	Totalizer		X	
	Calibration		X	CAL included in alarm statuses in old FCS is expressed as a data status of process value in the upgraded FCS.
Output signal processing	Clamp		X	CLP+, CLP- and CND included in part of loop statuses (LSUB) in old FCS are expressed as a data status of output value in the upgraded FCS.
	Conditional		X	
	Output velocity limiter		X	
	Output limiter		X	
	Preset MV function		X	
	MV index		X	
	Output signal conversion	Analog output	X	
		On/off output	X	
		Pulse-width output	X	
		Output to other CENTUM instrument	X	
Alarm processing	Input open check		X	Input open alarms are checked by the input module. Function blocks directly linked to the input modules accept input module check results and conduct input open alarm processing. The function blocks that are not directly linked to the input modules generate open alarms if data causing input open alarms are acknowledged.
	Input high-high and low-low limit check		X	The alarms turn active at HH = 100% and LL = 0%.
	Input high and low limit check		X	The alarms turn active at PH = 100% and PL = 0%.
	Velocity check		X	
	Deviation check		X	
	Output open check		X	Output open alarms are checked by the output module. The output module check results are accepted as data statuses (OOP) and output open alarms are handled. Output open alarms occur in the function blocks directly linked to the output modules.
	Output high and low limit check		X	The alarms turn active at MH = 100% and ML = 0%.
	Alarm bypass		X	

X: Equivalent function provided.
—: Substitute function provided.
*1: If range conversion is specified for the analog input data, converts it into an engineering quantity with the SL to SH scale.

5.1.3 Comparison of Continuous Control Function

The table below shows a comparison of the continuous control function models between the CENTUM V, CENTUM-XL, and CENTUM VP systems.

Table Comparison of Continuous Control Function

Block type	Model			Description
	CENTUM V	CENTUM-XL	Upgraded FCS	
Input indicator	7PV	PVI	PVI	Input indicator
	7PV-DV	PVI-DV	PVI-DV	Input indicator with deviation alarms
Controller	7DC-D5	PID	PID	PID controller The same control action can be obtained by changing the control algorithm and gap action using the builder.
	7DC-N5			
	7DC-D6			
	7DC-N6			
	–	PI-HLD	PI-HLD	Sampling PI controller
	7DC-B5	PID-BSW	PID-BSW	Controller with batch switch
	7DC-C2	ONOFF	ONOFF	2-position on/off controller
	7DC-C3	ONOFF-G	ONOFF-G	3-position on/off controller
	7DC-C9	PID-TP	PID-TP	Time-proportional on/off controller
	7DC-D3	PD-MR	PD-MR	Proportional controller
	7DC-D9	PI-BLEND	PI-BLEND	Blending controller
	–	PID-STC	PID-STC	Self-tuning PID controller
Manual operation unit	7ML-ND	MLD	MLD	Manual loader
	7ML	MLD-PVI	MLD-PVI	Manual loader with input indicator
	7ML-SW	MLD-SW	MLD-SW	Manual loader with auto/man switch
	7ML-XN			
	7MC-C2	MC-2	MC-2	2-position motor control unit
	7MC-C3	MC-3	MC-3	3-position motor control unit
Signal set unit	7RS	RATIO	RATIO	Ratio set unit
	7PG	PG-L13	PG-L13	6-zone program set unit (Substitute PG-L13.)
	7PG-BR			13-zone program set unit
	7PG-SP	PG-S13		13-step program set unit (Substitute PG-L13.)
	7BS	BSETU	BSETU-2	Batch set unit
	–	BSETU-2		Batch set unit for flow measurement
	–	BSETU-3	BSETU-3	Batch set unit for weight measurement
Signal limiter	7RL	VELLIM	VELLIM	Velocity limiter
Signal selector	7SS-S-H/M/L	SS-H/M/L	SS-H/M/L	Signal selector
	7SS-A-H/M/L	AS-H/M/L	AS-H/M/L	Autoselector
	7RD	SS-DUAL	SS-DUAL	Dual signal selector
Data link	7SL-DT	SDL	ADL	Station data link
	–	SDL-2		Station data link for setting by communication
YS80	SLCD	SLCD	SLCD	SLCD indicating controller
	SLPC	SLPC	SLPC	SLPC programmable controller
	SLMC	SLMC	SLMC	SLMC programmable controller with pulse-width output
	SMST-111	SMST-111	SMST-111	SMST-111 auto/manual station with push-button setpoint setting
	SMST-121	SMST-121	SMST-121	SMST-121 auto/manual station with manipulated output lever
	SMRT	SMRT	SMRT	SMRT ratio set unit
YS BCS	SBSD	SBSD	SBSD	SBSD batch set unit
	SLCC	SLCC	SLCC	SLCC blending controller
	SLBC	SLBC	SLBC	SLBC batch controller
	STLD	STLD	STLD	STLD totalizer
Alarm	–	ALM-R	ALM-R	Representative alarm unit

Interstation Communications

It is recommended that the control stations closely related to each other via station data link be collectively upgraded to CENTUM VP at the same time. For upgrade work methods, see Section 5.2, “Upgrade Specifications.” If inter-station communication must be performed for various reasons between a “Non-upgraded FCS” and “Upgraded FCS,” the setup must be changed.

Communication between “Upgraded FCS” and “Non-upgraded stations” is realized using the link block (ADL) between CENTUM VP stations, through which data reading and writing are conducted from the CENTUM VP. CENTUM V and CENTUM-XL use data buffer to accept the data for data processing.

Upgraded FCS (CENTUM VP):

1. Specify communication from “Upgraded FCS” to “Non-upgraded stations.” On the control drawing builder of CENTUM VP, describe the tag name and data identifier of “Non-upgraded stations” of the communication target as the connection target of the “IN” and “OUT” terminals of the function block.
   ADL is built automatically, and communication from “Upgraded FCS” to “Non-upgraded stations” is specified.

IMPORTANT

ADL communications by CI/CO cannot be made because signed integer data are changed to unsigned integer data when handling the first bit of 16 bits. As another corrective measure, it is necessary to use an appropriate computational expression.

When non-upgraded station is CENTUM V

1. If a communication error of “Non-upgraded stations” and “Upgraded FCS” is assigned to the annunciator or interlock, cancel it.
2. Delete communication from “Non-upgraded stations” to “Upgraded FCS” using the station connection unit screen. (Recommended)
   (If the communication setup is not to be deleted, a communication error occurs at “Non-upgraded stations”. However, there is no problem regarding control operation and communication performance.)

When non-upgraded station is CENTUM-XL

1. Change the setup of the inter-station communication instruments in the feedback control builder as follows.
   Command switch SV=2 (Data Reference and Setting is performed, communication is not.)

The table below shows a comparison of the detailed functions of the continuous control function between the CENTUM V, CENTUM-XL, and CENTUM VP systems.

Table Comparison of Details of Regulatory Control Functions

Function	Items of Functions Compared	CFCD2/CFSD	EFCD-S1/H2, H4	Upgraded FCS
Off-scan and service-off (O/S)	Existence of transmission	No transmission of statuses to other instruments linked to instruments set to off-scan.		Service-off (O/S) mode can even be transmitted to function blocks linked to the relevant block.
	Possibility of data read/write	Possible data read/write to relevant instruments from other instruments set to off-scan		In service-off (O/S) states, data read/write to the relevant block from other function blocks are impossible.
	Mode when regulatory control instruments are changed from off-scan mode to on-scan mode in sequence control	Returns to the mode immediately before changing to off-scan mode		Mode (e.g., AUT/MAN) should be specified.
CAL	CAL handling	Handled as an alarm		Handled as data status
Scale high and low limits	Possibility of reverse setting of scale high/ low limits (SH/SL)	Scale values smaller than scale low limit can be set to scale high limit.		Scale values smaller than scale low limit cannot be set to scale high limit. A reverse-scale display can be applied.
Connection terminal	Terminal	Table Comparison of Connection Terminal Functions		
	Chain connection	One OUT terminal allows terminal connections to multiple low-order instruments.		Cascade signal distributor blocks (FOUT) allow connections to multiple low-order blocks.
Processing when checking IOP	PV value overshooting	Depends on input signal states	FCS provides group setting	Depends on function blocks

The table below compares the terminal symbols used in CENTUM V, CENTUM-XL and CENTUM VP systems and the availability of loop connections of individual terminals used in regulatory control function.

Table Comparison of Connection Terminal Functions

Terminal	Terminal Symbol			Remarks
	CENTUM V	CENTUM XL	Upgraded FCS	
Input connection terminal	IN	IN	IN	*1 Ratio set unit can only be connected. Selector switches other than ratio set unit can be connected.
Connection terminal for input 1	IN1	IN1	IN1	
Connection terminal for input 2	IN2	IN2	IN2	
Connection terminal for input 3	IN3	IN3	IN3	
Connection terminal for set value input	SET	SET	SET	
Feedback input connection terminal	FB	FB	TIN (*2 FB)	*2 MC instruments are converted to FB.
REMOTE/LOCAL status contact input terminal	RL	RL	TSI	
Answerback input	AB	AB	IN	
Thermal trip input	TT	TT	TT	
Interlock input	IL	IL	IL	
Output connection terminal	OUT	OUT	OUT	
Auxiliary output connection terminal	SUB	SUB	SUB	
Switch terminal 10	X10	X10	S10	
Branch terminal 11	X11	X11	S11	
Branch terminal 12	X12	X12	S12	
Branch terminal 13	X13	X13	S13	
Switch terminal 20	X20	X20	S20	
Branch terminal 21	X21	X21	S21	
Branch terminal 22	X22	X22	S22	
Branch terminal 23	X23	X23	S23	
Switch terminal 30	X30	X30	S30	
Branch terminal 31	X31	X31	S31	
Branch terminal 32	X32	X32	S32	
Branch terminal 33	X33	X33	S33	
Set/acquired data terminal 1	J01	J01	J01	
⋮	⋮	⋮	⋮	
Set/acquired data terminal 14	J14	J14	J14	
Set/acquired data terminal 1	Q01			
⋮	⋮			
Set/acquired data terminal 11	Q11			

5.1.4 Comparison of Sequence Control Function

Upgraded FCS have no computational expressions (NCLxxx, %CLxxx) for sequence control. If these functions are used, a one-shot driven, general-purpose calculation block (CALCU) should be used.

Table Comparison of Sequence Control Function

Block type	Model			Description
	CENTUM V	CENTUM-XL	Upgraded FCS	
Sequence table	NST	%ST	ST16	Total of 64 input and output signals and 32 rules
			M_ST16	Total of 96 signals (32-64 input and 32-64 output signals) and 32 rules (*1)
			L-ST16	64 input and 64 output signals, and 32 rules
	–	–	ST16E	For extending rules to 32
	–	–	M_ST16E	For extending rules to 32 (for M_ST16) (*1)
	–	–	L_ST16E	For extending rules to 32 (for L_ST16) (*1)
Switch instrument	–	SI-1	SI-1	1-input switch instrument
	–	SI-2	SI-2	2-input switch instrument
	–	SO-1	SO-1	1-output switch instrument
	–	SO-2	SO-2	2-output switch instrument
	–	SIO-11	SIO-11	1-input, 1-output switch instrument
	–	SIO-12	SIO-12	1-input, 2-output switch instrument
	–	SIO-21	SIO-21	2-input, 1-output switch instrument
	–	SIO-22	SIO-22	2-input, 2-output switch instrument
	–	SIO-12P	SIO-12P	1-input, 2-pulse-output switch instrument
	–	SIO-22P	SIO-22P	2-input, 2-pulse-output switch instrument
Sequence auxiliary	NTM	%TM	TM	Internal timer (with tag name)
	NCT	%CT	CTS	Internal counter (with tag name)
			CTP	Pulse train counter (with tag name)
	NCI	%CI	CI	Code input (with tag name)
	NCO	%CO	CO	Code output (with tag name)
	NRL	%RL	RL	Relational expression (with tag name)
	NCL	%CL	CALCU	Computational expression (In Upgraded FCS, the function is covered by CALCU is one-shot driven.)
	–	%RM	RS	Resource scheduler
Valve monitor	(*2)	(*2)	VLVM	Valve monitor
Batch status indicator	–	BSI	BSI	Batch status indicator (A function block of the faceplate function)

*1: Can be used if upgrade type database (with sequence table with expanded number of signals) is selected.
*2: Although no element name is given, a valve output monitoring function exists.

The table below shows differences in the description method of input signals and condition specifications in the sequence table between the CENTUM V, CENTUM-XL, and CENTUM VP systems.

Table Condition Signals Description (1/3)

Type	CENTUM V		CENTUM-XL		Upgraded FCS	
	Input signal	Condition spec.	Input signal	Condition spec.	Input signal	Condition spec.
Contact input pushbutton	NDInnn		%DInnnn		Element name.PV	ON, OFF
Contact output	NDOnnn		%DOnnnn		Element name.PV	ON, OFF
Internal switch	NSWnnn		%SWnnnn		Element name.PV	ON, OFF
Annunciator	NANnnn		%ANnnn		Element name.PV	ON, OFF
Internal timer	NTMnnn	HI LO NR IO PS	%TMnnn	HI LO NR IO PS	Element name.BSTS	CTUP PALM RUN STOP PAUS
Internal counter	NCTnnn	HI LO NR IO	%CTnnn	HI LO NR IO	Element name.BSTS	CTUP PALM RUN STOP
Code input			%CInnn	NR LO HI IOP	Element name.BSTS	NR LO HI ERR
Code output			%COnnn	NR LO HI IOP	Element name.BSTS	NR LO HI ERR
SEQ table entire reference	NSDnnn		%STnnn.SD	None	Element name.SD	R
SEQ table conditional quotation	NSDnnn	C	%STnnn.SD	C	Element name.SD	C
SEQ table step quotation	NSDnnn	mm: Step No.	%STnnn.SD	mm: Step No.	Element name.SA	mm: Step No.
SEQ table step reference	NSTnnn	mm: Step No.	%STnnn.PV	mm: Step No.	Element name.PV	mm: Step No.
SEQ table status			%STnnn.S	ON	Element name.MODE	O/S, MAN, AUT
CENTUM instrument loop status	Tag name	MA AU CA PR DD CM	Tag name.S	MAN AUT CAS PRD DDC SPC	Element name.MODE	MAN AUT CAS PRD ROUT RCAS MAN(ROUT/RCAS) AUT(ROUT/RCAS)
		BM BA BC CB CU CC		BUM BUA BUC CBM CBA CBC	Element name.XMODE	BUM BUA BUC BUM BUA BUC
		OO		OOP	Element name.ALRM	OOP
		PC MC CD		CLP+ CLP- CND	Element name.MV	=CLP+ =CLP- IMAN
				OFF LOCK SIM EMST	Element name.BSTS	OFF LOCK SIM EMST

Table Condition Signals Description (2/3)

Type	CENTUM V		CENTUM-XL		Upgraded FCS	
	Input signal	Condition spec.	Input signal	Condition spec.	Input signal	Condition spec.
CENTUM instrument scan status	Tag name	ON	Tag name.S	ON	Element name. MODE	O/S
CENTUM instrument alarm status (Y holds while alarm is active.)	Tag name	NR HI/LO PD/MD VE IO CL MH/ML	Tag name.S	NR HI/LO +DV/-DV VEL/VEL- IOP CAL MHI/MLO HH/LL AOF TRIP ANS+/ANS- PERR PRE/END BPRE/BEND LEAK LDV/HDV ALM INT +BDV/-BDV NPLS	Element name. ALRM	NR HI/LO DV+/DV- VEL+/VEL-
					Element name. XALRM	VEL
						VEL+/VEL-
						IOP
					Element name.PV	=CAL
					Element name. ALRM	MHI/MLO HH/LL
					Element name. AOFS	AOF
					Element name. ALRM	TRIP ANS+/ANS- PERR/IOP BRPE BEND LEAK LDV/HDV HALM/MALM /LALM/RALM INT BDV+/BDV- NPLS
CENTUM instrument alarm detection status (Y holds while alarm detection is inactive.)			Tag name. AF	IOP HH/LL HI/LO +DV/-DV VEL/VEL- MHI/MLO +BDV/-BDV LEAK BPRE/BEND NPLS	Element name.XAF	IOP
					Element name.AF	IOP/IOP- HH/LL HI/LO DV+/DV- VEL+/VEL- MHI/MLO BDV+/BDV- LEAK BPRE/BEND NPLS
Switch instrument answer back status			Tag name. PV	0, 1, 2	Element name.PV	0, 1, 2
Switch instrument output status			Tag name. MV	0, 1, 2	Element name.MV	0, 1, 2
Switch instrument loop status			Tag name.S	MAN AUT CAS DDC BUM	Element name. MODE	MAN AUT CAS ROUT TRK
Switch instrument alarm status			Tag name.S	NR PERR ANS+/ANS- OOP CAL AOF	Element name. ALRM	NR PERR&&IOP ANS+/ANS- OOP
					Element name.PV	=CAL
					Element name. AOFS	AOF

Table Condition Signals Description (3/3)

Type	CENTUM V		CENTUM-XL		Upgraded FCS	
	Input signal	Condition spec.	Input signal	Condition spec.	Input signal	Condition spec.
Batch status indicator			Tag name. PV	0 to 15	Element name.SV	1 to 99
			Tag name. SV	0, 1, 2	Element name. PV01 to PV10	0, 1
Relational expression	NRLnnn	EQ GT GE LT LE	%RLnnn	EQ GT GE LT LE	Element name.X01 to X16	EQ GT GE LT LE AND
Resource scheduler			%RMnnn. RQ	1 to 32	Element name. RQ01 to RQ32	0, 1
			%RMnnn. PM	1 to 32	Element name. PM01 to PM32	0, 1

The following shows input signals and condition specifications that were newly added to a upgraded FCS.

Table Signal Operation

Type	Condition signal column		Condition rule	Condition
	Input signal	Condition spec.		
Mode of function block	Element name.XMODE	BUM	Y	Block mode is ROUT(MAN) or RCAS(MAN)
			N	Block mode is neither ROUT(MAN) nor RCAS(MAN)
		BUA	Y	Block mode is ROUT(AUT) or RCAS(AUT)
			N	Block mode is neither ROUT(AUT) nor RCAS(AUT)
		BUC	Y	Block mode is ROUT(CAS) or RCAS(CAS)
			N	Block mode is neither ROUT(CAS) nor RCAS(CAS)
Alarm status of function block	Element name.XALPM	IOP	Y	Alarm status is IOP or IOP-
			N	Alarm status is neither IOP nor IOP-
		VEL	Y	Alarm status is VEL+ or VEL-
			N	Alarm status is neither VEL+ nor VEL-
Alarm detection status of function block	Element name.XAF	IOP	Y	Do not detect IOP or IOP- alarm.
			N	Detect IOP and IOP- alarms.

The table below shows differences in the description method of output signals and action specifications in the sequence table between the CENTUM V, CENTUM-XL, and CENTUM VP systems.

Table Action Signals Description (1/2)

Type	CENTUM V		CENTUM-XL		Upgraded FCS	
	Output signal	Action spec.	Output signal	Action spec.	Output signal	Action spec.
Contact output	NDOnnn	H L P	%DOnnnn	H L P F	Element name.PV	H L P F
Internal switch	NSWnnn	H L	%SWnnnn	H L	Element name.PV	H L
Annunciator	NANnnn	H L	%ANnnn	H L	Element name.PV	H L
Internal timer	NTMnnn	PS	%TMnnn	PS	Element name.OP	START, STOP, RSTR, WAIT
Internal counter	NCTnnn		%CTnnn		Element name.XACT	ON
Pulse train input counter	NCTnnn		%CTnnn		Element name.OP	STOP, START, RSTR, WAIT
Code input	NCInnn		%CInnn		Element name.ACT	ON
Code output	NCOnnn		%COnnn		Element name.ACT	ON
SEQ table entire execution	NSDnnn		%STnnn.SD	None	Element name.ACT	ON
SEQ table conditional execution	NSDnnn	C	%STnnn.SD	C	Element name.SD	C
SEQ table step execution	NSDnnn	mm: Step No.	%STnnn.SD	mm: Step No.	Element name.SA	mm: Step No.
SEQ table step setting	NSTnnn	mm: Step No.	%STnnn.PV	mm: Step No.	Element name.PV	mm: Step No.
Resume SEQ table execution	NSTnnn	HH	%STnnn.S	ON	Element name.XS	ON
CENTUM instrument loop status	Tag name	MA AU CA DD	Tag name.S	MAN AUT CAS DDC SPC PRD	Element name. MODE	MAN AUT CAS ROUT RCAS PRD
CENTUM instrument scan status	Tag name	ON	Tag name.S	ON	Element name. MODE	O/S
CENTUM instrument alarm status	Tag name	CL AOF	Tag name.S	CAL AOF	Element name.PV Element name.CPV	=CAL =AOF
CENTUM instrument alarm detection status (Alarm detection is inactive while Y holds.)			Tag name.AF	IOP	Element name.XAF	IOP
				IOP+/IOP- HH/LL HI/LO +DV/-DV VEL/VEL- MHI/MLO +BDV/-BDV LEAK BPRE BEND NPLS	Element name.AF	IOP/IOP- HH/LL HI/LO DV+/DV- VEL+/VEL- MHI/MLO BDV+/BDV- LEAK BPRE BEND NPLS

Table Action Signals Description (2/2)

Type	CENTUM V		CENTUM-XL		Upgraded FCS	
	Output signal	Action spec.	Output signal	Action spec.	Output signal	Action spec.
CENTUM instrument preset MV	Tag name	MV, MC	Tag name.MV	0 100 PMV	Element name.PSW	1 2 3
CENTUM instrument pulse-width output reset	Tag name	PW	Tag name.PW		Element name.RSW	1
Switch instrument output status			Tag name.MV	0, 1, 2	Element name.CSV	0, 1, 2 P0 P1 P2
Switch instrument loop status			Tag name.S	MAN AUT CAS DDC	Element name. MODE	MAN AUT CAS ROUT
				BUM	Element name.TSW	1
Switch instrument alarm status			Tag name.S	CAL	Element name.PV	=CAL
				AOF	Element name. AOFS	AOF
Batch status indicator			Tag name.PV	0 to 15	Element name.PV	1 to 99
			Tag name.SV	0, 1, 2	Element name. PV01 to PV10	0, 1
Arithmetical expression	NCLnnn		%CLnnn		Element name.ACT	ON
Resource scheduler			%RMnnn.RQ	0	Element name.ACT	ON/OFF
				1 to 32	Element name. RQ01 to RQ32	0, 1
			%RMnnn.N	0 to 32	Element name.PMH	0 to 32
Message output	NSMnnn m	m: Device number	%PRnnn %OGnnn %VMnnn %RQnnn %PDnnn %M3nnn %M6nnn	mmm (0 to 65534)	Element name.PV	NON mmm (-32768 to 32767)

The following shows output signals and action specifications that were newly added to a upgraded FCS.

Table Signal Column

Type	Action signal column		Action rule	Action description
	Output signal	Action spec.		
Contact output	Element name.PV	P	Y	Output 1 second of pulse to the specified bit.
			N	Invalid
Alarm detection status of function block	Element name.XAF	IOP	Y	Do not detect IOP or IOP- alarm.
			N	Detect IOP and IOP- alarms.
Sequence table	Element name.XS	ON	Y	Execute/resume sequence table.
			N	Suspend sequence table.
Software counter	Element name.XACT	ON	Y	Activate software counter. (Increment by 1)
			N	Stop software counter.
CAL of function block	Element name.PV Element name.CPV	=XCAL	Y	Switch status between CAL and NOT CAL.
			N	Invalid

Table Comparison of Details of Sequence Control Functions (1/2)

Function	Items of Functions Compared	CENTUM V	CENTUM-XL	Upgraded FCS
Common switch	System common switch	Table Comparison of Common Switch Functions (for reference)		
Annunciator	Number of message characters	Maximum of 16 single-byte characters (single-byte Katakana characters allowed, Chinese and Hiragana characters not allowed for CENTUM V*A)	Maximum of 16 single-byte characters	Maximum of 24 single-byte characters
	Representative annunciator functions	Present	Not present	Not present
	Lock functions	Present	Not present	Not present
	Flash functions	Present	Not present	Not present
	OPS notification mask functions	Present	Not present	Not present
Printout message	Number of message characters	Maximum of 16 single-byte characters	Maximum of 16 single-byte characters	Maximum of 80 single-byte characters
Voice message	Registration method	Registration by syllables (custom-ordered)	Registration by syllables (custom-ordered)	Multimedia functions register each message in a file.
Timer/counter/ code I/O	Pre-alarm judgement using sequence table	After pre-alarm (LO) status, LO status is judged true even in time-up (HI) status.	After pre-alarm (LO) status, LO status is judged true even in time-up (HI) status.	Pre-alarm (PALM) and time-up (CTUP) statuses are not true simultaneously. If the time-up is true, pre-alarm (PALM) status is then canceled.
Code I/O	Possible connections including digital I/O cards	Can be connected	Can be connected	Cannot be connected (Internal switches, etc., should additionally be replaced.)
Relational expression	Comparison method	One NRL performs a couple of data comparisons.	One %RL performs a couple of data comparisons.	A 16-data set comparison can be made in a relational expression block.
Resource scheduler	Description of request for use in sequence table		Request for use in k-th number (%RM001, RQ, k) Y: Yes N: No (request canceled)	Request for use in k-th number: RM001, RQ0k, 1: Y: Yes RM001, RQ0k, 0: N: No (request canceled)
Valve monitor	Monitoring method	Valve action monitored based on a couple of I/O signals.	Valve action monitored based on a couple of I/O signals.	Valve action monitored based on 16 couples of I/O signals in a block.
	Presence of output variable mask function	Present	Not present	Not present
Batch status indicator	Batch step number change operation		PV changes batch step number 0 to 15.	SV changes batch step number 1 to 16. (PV: Phase signal)

Table Comparison of Details of Sequence Control Functions (2/2)

Function	Items of Functions Compared	CENTUM V	CENTUM-XL	Upgraded FCS
Sequential logic diagram	Execution timing		• Execution timing: Periodic execution (T) • Output timing: [Each time output when conditions are true (E)]	• Execution timing: Periodic execution (T) One-shot execution (O) Selected from execution at the time of initial cold start /at the time of restart (I) or from execution at the time of initial cold start (B) • Output timing: [Each time output when conditions are true (E)]
	Scan period		Usually scanned on a one-second basis. 0.5-second scan period or 0.2-second high-speed scan period selectable	Selectable from basic, medium-speed and high-speed scan periods.
Sequential processing	Operation of switch instrument	Execution of AUT → MV = 2 →MAN within the same scan period possible	Execution of AUT → MV = 2 →MAN within the same scan period possible	Execution of AUT → MV = 2 →MAN within the same scan period possible (Appropriate processing is needed after the scanning)

Internal switch allocations for systems are different between CENTUM V, CENTUM-XL and CENTUM VP systems.

Table Comparison of Common Switch Functions

	CENTUM V	CENTUM-XL	CENTUM VP
For system	NSW000-079	%SW0000-0079	%SW0001-0199
	000 initial cold start (MAN)	0000 initial cold start (MAN)	0001 initial cold start (MAN)
	001 restart (AUT)	0001 restart (AUT)	0002 restart (AUT)
	002 transfer of control rights	0002 transfer of control rights	
		0003 sequence table initialization start command	0004 sequence table initialization start command
		0004 sequence table restart command	0005 sequence table restart command
		0005 transfer of control rights	
	005-047 valve monitor mask command		
		0006 FCS start status	
			0007 long-term power failure/ momentary power failure
			0008-0016 Reserve
		0016-0020 abnormal cabinet environment	0017-0400 FCS internal status identification
	0064 supervisory computer failure	0064 supervisory computer failure	
		0065-0079 auxiliary switch for system (cannot be used)	
For sequence	NSW080-511	%SW0080-2047	%SW0401-4000

5.1.5 Comparison of Computational Function

The table below shows a comparison of computational functions between the CENTUM V, CENTUM-XL, and CENTUM VP systems. If the corresponding computational functional blocks are not available in a upgraded FCS, it is necessary to consider a substitute.

Table Comparison of Computational Function Blocks

Block type	Model			Description
	CENTUM V	CENTUM-XL	Upgraded FCS	
General-purpose calculation	7CM-CL	CALCU	CALCU	Calculation unit
Logic operation	(*1)	(*1)	(*2)	Logical operators (AND, OR, NOT, etc.)
Analog calculation	(*1)	(*1)	SQRT	Square-root extraction unit
	–	(*1)	EXP	Exponential unit
	7CM-EX	LAG	LAG	First-order lag unit
	7CM-DR	LD	LD	First-order lead unit
	7CM-UF	RAMP	RAMP	Ramp unit
	7CM-LL	LDLAG	LDLAG	Lead/lag unit
	7CM-LA	DLAY	DLAY	Dead time unit
	7CM-LC	DLAY-C	DLAY-C	Dead time compensation unit
	7CM-AV	AVE-M	AVE-M	Moving average unit
	7CM-IA	AVE-C	AVE-C	Cumulative average unit
	7CM-NL	FUNC	FUNC-VAR	Equally-divided line-segment function unit (Included in FUNC-VAR)
	7CM-XY			Unequally-divided line-segment function unit (Included in FUNC-VAR)
	–	FUNC-VAR		Variable line-segment function unit
	(*1)	(*1)	TPCFL	Temperature and pressure compensation unit
	–	(*1)	ASTM1	ATSM1 compensation
	–	(*1)	ASTM2	ATSM2 compensation
Calculation auxiliary block	7SW-33	SW-33	SW-33	3-pole, 3-position selector switch
	–	SW-91	SW-91	1-pole, 9-position selector switch
	7SW-D7	–	DSW-16/16C	7-data set switch → 16-data set switch
	7SW-DE	DSW-14		14-data set switch → 16-data set switch
	7DS-ND	DSET	DSET	Data set unit
	7DS	DSET-PVI	DSET-PVI	Data set unit with input indicator
	7BD	BDSET-1	BDSET-1L/1C	One-batch data set unit
	7BD-B2	BDSET-2	BDSET-2L/2C	Two-batch data set unit
	7BC	BDA	BDA-L/C	Batch data acquisition unit

*1: Equivalent function is provided as a computational expression function. See the next table.
*2: Function blocks newly added from CENTUM CS 3000, including the AND, OR, NOT function blocks, etc.
For details, refer to “Integrated Production Control System CENTUM VP System Overview (FCS Overview)” (TI 33K01A12-50E).

Table Functions Available in Computational Function

Type	Function			Description
	CENTUM V	CENTUM-XL	Upgraded FCS	
Arithmetic function	SQRT	SQRT	sqrt	Square root calculation
	–	EXP	power	Exponential calculation (EXP is the exponential function of “e,” the base of natural logarithm.)
	–	LN	log	Natural logarithm
	–	LOG	–	Logarithm to the base 10
	–	SIN	sin	Sine function
	–	COS	cos	Cosine function
Numeric processing	AVR2 to 6	AVR2 to 6	–	Average of argument-2 to -6
	SMH/SMHC SMM/SMMC SMS/SMSC	–	–	Totalization by hour/minute/second Same as SUM calculated by function block.
	–	SC	–	Scale conversion
Logic operation	IOR	IOR	Operator “or”	Logical OR
	IAND	IAND	Operator “and”	Logical AND
	IEOR	IEOR	Operator “eor”	Exclusive OR
	NOT	NOT	Operator “not”	Negation
Absolute value	ABS	ABS	labs/dabs	Absolute value calculation
Round-off	ROUD	ROUD	–	Returns the round-off result of data.
Compare and extract	CPGT	CPGT	lmax/dmax	Returns a larger value.
	CPLT	CPLT	lmin/dmin	Returns a smaller value.
	CPAG	CPAG	–	Returns the larger in absolute.
	CPAL	CPAL	–	Returns the smaller in absolute.
Corrective calculation	TPC	TPC	TPCFL	Temperature and pressure compensation (*1)
	TC	TC	TPCFL	Temperature compensation (*1)
	PC	PC	TPCFL	Pressure compensation (*1)
	–	ASTM1	ASTM1	ASTM compensation (Old JIS) (*1)
	–	ASTM2/3/4	ASTM2/3/4	ASTM compensation (New JIS) (*1)

*1: The old FCS uses normalized data of 0 ~ 1, but the upgraded-FCS calculates data with an engineering quantity as is.

5.1.6 Comparison of Optional Control Function

The following table gives a comparison of optional control function blocks based on each type name among V-format/XL-format system and CENTUM VP system. If the FCS after update has no compatible optional control function block, you need to consider alternative means.

Table Comparison of Optional Control Function Blocks

Type	Function			Description
	CENTUM V	CENTUM-XL	Upgraded FCS	
Advanced control	–	FUZZY	(None)	Fuzzy control function
	–	PRDCT	(None)	Predictive control function
Off-site instrument	–	FSBSET	FSBSET	Batch set control unit
	–	BLEND BLEND-1	BLEND	Blend master control unit

5.2 Upgrade Specifications

Yokogawa performs upgrade work based on the following standards.

Node number

I/O nests in the old FCS are replaced with node units in the upgraded-FCS. In this case, “A new node number = an old nest number + 1” shall be configured as shown in the figure below. This is a measure to be taken to make slot positions of an I/O card (module) equal before and after upgrading the FCS. The I/O slots of the FCU after upgrade are equipped with communication modules (*1) for node unit.

*1: Those are EC401, EC402, ANT401, ANT411, etc.

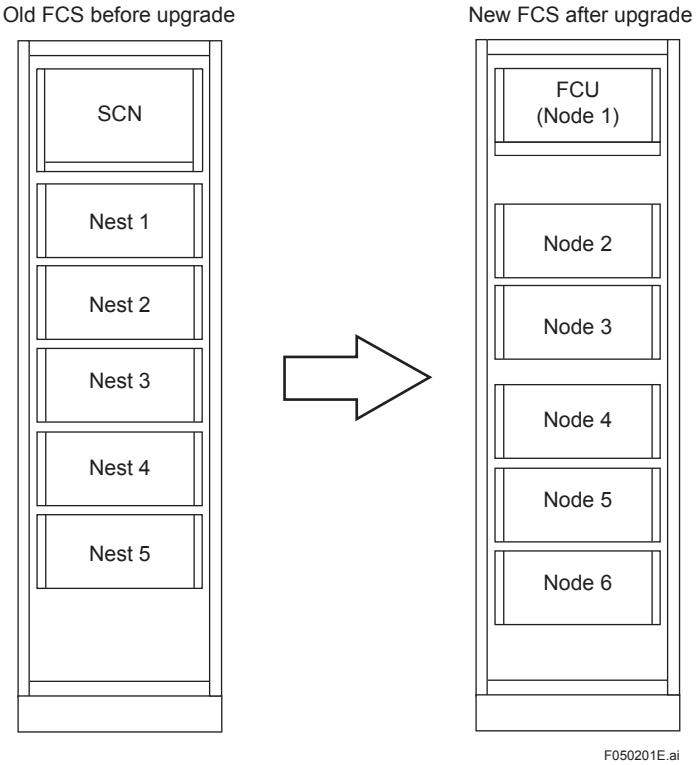


Figure Comparison between Old Nest Number and New Node Number

Tag name

1. Regulatory control function block

   A maximum of eight character tag numbers for CENTUM V and CENTUM-XL are directly converted to a maximum of 16 character tag numbers for CENTUM VP field control stations.

   In addition, tag names in the case where there is an additional block including corrective calculation, add branch numbers to original tag numbers.

   Additional tag name rules:

   <Original tag name> + <X> + <1 to 3>

   Example:

   Original tag number P100, additional tag number P100X1

2. Sequence element

   A sequence element is converted into a tag name with a station number identifying the station.

   Example:

   xxxxxxSddss (dd: domain, ss: station)

Tag comment

A maximum of eight-character tag comments for CENTUM V and a maximum of 16 single-byte character tag comments for CENTUM-XL are directly converted to tag comments (a maximum of 24 characters) for CENTUM VP field control stations. In addition, if CENTUM V uses single-byte Katakana characters, they are converted to double-byte Katakana characters.

Element number

Element numbers start with 0 for CENTUM V and with 1 for CENTUM VP systems. An element in number 0 (zero) is moved to number 100 by definition.

Computational expression

Each corresponding tag is registered on the control drawing as a functional block. Computational expressions are converted manually because they cannot be simply converted in such a way that their data format is changed from the normalized data to engineering unit data. However, the following conversions are made to existing computational expressions and left as comments. Note that R4.01.60 or later supports normalization so the normalized data can be converted.

- Process data ranges used in computational expressions are described as comments. (No buffer ranges are described)
- If a tag name includes “-” or starts with a numeric character, specify an alias to use a tag name + item name (a maximum of eight characters) or AL01 ... in a serial number (a minimum of eight characters) as aliases.

Station data link

- Conversion of CENTUM V, 7SL-DT
  7SL-DT converts the transmission buffer and the receive buffer to BDA-L and BDSET-1L respectively and also converts inter-station communications to CALCU.
  If the buffer in the 7SL-DT is directly referenced and set by an intra-list relative specification, or the same data in the buffer are set and referenced in multiple sections, a manual conversion is made.
- Conversion of CENTUM-XL, SDL
  SDL converts the transmission buffer and the receive buffer to BDA-L and BDSET-1L respectively and also converts inter-station communications to CALC to execute BDA-L, CALCU, and BDSET-1L in order.

5.3 Application Capacity of Upgraded FCS

When upgrading CENTUM V or CENTUM-XL to CENTUM VP, use a FFCS-V. The table shows the application capacities of the CENTUM V, CENTUM-XL and CENTUM VP systems.

Table Comparison of Application Capacities

CENTUM V			CENTUM-XL			CENTUM VP						
							General type			Batch type		
Function	CFCS2 /CFCD2	CFSS /CFSD	Function	EFCS /D-S1	EFCS /D-H2	Function	LFS1700	LFS1750 (10 nodes)	LFS1750 (14 nodes)	LFS1700	LFS1750 (10 nodes)	LFS1750 (14 nodes)
Internal instrument (DDC calc.)	255	255	Internal instrument (DDC calc.)	255	255	Regulatory control, calculation	500	1200	1800	400	1000	1500
–	–	–	–	–	–	Batch data	100	400	600	50	100	150
Arithmetic expression	255	255	Arithmetic expression	255	255	General-purpose calculation	400	500	750	120	250	350
Sequence table	40 (99)	200 (255)	Sequence table	200	200	Sequence table (S)	200	400	700	100	200	400
						Sequence table (M)	100	200	400	50	100	150
						Sequence table (L)	100	200	300	50	100	150
Timer/ counter/ code I/O	200 99	512 200	Timer/ counter/ code I/O	511	511	Sequence auxiliary -1	500	700	1100	500	700	1100
Relational expression Valve monitor	99 128	200 128	Relational expression Valve monitor	255 255	255 255	Sequence auxiliary -2	100	200	300	50	100	150
–	–	–	Switch instrument	255	511	Switch instrument	500	1000	1500	500	1000	1500
–	–	–	Batch status indicator	32	32	Faceplate	120	200	300	50	100	150
–	–	–	–	–	–	SFC block	40	100	300	100	200	300
Sequence message	255	255	Sequence message	255	255	Printout message	2000	2000	2000	2000	2000	2000
–	–	–	Message with data attached	100	100	–	–	–	–	–	–	–
Message request	100	100	Message request	100	100	Message request	200	200	200	200	200	200
Operator guide message	100	100	Operator guide message	100	100	Operator guide message	1000	1000	1000	1000	1000	1000
–	–	–	Request for voice output	100	100	–	–	–	–	–	–	–
FORTRAN program initiation	100	100	–	–	–	Supervisory computer message for PICOT	9999	9999	9999	9999	9999	9999
High-order interrupt request	100	100	High-order interrupt request	510	510	Supervisory computer event message	9999	9999	9999	9999	9999	9999
Annunciator	255	255	Annunciator	255	255	Annunciator	2000	2000	2000	2000	2000	2000
Common switch	512	512	Common switch	2048	2048	Common switch	9000	9000	9000	9000	9000	9000
Contact input	512	512	Contact input	768	768	Contact input	1920	4096	4096	1920	4096	4096
Contact output			Contact output			Contact output						
-	-	-	Instrument/ loop drawing	24	24	Block/1 drawing	100	100	100	100	100	100
-	-	-	Loop drawing	200	200	Drawing	200	200(300/400/500)		200	200(300/400/500)	

Appendix 1. Signal Conditioner Models

The following tables list the signal conditioner cards and nests used in CENTUM V and -XL systems.

(1) CENTUM V System

Type	Model	Name
Signal conditioner nest	CNC	CENTUM I/O nest
	CNM	CENTUM MAC2 connection I/O nest
Input signal conditioner card	CM1	mV input card
	CT5	Thermocouple input card
	CR5	RTD input card
	CS1	Potentiometer input card
	CH1	Input isolator card (1-5 V input)
	CH2	Input isolator card (0.2-1 V input)
	CH5	Input isolator card (1-5 V input, w/square root extraction)
	CA1	2-wire transmitter input card
	CA5	2-wire transmitter input card (w/square root extraction)
	CP1	Pulse-train input card
Output signal conditioner card	CC0	Control output isolator card
	CA0	Output isolator card (4-20 mA output)
	CH0	Output isolator card (1-5 V output)
Through card	CX1	I/O through card

(2) CENTUM-XL System

Type	Model	Name
Signal conditioner nest	ENC	I/O signal conditioner nest
	ENM	Control I/O signal conditioner nest
	MHC	I/O signal conditioner nest
	MHM	Control I/O signal conditioner nest
Signal conditioner power supply	PS40	Power unit (24 V DC)
	PS41	Power unit (220/230/240 V AC)
Input signal conditioner card	ET5	Thermocouple input card
	ER5	RTD input card
	ES1	Potentiometer input card
	EM1	mV input card
	EH1	Input isolator card (1-5 V input)
	EH5	Input isolator card (1-5 V input, w/square root extraction)
	EA1	2-wire transmitter input card
	EA2	2-wire transmitter input card (w/communication function)
	EA5	2-wire transmitter input card (1-5 V, w/square root extraction)
	EP1	Pulse-train input card
	EP3	Frequency input card
	EA9	I/O Non-isolated distributor
Output signal conditioner card	EC0	Control output isolator card
	EA0	Output isolator card (4-20 mA output)
	EH0	Output isolator card (1-5 V output)
Common card	ESC	Signal conditioner communication card
	EXT	Extension card
	EX1	I/O through card

Appendix 2. Installation Conditions for CENTUM V and CENTUM-XL

(1) Installation Conditions for CENTUM V

Equipment	Input-voltage range		Max. power consumption	Heating value (J/h)
	Voltage (V)	Frequency (Hz)		
CFCS2, CFSS Field Control Station	100/110/115/ 120 V AC±10 %	50/60±2	1300 VA	2814×10^3
	24 V DC±10 %	–	41.3 A	3402×10^3
CFCD2, CFSD Duplexed Field Control Station	100/110/115/ 120 V AC±10 %	50/60±2	1570 VA	3486×10^3
	24 V DC±10 %	–	50.0 A	4158×10^3
CFMS2 Field Monitoring Station	100/110/115/ 120 V AC±10 %	50/60±2	470 VA	1176×10^3
	24 V DC±10 %	–	17.5 A	1428×10^3
CTBC2 Terminal Board Cubicle	100/110/115/ 120 V AC±10 %	50/60±2	1290 VA	2310×10^3
	24 V DC±10 %	–	27.7 A	2394×10^3
CGWU Gateway Unit (Rack type mounted)	100/110/115/ 120 V AC±10 %	50/60±2	140 VA	353×10^3
	24 V DC±10 %	–	4.0 A	349×10^3
CFGW Field Gateway Unit (Rack type mounted)	100/110/115/ 120 V AC±10 %	50/60±2	100 VA	353×10^3
	24 V DC±10 %	–	3.0 A	349×10^3

Note: The table shows the power consumption and heat dissipation when the respective components are loaded to the maximum.

(2) Installation Conditions for CENTUM-XL

Equipment	Input-voltage range		Max. power consumption	Heating value (J/h)
	Voltage (V)	Frequency (Hz)		
EFCS-S Field Control Station	90 to 125 V AC	50/60	1780 VA	3800×10^3
	198 to 254.4 V AC		2100 VA	4100×10^3
	24 V DC	–	47 A	3900×10^3
EFCD Duplexed Field Control Station	90 to 125 V AC	50/60	1950 VA	4200×10^3
	198 to 254.4 V AC		2400 VA	4500×10^3
	24 V DC	–	53 A	4400×10^3
EFUS Field Control Unit	90 to 125 V AC	50/60	250 VA	460×10^3
	198 to 254.4 V AC		250 VA	460×10^3
	24 V DC	–	5 A	420×10^3
EFUD Field Control Unit	90 to 125 V AC	50/60	280 VA	500×10^3
	198 to 254.4 V AC		280 VA	500×10^3
	24 V DC	–	5.5 A	460×10^3
EFMS Field Monitoring Station	90 to 125 V AC	50/60	910 VA	1900×10^3
	198 to 254.4 V AC		1050 VA	1900×10^3
	24 V DC	–	16 A	1300×10^3
ETBC Terminal Board Cabinet	90 to 125 V AC	50/60	1760 VA	3800×10^3
	198 to 254.4 V AC		2250 VA	4000×10^3
	24 V DC	–	48 A	4000×10^3
EFGW Field Gateway Unit	90 to 125 V AC	50/60	170 VA	250×10^3
	198 to 254.4 V AC		180 VA	250×10^3
	24 V DC V AC	–	3 A	

Note: The table shows the power consumption and heat dissipation when the respective components are loaded to the maximum.

Appendix 3. Tuning Parameter Differences

It may be necessary to reset the tuning parameters between the existing CENTUM V or CENTUM-XL and CENTUM VP system. The following pages show the data types of the tuning parameters that are different in the CENTUM V, CENTUM-XL and CENTUM VP systems. In addition, tuning parameters marked with a number in the conversion equation column require conversion. See the table “Equations for Tuning Parameters Requiring Conversion” at the end of this chapter.

CENTUM V and CENTUM VP

Table Tuning Parameters Difference between CENTUM V and CENTUM VP(1/5)

CENTUM V Instrument type	CENTUM VP Function block	CENTUM V Data type	CENTUM VP Data item	Conversion equation
Common	–	ALRM, AS, ASUB	ALRM	(*25)
Common	–	LOOP, LS, LSUB	MODE, BSTS	(*26)
Common	–	SM(EOPS indicates as SUM)	SUM	
Common(7DC-*)	–	K1	Control direction: DR	
Common	–	K2(EOPS indicates as SU)	(None)	
Common	–	K3(EOPS indicates as SM)	(None)	
Common	–	K5	RAW	
Common	–	AV	(None)	
Common	–	SD	(None)	
Common	–	RD	(None)	
Common(7CM-*)	–	PV	CPV	
Common(7CM-*)	–	K4	GAIN	
Common	–	MH, ML, MV	Ditto as left	(*1)
Common(7DC-*)	–	P, I, D	Ditto as left	(*20)
7PV	PVI	No difference except "Common"		
7PV-DV	PVI-DV	No difference except "Common"		
7DC-D5/N5	PID	BS	GW	(*3)
		CS	CK	
7DC-D6/N6	PID	BS	GW	(*3)
		CS	CK	
7DC-B5	PID-BSW	BS	BIAS	(*4)
		CS	LK	(*3)
7DC-D3	PD-MR	BS	MR	(*1)
		CS	CK	
		K7	CALC	(*1)
7DC-C2	ONOFF	CS	CK	
7DC-C3	ONOFF-G	BS	DB	(*3)
		CS	CK	
7DC-C9	PID-TP	BS	GW	(*3)

Table Tuning Parameters Difference between CENTUM V and CENTUM VP(2/5)

CENTUM V Instrument type	CENTUM VP Function block	CENTUM V Data type	CENTUM VP Data item	Conversion equation
7DC-D9	PI-BLEND	VL	VL	(*2)
		D	TK	
		BS	RP	(*4)
		DL	DL	(*2)
		K4	RST	(*5)
7ML-ND	MLD	No difference except "Common"		
7ML	MLD-PVI	No difference except "Common"		
7ML-SW	MLD-SW	BS	BIAS	(*7)
		CS	GAIN	
		SH	SSH	
		SL	SSL	
7ML-XN	MLD-SW	BS	BIAS	(*7)
		CS	GAIN	
		DL	RP	(*6)
		SH	SSH	
		SL	SSL	
7RL	VELLIM	K1	DMVP	(*8)
		K2	DMVM	(*8)
		K3	TU	(*9)
		K4	BPSW	
7RS	RATIO	BS + CS	BIAS	(*10)
		K7	CALC	(*1)
		DL	RP	
		RS	SSH	
7SS-A	AS-H/M/L	SV	SW	
		PH	SWH	
		PL	SWL	
7SS-S	SS-H/M/L	SV	SW	
		PH	SWH	
		PL	SWL	
7RD	SS-DUAL	K4	SW	
		K6	RV1	
		K7	RV2	
7SW-33	SW-33	SV	SW	
		PH	SWH	
		PL	SWL	
7SW-D7/DE	DSW-16	PV	CPV	
		SV	SW	
		D1 to D9, DA to DE	SD01 to SD09, SD10 to SD14	
7DS-ND	DSET	PH	SVH	
		PL	SVL	

Table Tuning Parameters Difference between CENTUM V and CENTUM VP(3/5)

CENTUM V Instrument type	CENTUM VP Function block	CENTUM V Data type	CENTUM VP Data item	Conversion equation
7DS	DSET-PVI	PV	CPV	
		PH	SVH	
		PL	SVL	
7PG, 7PG-BR/SP	PG-L13	K4	ZONE	
		K7	CALC	(*1)
		D1 to DE	Y01 to Y14	
		X1 to XE	X01 to X14	
7CM-EX	LAG	No difference except "Common"		
7CM-DR	LD	No difference except "Common"		
7CM-UF	RAMP	I	STEP	
7CM-LL	LDLAG	No difference except "Common"		
7CM-LA/L1/L2	DLAY	D	SMPL	
7CM-LC/L3/L4	DLAY-C	D	SMPL	
7CM-AV/A1/A2	AVE-M	I	NUM	
		D	SMPL	
		K7	PREV	
7CM-1A	AVE-C	SV	SW	
		K3	PREV	
7CM-NL/XY	FUNC-VAR	No difference except "Common"		
7CM-CL	CALCU	K4	(None)	
		RD	RV	
7BS	BSETU-2	SV	SW	
		PL	(None)	
		VL	LPV	
		I	TU	
		D	TD	
		DL	(None)	
		K8 x K9	BSET	(*17)
		PL x K9	ILST	(*18)
		DL x K9	PLST	(*19)
7BD	BDSET-1L	SV	SW	
		K1 to K9, KA to KE	DT01 to DT09, DT10 to DT14	(*13)
7BD-B2	BDSET-2L	NX	NXBS	
		K1 to K9, KA to KE	DT01 to DT09, DT10 to DT14	(*13)
		D1 to D9, DA to DE	NX01 to NX09, NX10 to NX14	
7BC	BDA	SV	SW	
		K1 to K9, KA to KE	DT01 to DT09, DT10 to DT14	(*13)

Table Tuning Parameters Difference between CENTUM V and CENTUM VP(4/5)

CENTUM V Instrument type	CENTUM VP Function block	CENTUM V Data type	CENTUM VP Data item	Conversion equation
7MC-C2/C3	MC-2/3	PV	FV	
		MV	MV	(*15)
		PL	ANSP	
		MH	(None)	
		ML	(None)	
		I	MTM	
		K4	CSV	
		K5	RAW	
		K7	BPSW	
7UN	ADL	No difference except "Common"		
7SL-DT	ADL	No difference except "Common"		
7SL-SD/RV	BDA-L	SV	SW	
	BDSET-1L	K1 to K9, KA to KE	DT01 to DT09, DT10 to DT14	(*13)
(YS80)	SLCD	No difference except "Common"		
(YS80)	SLPC	X1 to X3	AUX1 to AUX3	
(YS80)	SLMC	X1 to X3	AUX1 to AUX3	
(YS80)	SMST111	No difference except "Common"		
(YS80)	SMST121	No difference except "Common"		
(YS80)	SMRT	K7	(None)	
		RS	SSH	
		P1 to P4	P01 to P04	
		D1 to D4	CC1 to CC4	
(YS80)	SBSD	BT	BSET	
		K8 to K9	(None)	
		D1 to D4	CC1 to CC4	
(YS80)	SLBC	BT	BSET	
		K8 to K9	(None)	
		D1 to D4	CC1 to CC4	
(YS80)	SLCC	RS	SSH	
		D1 to D4	CC1 to CC4	
(YS80)	STLD	D1 to D4	CC1 to CC4	
NST	ST16	K1	MODE	(*21)
NSW	%SW	No difference except "Common"		(*22)
NAN	%AN	No difference except "Common"		
NDI	%Z	No difference except "Common"		
NDO	%Z	No difference except "Common"		
NTM	TM	ALRM	BSTS	
NCT	CTS	ALRM	BSTS	
NCT	CTP	ALRM	BSTS	

Table Tuning Parameters Difference between CENTUM V and CENTUM VP(5/5)

CENTUM V Instrument type	CENTUM VP Function block	CENTUM V Data type	CENTUM VP Data item	Conversion equation
NRL	RL	-	-	(*21)
NCL	(CALC)	-	-	(*21)
Valve monitor	VLVM	Operation check time	MT01 to MT16	(*23)

CENTUM-XL and CENTUM VP

Table Tuning Parameters Difference between CENTUM-XL and CENTUM VP(1/6)

CENTUM-XL Instrument type	CENTUM VP Function block	CENTUM-XL Data type	CENTUM VP Data item	Conversion equation
Common	–	ALRM, AS, ASUB	ALRM	(*25)
Common	–	LOOP, LS, LSUB	MODE, BSTS	(*26)
Common	–	SU, SM	None (combined into SUM)	
Common	–	CALC	Ditto as left	(*1)
Common	–	MH, ML	Ditto as left	(*1)
Common	–	MV, PMV	Ditto as left	(*1)
Common	–	OPHI, OPLO	Ditto as left	(*1)
PVI	PVI	No difference except "Common"		
PVI-DV	PVI-DV	No difference except "Common"		
PID	PID	P, I, D	Ditto as left	(*20)
		BS	GW	(*3)
		CS	CK	(*31)
PI-HLD	PI-HLD	BS	GW	(*3)
		CS	CK	(*31)
		SW	CSW	
PID-BSW	PID-BSW	P, I, D	Ditto as left	(*20)
		BS	BIAS	(*4)
		CS	LK	
ONOFF	ONOFF	CS	CK	(*31)
ONOFF-G	ONOFF-G	BS	DB	(*3)
		CS	CK	(*31)
PID-TP	PID-TP	P, I, D	Ditto as left	(*20)
		BS	GW	(*3)
		CS	CK	(*31)
PD-MR	PD-MR	P, D	Ditto as left	(*20)
		BS	MR	(*1)
		CS	CK	(*31)
PI-BLEND	PI-BLEND	DL, VL	Ditto as left	(*2)
		D	TK	
		BS	RP	(*4)
		SW	RST	(*5)
PID-STC	PID-STC	PB	P	
		TI	I	
		TD	D	(*20)
MLD	MLD	No difference except "Common"		
MLD-PVI	MLD-PVI	No difference except "Common"		
MLD-SW	MLD-SW	DL	RP	(*6)
		BS	BIAS	(*7)
		CS	GAIN	
		SH	SSH	
		SL	SSL	

Table Tuning Parameters Difference between CENTUM-XL and CENTUM VP(2/6)

CENTUM-XL Instrument type	CENTUM VP Function block	CENTUM-XL Data type	CENTUM VP Data item	Conversion equation
VELLIM	VELLIM	DMVP, DMVM	Ditto as left	(*8)
		TU	TU	(*9)
		SW	BPSW	(*9)
		SH	SSH	
		SL	SSL	
RATIO	RATIO	CALC	CALC	(*1)
		DL	RP	
		BS + CS	BIAS	(*10)
		RS	SSH	
AS-H/M/L	AS-H/M/L	PH	SWH	
		PL	SWL	
		SV	SW	
SS-H/M/L	SS-H/M/L	PH	SWH	
		PL	SWL	
		SV	SW	
SS-DUAL	SS-DUAL	PV1, PV2	RV1, RV2	
SW-33	SW-33	SV	SW	
		PH	SWH	
		PL	SWL	
SW-91	SW-91	SV	SW	
		PH	SWH	
		PL	SWL	
DSW-14	DSW-16	PV	CPV	
		SV	SW	
DSET	DSET	PH	SVH	
		PL	SVL	
DSET-PVI	DSET-PVI	PV	CPV	
PG-L13/S13	PG-L13	RS	SH - SL	
		Y01 to Y14	Ditto as left	(*1)
		BSZ	ZSTR	
		BEZ	ZEND	
LAG	LAG	PV	CPV	
LD	LD	PV	CPV	
RAMP	RAMP	I	STEP	
		PV	CPV	
LDLAG	LDLAG	PV	CPV	
DLAY	DLAY	PV	CPV	
		D (0 to 9999)	SMPL (0.1 to 10000.0)	
		SW	RST	(*5)
DLAY-C	DLAY-C	PV	CPV	
		D (0 to 9999)	SMPL (0.1 to 10000.0)	
		SW	RST	(*5)

Table Tuning Parameters Difference between CENTUM-XL and CENTUM VP(3/6)

CENTUM-XL Instrument type	CENTUM VP Function block	CENTUM-XL Data type	CENTUM VP Data item	Conversion equation
AVE-M	AVE-M	PV	CPV	
		I	NUM	
		D (0 to 9999)	SMPL (0.1 to 10000.0)	
		SW	RST	(*5)
		CALC	PREV	
AVE-C	AVE-C	PV	CPV	
		SV	SW	
		DERV	PREV	
FUNC	FUNC-VAR	PV	CPV	
		(None)	X01 to Y15	(*3)
		(None)	Y01 to X15	(*1)
FUNC-VAR	FUNC-VAR	PV	CPV	
		X01 to Y14	Ditto as left	(*3)
		Y01 to X14	Ditto as left	(*1)
CALCU	CALCU	PV	CPV	
		GAIN	(None)	(*29)
ALM-R	ALM-R	SV	SW	
		CN01 to CN16	(None)	
		DT01 to DT16	(None)	
BSETU	BSETU-2	SV	SW	
		LPV	LK	
		I	TU	
		D	TD	
		BU, BL	None (combined into BSET)	
		PLU, PLL	None (combined into PLST)	
		ILU, ILL	None (combined into ILST)	
BSETU-2	BSETU-2	SV	SW	
		I	TU	
		D	TD	
		SW	EMSW	
		BU, BL	None (combined into BSET)	
		PLU, PLL	None (combined into PLST)	
		ILU, ILL	None (combined into ILST)	
		SU1, SM1	None (combined into SUM1)	
		DL	DL	(*28)

Table Tuning Parameters Difference between CENTUM-XL and CENTUM VP(4/6)

CENTUM-XL Instrument type	CENTUM VP Function block	CENTUM-XL Data type	CENTUM VP Data item	Conversion equation
BSETU-3	BSETU-3	SV	SW	
		I	TU	
		D	TD	
		SW	EMSW	
		SRAW	(None)	
		BU, BL	None (combined into BSET)	
		PLU, PLL	None (combined into PLST)	
		ILU, ILL	None (combined into ILST)	
		SU1, SM1	None (combined into SUM1)	
		DL	DL	(*28)
BDSET-1	BDSET-1L	SV	SW	
		DT01 to DT14	Ditto as left	(*13)
		(None)	DH01 to DH16	(*30)
		(None)	DL01 to DL16	(*30)
BDSET-2	BDSET-2L	SV	SW	
		DT01 to DT14	Ditto as left	(*13)
		NX01 to NX14	Ditto as left	(*13)
		(None)	DH01 to DH16	(*30)
		(None)	DL01 to DL16	(*30)
BDA	BDA-L	SV	SW	
		DT01 to DT14	Ditto as left	(*13)
		(None)	DH01 to DH16	(*30)
		(None)	DL01 to DL16	(*30)
MC-2/3	MC-2/3	I	MTM	
		SW	BPSW	
SDL, SDL-2	ADL	SV	(None)	
		DT01 to DT14		
SLCD	SLCD	No difference except "Common"		
SLPC	SLPC	No difference except "Common"		
SLMC	SLMC	No difference except "Common"		
SMST-111	SMST-111	No difference except "Common"		
SMST-121	SMST-121	No difference except "Common"		
SMRT	SMRT	RS	SSH	
SBSD	SBSD	No difference except "Common"		
SLBC	SLBC	No difference except "Common"		
SLCC	SLCC	RS	SSH	
STLD	STLD	No difference except "Common"		

Table Tuning Parameters Difference between CENTUM-XL and CENTUM VP(5/6)

CENTUM-XL Instrument type	CENTUM VP Function block	CENTUM-XL Data type	CENTUM VP Data item	Conversion equation
FSBSET	FSBSET	PH	SVH	
		PL	SVL	
		SEL	ILSW	
		PRE	SVPR	
		ML	CVK	
		SW	EMSW	
		BU, BL	None (combined into BSET)	
		PLU, PLL	None (combined into PLST)	
		ILU, ILL	None (combined into ILST)	
		SU1, SM1	None (combined into SUM1)	
		SU2, SM2	None (combined into SUM2)	
BLEND	BLEND	PH	SVH	
		PL	SVL	
		PRE	SVPR	
		SW	EMSW	
		BU, BL	None (combined into BSET)	
		PLU, PLL	None (combined into PLST)	
		ILU, ILL	None (combined into ILST)	
		CN01 to CN14	CP01 to CP14	(*24)
		X01 to X14	CR01 to CR14	(*24)
		NX01 to NX06	MS01 to MS06	(*24)
		SEL	ILSW	
BLEND-1	BLEND	SV	MOD1	
		SV2	(None)	
		DT01 to DT14	SM01 to SM14	(*24)
		CN01 to CN14	CP01 to CP14	(*24)
		X01 to X14	WR01 to WR14	(*24)
		CN16	MSMD	(*24)
		SEL	ILSW	
BSI	BSI	PV	SV	(*32)
		SV	PV01 to PV03	(*33)
SI-1/2	SI-1/2	No difference except "Common"		
SO-1/2	SO-1/2	No difference except "Common"		
SIO-xx, SIO-xxP	SIO-xx, SIO-xxP	I	MTM	
		SW	BPSW	
%ST	ST16	–	–	(*21)
		PV	PV	(*27)
%SW	%SW	No difference except "Common"		(*22)

Table Tuning Parameters Difference between CENTUM-XL and CENTUM VP(6/6)

CENTUM-XL Instrument type	CENTUM VP Function block	CENTUM-XL Data type	CENTUM VP Data item	Conversion equation
%AN	%AN	No difference except "Common"		
%DI	%Z	No difference except "Common"		
%DO	%Z	No difference except "Common"		
%TM	TM	ALRM	BSTS	
%CT	CTS, CTP	ALRM	BSTS	
%CI	CI	ALRM	BSTS	
%CO	CO	ALRM	BSTS	
%RL	RL	–	–	(*21)
%CL	(CALC)	–	–	(*21)
%RM	RS	–	–	
Valve monitor	VLVM	Operation check time	MT01 to MT16	(*23)

Table Equations for Tuning Parameters Requiring Conversion(1/2)

conversion equation	Conversion Detail	Conversion Equation (Y: converted; X: prior to conversion)	Remarks
(*1)	Express MV range in engineering unit	Y=(MSH-MSL) * X+MSL	
(*2)	Express DV span in engineering unit	Y=(DSH-DSL) * X	
(*3)	Express PV span in engineering unit	Y=(SH-SL) * X	
(*4)	Express MV span in engineering unit	Y=(MSH-MSL) * X	
(*5)	Reverse 1 and 0	If (X==0) → Y=1 If (X==1) → Y=0	
(*6)	Express SV range in engineering unit	Y=(SSH-SSL) * X+SSL	
(*7)	Express SV span in engineering unit	Y=(SSH-SSL) * X	
(*8)	Rate of change set value on UP/ DOWN side	Y=(X-SSL)/(SSH-SSL) * (MSH-MSL)	
(*9)	Number transfer	Y=X-1	
(*10)	Bias calculation	BIAS=(BS/100+CS/100) * (MSH-MSL) -{MSL/(MSH-MSL)} +{SL/(SH-SL) * KP}	
(*11)	(N/A)		
(*12)	(N/A)		
(*13)	Reflection of link source range	No conversion	No conversion
(*14)	(N/A)		

(*15)	Response to 0, 1, and 2	If (X==0.0) → Y==0
		If (X==50.0) → Y==1
		If (X==100.0) → Y==2	

(*16)	(N/A)		
(*17)	Batch set	BSET=K8 * K9	
(*18)	Batch set	ILST=PL * K9	
(*19)	Batch set	PLST=DL * K9	
(*20)	PID parameter	In case of using D parameter, re-tuning of PID is basically required because the D-term calculation algorithm has been changed.	Refer to "4.5.3 Handling tuning parameters."
(*21)	Sequence table, relational expression, operational expression	There are difference in function as an instrument (function block) rather than a category of tuning parameter. (These are automatically converted by the tool.)	Refer to "5.1.4 Comparison of sequence control function."
(*22)	Internal switch	Take care that the switch number in the system area is different. (This is the target of automatic conversion by the tool.)	Refer to "5.1.4 Comparison of sequence control function."
(*23)	Valve output monitoring	This parameter, which has been set in [Operation Check Time] of the valve output monitoring builder in old FCS, is upgraded to MTxx of VLVM in CENTUM VP.	
(*24)	Off-site instrument (BLEND)	BLEND and BLEND-1 instruments of CENTUM-XL are integrated into the BLEND block of CENTUM VP. At this time, the interface from a supervisory computer is also changed, thus reimplementation of engineering is required. Therefore, parameters with this conversion number only indicates compatibility with XL-to-VP upgrade, and is not actually the target of conversion.	
(*25)	Alarm status	The basic alarm status still remains as ALRM. CAL that was included in the conventional alarm status is changed to the data status of a process variable (such as &PV).	Refer to "5.1.2 Comparison of function block's common function."

Table Equations for Tuning Parameters Requiring Conversion(2/2)

conversion equation	Conversion Detail	Conversion Equation (Y: converted; X: prior to conversion)	Remarks
(*26)	Loop status	The basic loop status is changed to block mode MODE. CLP+, CLP-, and CND that existed as a part of the conventional loop status (LSUB) are changed to a data status of a manipulated output value (such as &MV). LOCK, OFF, SIM of MC instruments and EMST of batch set block are changed to block status BSTS.	Refer to "5.1.2 Comparison of function block's common function."
(*27)	Step number	The step number of CENTUM-XL is a numeric value data, but it is a character string data in CENTUM VP.	
(*28)	Cumulative deviation	When the cumulative deviation of CENTUM-XL is negative, this function should be examined.	
(*29)	Gain	This function should be examined because it became extinct in CENTUM VP.	
(*30)	Buffer range	The buffer range of CENTUM-XL corresponds to the connected tag's range, but it is specified by DHxx/DLxx parameter setting in CENTUM VP.	
(*31)	Output compensation	When the control action direction is REV, the plus/minus sign should be reversed.	
(*32)	Phase step number	The range of the phase number is 0 to 15 in CENTUM-XL, but 1 to 16 in CENTUM VP. So, it is required to add 1.	
(*33)	Operation instruction	This function should be examined because it changed quite differently.	

Appendix 4. Functions Related to Upgrade

Table Functions Related to Upgrade Before R5.03.00 (1/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
Input open check	IOP+/IOP- setting range expansion	CENTUM instruments detect an IOP, so they specify alarm detection. If “no detection” is specified, even when input corresponding to an IOP occurs, NR is as is, and the system is in automatic control.	Input values read by the input module are checked whether they are within the high- and low-limit input open detection set values. Function blocks directly linked to the input modules accept the check results as data statuses. Regulatory control blocks incorporating manual fallback functions perform manual fallback operations to change the block mode to MAN (manual) mode.	The IOP+/IOP- setting range is expanded to -1000.0% to 1000.0% to be set outside the input ranges, thereby allowing detection of high- and low-limit input open to bypass.
Relational expression block (RL)	Measures for Input destination data abnormality	Input data values are used even though the data status is abnormal (BAD).	If the data status is abnormal, the last normal input values are used.	By the specification of Yes in [Accept BAD data] of the RL Block Builder, the input data values are used even if abnormal data, such as an IOP occurs in the input destination, thereby resulting in a BAD data status.
Batch set block for weight measurement (BSETU-3)	SUM value after canceling CAL	Even if CAL, which is set during batch operation or after completing batch operation, is canceled, the SUM values are retained.	Even if CAL, which is set during batch operation or after completing batch operation, is canceled, the SUM values are reset to zero.	Even if CAL, which is set during batch operation or after completing batch operation, is canceled, the SUM values are retained.
PID instrument, pulse width output	Operation of the MV indicator in AUTO mode	In AUTO mode, the MV indicator reads the pulse width output and then returns to 50% output.	In AUTO mode, the MV indicator reads the pulse width output and then remains held.	By specifying Yes in [PID Pulse Width Output] in the FCS property, the MV indicator, in AUTO mode, reads the pulse width output and then returns to 50% output, indicating no pulse output provided.
PV range	PV range limit function	Data exceeding the scale high- and low-limit values are not provided because numeric data are processed as 0 to 1 normalized data.	Numeric data are processed in engineering quantities and data outside the scale ranges are present, so, it is necessary to add a calculation block to limit the ranges.	Specifying Yes in [PV Limit] in the function block detail builder makes respective PV, RV and FV values coincide with SH/SL when PV, RV, and FV values exceed SH/SL.
Preset manipulated output	Preset manipulated variable output, immediate setting function	A preset MV-block mode change and MV output operation are immediately executed by the preset switch set timing from the sequence table.	A preset MV-block mode change and MV output operation are executed by the periodic timing set in function blocks. (Not immediately operated when setting the preset switches using the sequence table, or the like)	Specifying Yes in [Preset MV valid immediately] performs immediately a block mode change and MV output setting, and IO image setting in the timing set to the preset switches. When this is specified, no preset MV is processed when executing function block scanning.

Table Functions Related to Upgrade Before R5.03.00 (2/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
Sequence table	Nonlatched (L-shaped) output OFF and N operations in nonlatched step sequence in processing timing TC (periodic execution or execution only when conditions are changed)	If conditions are false, L-shaped outputs are turned off.	Even if conditions are false, L-shaped outputs are not turned off.	If conditions are false, an L-shaped output is off provided that Yes in [CENTUM-XL Compatible Sequence Tables] is specified in the FCS property.
		If conditions are true, an L-shaped output is off when an N operation is executed on the L-shaped output.	If an N operation is executed on an L-shaped output, the output is ignored even though conditions are true.	When an N operation is executed on an L-shaped output, the output is turned off if conditions are true provided that Yes in [CENTUM-XL Compatible Sequence Tables] is specified in the FCS property.
	"N" operation of pulse-shaped (P-shaped) output	If an N operation is executed on a P-shaped output, a P-shaped output that has been turned on is turned off.	Even if an N operation is executed on a P-shaped output, its operation is ignored.	If an N operation is executed on a P-shaped output, P-shaped outputs that are turned on are off when Yes in [CENTUM-XL Compatible Sequence Tables] has been specified in the FCS property.
	Action execution timing in step 00 (When 1.00 steps and the execution steps are on the same table)	Carry out the processing in the following steps: 1) Evaluate condition signals in step 00 and the execution step. 2) Execute action signals in step 00 and the execution step	Carry out the processing in the following steps: 1) Evaluate the condition signal in step 00 and then execute the action signal. 2) Evaluate the condition signal in the execution step and then execute the action signal.	Specify Yes in [CENTUM-XL Compatible Sequence Tables] in the FCS property and then execute the following steps: 1) Evaluate condition signals in step 00 and in the execution step. 2) Execute action signals in step 00 and the execution step
	Action execution timing in step 00 (If step 00 is on the expansion source table and the execution step is on the extension destination table:	Carry out the processing in the following steps: 1) Evaluate the condition signal in step 00 and then execute the action signal. 2) Evaluate the condition signal in the execution step and then execute the action signal.	Carry out the processing in the following steps: 1) Evaluate the condition signal in step 00 and then execute the action signal. 2) Evaluate the condition signal in the execution step and then execute the action signal.	Specify Yes in [CENTUM-XL Compatible Sequence Tables] in the FCS property and then execute the following steps: 1) Evaluate the condition signal in step 00 and then execute the action signal. 2) Evaluate the condition signal in the execution step and then
	Step changes in own table and THEN/ELSE priority order	If THEN/ELSE is in the execution step, follow the description of the THEN/ELSE in the execution step to shift steps. If there is no THEN/ELSE in the execution step, shift to a step to which a step name has been set.	Shift to a step name set in the execution step and execute to set steps. Then follow the description of THEN/ELSE in the set step to shift steps.	If THEN/ELSE is in the execution step, setting the steps to their own table is invalid, step is then shifted to THEN/ELSE in the execution step when Yes in [THEN/ELSE is precedent in the action of sequence table has been specified in the FCS property. If THEN/ELSE is not in the execution step, shift to a step to which a step name is set.

Table Functions Related to Upgrade Before R5.03.00 (3/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
MC instrument	Answerback check masking when starting MC instruments	Answerback check masking continues until the answerback check masking time (MTM) passes from the time of starting MV regardless of answerback input value (PV value).	If the answerback input (PV) value coincides with the manipulated variable (MV) output, an answerback check mask is canceled, FV value HI/LO alarms, which may subsequently occur between MTMs, are not masked.	Even if the PV and MV coincide during answerback check masking by the specification only after a lapse of MTM on the answerback check mask resolutive conditions in the function block (MC-2, MC-2E, MC-3, MC-3E) property, answerback check masking continues until the lapse of answerback check masking time (MTM).
	Output hold function when the interlock is true	When a custom-ordered specification bit (output hold specification bit for MC instrument interlock ON) in the FCS common table is on, the output is held when the interlock is true; if it is false, the normally specified output is provided.	No output hold function is provided when the interlock is true.	The output is held when the interlock is true by specifying [Effective] in [output hold function when the interlock is true] in the function block property; if the interlock is false, a normally specified output is provided.
High- and low-limit extension function	When ML and MH values are changed by operation and monitoring functions	When a regulatory control instrument carries out automatic operation (AUT, CAS or RCAS), if the MH value/ ML value are changed by the operation and monitoring functions, MV values are then limited to the MH/ML ranges.	When a regulatory control instrument carries out automatic operation (AUT, CAS or RCAS), even if the MH value/ML value are changed by the operation and monitoring functions, the high- and low-limit extension functions work, and the MV values are thus not limited.	High- and low-limit extension functions are invalid when Yes in [High/Low bumpfree capability] in the function block detail builder is specified; then, if MH value/ ML value are changed by the operation and monitoring functions, the MV values are forcibly changed within the range of the MH and ML values during the next scan period.
	When transferring from manual (MAN) operation to automatic (AUT, CAS, RCAS) operation	When regulatory control instruments carry out manual (MAN) operation, if it is transferred to automatic operation while MV values exceed the limits of the MH and ML values, the MV values are then limited to the range of the MH and ML values.	When regulatory control instruments carry out manual (MAN) operation, even if it is transferred to automatic operation while MV values exceed the limits of the MH and ML values, the high- and low-limit extension functions work, and thus the MV values are not limited.	High- and low-limit extension functions are invalid when Yes in [High/Low bumpfree capability] in the function block detail builder is specified; then, if changed to automatic operation while the MV value exceeds the limits of the MH and ML values, the MV values are forcibly changed to MH or ML values during the next scan period.
CALCU CPV range	CALCU CPV range limit	Data exceeding the scale high- and low-limit values are not present because numeric data are processed as normalized data taking the value from -1 to 1.	The numeric character data are treated as engineering quantity involving data beyond scale limits; therefore, it is necessary to add calculation blocks for range limits.	Specifying Yes in [CPVL range limit] in the function block detail builder makes the CPV value of CALCU/ CALCU-C coincide with SH if the CPV value exceeds SH and with SL-(SH-SL) if the value exceeds SL-(SH-SL).

Table Functions Related to Upgrade Before R5.03.00 (4/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
SUB output terminal	SUB output terminal ΔPV calculation	SUB terminal provides the following output if an IOP occurs: ΔPV = 0 or ΔCPV = 0	If an IOP occurs, the function block provides ΔPV (calculation block provides ΔCPV output) even when PV value overshooting occurs. (If overshooting does not occur, both ΔPV and ΔCPV are 0 as PV values do not change even if an IOP occurs.)	When the FCS property's [dPV/dCPV Output from SUB Becomes Zero Right After IOP] checkbox ON is specified, the SUB terminal provides ΔPV = 0 or ΔCPV = 0 output when an IOP occurs.
Totalizer data	Data set to totalizer value	Even if the instrument totalizer "NO" is specified, it is possible to set data to SUM values.	If the function block totalizer "NO" is specified, it is not possible to set data to SUM values.	Specifying the [Sum Value Entry] menu in the function block detail builder makes data setting to SUM values from HIS possible.
CALCU/ CALCU-C pulse train input	Totalizer data specification with pulse train inputs (batch data totalizer type)	–	If the pulse train input (batch data totalizer) is selected with CALCU, RV rather than CPV is used for totalization.	If CPV in the [Data Item for Totalization] menu in the function block detail builder is specified, CPV is used for totalization.
PID-TP instrument	PID-TP control algorithm	The method of selecting control algorithms differs between CENTUM-XL and CS or later systems, so differential control action results in CAS mode. In CS or later systems, only PV proportional and derivative-type PID control (I-PD) is used (fixed). A builder such as a PID block cannot be specified.		The [PID control algorithms] menu in the function block detail builder allows the selection of control algorithms identical to PID algorithms, as given below: • Proportional PV Derivative Type PID Control • PV Derivative PID Control • Basic TypeID • Automatic Determination 2 • Automatic Determination
	Output action	–	Positional type (fixed)	[Auxiliary Output Type] menu in the function block detail builder allows the selection of positional or velocity output action.
BSETU compatible mode `	Starting/ restarting blocks by sequence table action	BSETU/7BS Start: LOOP = AUT, SV = 0 Suspend: LOOP = CAS Restart: LOOP = AUT Reset: LOOP = MAN	BSETU-2/3 Start: MODE = AUT, SW = 1 Suspend: SW = 4 Restart: SW = 2 Reset: SW = 3	Specifying [CENTUM V/ CENTUM-XL Compatible] in the function block detail builder allows batch starting or restarting depending on the conditions with ACT. ON descriptions on the sequence table, or the like.
	Restart during EMST	Restart is accepted even during EMST.	Does not restart under ZONE8 (during EMST or while MV values are decreasing).	Specifying [CENTUM V/ CENTUM-XL Compatible] or [CENTUM-XL Compatible] in the function block detail builder can accept restart instructions when BSTS = EMST (while MV values are decreasing in an emergency stop).

Table Functions Related to Upgrade Before R5.03.00 (5/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
BSETU compatible mode	Batch alarm when batch end is not complete.	7BS Batch end: ALRM=HI Pre-batch: ALRM=LO BSETU Batch end: ALRM=END Pre-batch: ALRM=PRE	BSETU-2/3 Batch end: BSTS=NCNT or END Pre-batch: BSTS=ERLY or PBCH	Specifying [CENTUM V/ CENTUM-XL Compatible] or [XL compatible CENTUM-XL Compatible] in the function block detail builder allows the transmission of a batch end alarm when the batch ends even if the batch end conditions (SUM ≥ BSET - LPV) are not satisfied.
	Pre-batch alarm when the batch ends.	After the pre-batch transmission, the pre-batch returns at the time of pre-batch end.	Pre-batch does not return at the time of pre-batch end, but, it returns simultaneously at the time of batch end when the next batch starts.	Specifying [CENTUM V/ CENTUM-XL Compatible] in the function block detail builder allows the pre-batch alarm return when the batch ends.
	Handling MV values when transferring from MAN to AUT mode	MV-value handling when transferring to MAN and then back to AUT differs between CENTUM-XL or earlier systems and CS or later systems.		Specifying [CENTUM V/ CENTUM-XL Compatible] or [XL compatible CENTUM-XL Compatible] in the function block detail builder allows the change of MV values when transferring from MAN to AUT mode.
	Acceptance of batch end during EMST	–	CS can specify whether or not accepting batch end during EMST, whereas CS 3000 or later systems can specify specific forms.	Specifying “Not accepted” in [Accept Batch-End during EMST] in the FCS property allows specification of the presence or absence of accepting batch end during EMST.
	Way to restart batch operation	The ways to restart batch operations differ between CENTUM-XL or earlier systems and CENTUM CS or a later system.		Specifying [CENTUM V/ CENTUM-XL Compatible] or [CENTUM-XL Compatible] in the function block detail builder, or specifying Yes in the [Start from ML value at the time of restart] menu allows starting with ML values when restarting batch operation.
	Way to batch start in cascade connections	The ways to batch start when [Batch start in BSETU-2/3] and [CAS set in function block for destination cascade connections] are set simultaneously in cascade connections differ between CENTUM-XL or earlier systems and CENTUM CS or later systems.		Specifying [CENTUM V/ CENTUM-XL Compatible or [CENTUM-XL Compatible] in the function block detail builder, or specifying Yes in the [Start from ML value at the time of restart] menu allows starting with ML values when starting batch processing when [Batch start in BSETU-2/3] and [CAS set in function block for destination cascade connections] are set simultaneously in cascade connections.
	Sending of pre-batch alarms during EMST	The method of sending pre-batch alarms during EMST differs between CENTUM-XL or earlier systems and CENTUM CS or later systems.		Specifying [CENTUM-XL Compatible] in the function block detail builder stops pre-batch alarms from being transmitted during EMST.

Table Functions Related to Upgrade Before R5.03.00 (6/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
Handling when IOP occurs.	Limitation on operation when an IOP occurs.	Limited only by tags directly linked to input cards. Presence or absence of IOP detections is specified through instrument detailed specifications.		Specifying Yes in [Limitation on operation when IOP occurs] in the function block detail builder allows operation in the current mode not only without sending BAD to PV-value data statuses but also without falling-back to block mode manually.
Switch instrument/ MC instrument	Apply to MV values when setting CSV values	Possible to rewrite MV values of switch instrument/MC instrument directly from other functional blocks such as a sequence table	If CSV values of switch instrument/MC instrument are rewritten from other functional blocks such as a sequence control block, the CSV values are applied to the MV values at the timing when the switch instrument/MC instrument start next time	CSV values are applied to the MV values immediately if you specify “Yes” in “Apply to MV values when setting CSV values of switch instrument/MC instrument” in FCS properties
Timer/soft counter/pulse train counter block (TM/ CTS/CTP)	Action in PALM	Pre-alarm status (PALM) of block status occurs at the same time as the time up status “DV (remaining time of timer) ≤0” (CTUP)	If block status reaches the time up status “DV (remaining time of timer) ≤0,” pre-alarm status (PALM) of block status is released	Pre-alarm status (PALM) of block status occurs at the same time as the time up status “DV (remaining time of timer) ≤0” (CTUP) if you specify “Yes” in “PALM action of TM/CTS/CTP: PALM continues after CTUP occurs” in FCS properties
Action at the time of IOP	Action resulting from specifying IOP detection	The action resulting from specifying IOP detection in IOP/at the time of IOP occurrence and PV in IOP/at the time of IOP occurrence is different between XL or earlier and CS or later		The action resulting from specifying IOP detection in IOP/at the time of IOP occurrence and PV in IOP/at the time of IOP occurrence becomes the same as that in XL if you specify “Yes” in “Action at the time of IOP is compatible with XL” in FCS properties
CALCU data range	Normalization of CALCU data and range limit	Numerical data is processed with normalized data in the range between -1 and +1, so there is no data that exceeds the high and low limits of the scale	Numerical data is processed with engineering unit data and there is data outside the scale, so computational blocks need to be added to provide limits to the range	If the data to be referred to/set at the connection destination of IN terminal/ Qnn terminal or OUT terminal/Jnn terminal of CALCU, or in computational expressions is within the PV range (SH/SL), within the SV range (SSH/SSL), or within the MV range (MSH/MSL), the data is handled as the normalized data in the computational expressions. Then, if each data exceeds the range at the connection destination, the data is limited so that it comes within the range.

Table Functions Related to Upgrade Before R5.03.00 (7/7)

Item	Function	CENTUM V or CENTUM-XL	CENTUM VP	Measures
CALCU	System alarm upon occurrence of a calculation error	Even if a calculation error occurs in operational expressions, no system error is submitted.	If a calculation error occurs in operational expressions, a system error is submitted.	If you set the [Restrain system alarm when CALCU calculation error occurs] in the FCS properties to "ON", a system error is not submitted during operational expressions.
	Change of CALCU input/ output limit range	Input data/output data is limited within a range of ±1 as normalized data.	Input data/output data is not limited within a range of ±1 as normalized data.	The specification is revised so that input data/output data is limited within a range of ±1 as normalized data.
	Change of normalization target data	Data items that indicate range upper/lower limit value are non-target items of normalization.	Data items that indicate range upper/lower limit value are not non-target items of normalization.	The specification is revised so that data items that indicate range upper/lower limit value (SH/SL/ SSH/ SSL/ MSH/MSL/ DSH/DSL/ MSH1/MSL1/ MSH2/MSL2) are non-target items of normalization.
	Operation in cases where nothing is substituted for CPV in operational expressions	If nothing is substituted for CPV in operational expressions, this function is operated assuming that expression CPV=RV exists at the end of expression	There is no such assumption.	Change so as to operate assuming that expression CPV=RV exists at the end of expression if nothing is substituted for CPV in operational expressions.
PRD mode	Change to the PRD mode during CAL	Possible to change to the PRD mode even during CAL. Even if CAL is entered in the PRD mode, MAN fall-back is not made.	Not possible to change to the PRD mode during CAL. If CAL is entered in the PRD mode, MAN fall-back is made.	If “Permit PRD mode during CAL (XL compatible)” is selected from builder specification items, the PRD mode can be changed during CAL. (*1) Even if CAL is entered in the PRD mode, MAN fall-back is not made. If CAL is entered when a block mode is any of AUT/ CAS/RCAS/ROUT, the MAN mode appears as usual. *1: Version upgrade of HIS is also required.
Output limiter	Output limiter in the RPD mode	In a cascade-connected internal instrument, the output in the PRD mode is limited with the secondary tag MH/ML.	In a cascade-connected function block, the output in the PRD mode is not limited with the secondary tag MH/ML.	By specifying ON for the "Enable output limiter in the PRD mode (XL compatible)" checkbox, the output of the primary tag is limited with the secondary tag MH/ML.

Appendix 5. Glossary

This is a glossary of abbreviations and acronyms about Yokogawa products that are mentioned in this document.

Table Glossary(1/2)

Abbreviation or Acronym	Description
ACG	CENTUM VP Communication gateway with supervisory computer
ANB10S, ANB10D	CENTUM VP Node unit for FIO (Single/Duplexed)
ANR10S, ANR10D	CENTUM VP Remote node unit for FIO (Single/Duplexed)
APCS	Advanced Process Control Station (Station on a PC platform, mainly intended to perform plant advanced control)
BCV-H	Converter between V net and HF bus
BRAIN communication	Function to communicate with BRAIN Series products supported with CENTUM-XL
CCMS	CENTUM V Computer station
CFBS2	CENTUM V Compact field control station
CFCS2, CFCD2	CENTUM V Field control station (Single/Duplexed)
CFGW	CENTUM V Field gateway unit
CFSS, CFSD	CENTUM V Field control station for sequence control (Single/Duplexed)
CGWU	CENTUM V Gateway unit for communication with higher-level systems (-1, -2, -3 models)
COPSV	CENTUM V Operation & monitoring station
ECGWZ, ECGW2, ECGW3	CENTUM-XL Gateway units for communication with higher-level systems
ECMP	CENTUM-XL Computer stations
EFCS, EFCD	CENTUM-XL Field control station (-S1, -H2, -H4 models) (Single/Duplexed)
EFGW	CENTUM-XL Field gateway unit
EFUS, EFUD	CENTUM-XL Compact field control station (Single/Duplexed)
EMCS, EMCD	CENTUM-XL Master control station (Single/Duplexed)
ENG	CENTUM VP Engineering station
ENGS	CENTUM-XL Engineering station
EOPS	CENTUM-XL Operation & monitoring station
ER bus	I/O bus that connects remote connection card installed in Node Unit for FIO to Remote Node Unit for FIO
ESB bus	I/O bus that connects CPU in Field Control Unit (SCN) to Node Unit for FIO.
Exaopc	OPC interface package
Exapro	Expert system building support tool
Exaquantum	Plant information management system
FCS	Field Control Station (generally used for CENTUM series.)
FCU	Field control unit; the CPU of an FCS of the CENTUM VP.
FFCS, FFCD	CENTUM VP Field control station (Single/Duplexed)
FIO	I/O for CENTUM VP's field control station
FMS	Field Monitoring Station (generally used for CENTUM series.)
HF bus	Control bus used in CENTUM V and CENTUM-XL systems
HIS	CENTUM VP Operation & monitoring station
HKU	House Keeping Unit (Collects alarm information, changes and collects SC setting information in CENTUM-XL field control station.)
IOM	I/O Module for CENTUM VP
KFCS	Field control station for CENTUM VP
KFCS-V	An FCS which was of the CENTUM V and has been upgraded to CENTUM VP's FCS with 16-MB RAM; also referred to as upgraded FCS-V.
KFCS2-V	An FCS which was of the CENTUM V and has been upgraded to CENTUM VP's FCS with 32-MB RAM; also referred to as upgraded FCS2-V.
KFCS-XL	An FCS which was of the CENTUM-XL and has been upgraded to CENTUM VP's FCS with 16-MB RAM; also referred to as upgraded FCSXL.
KFCS2-XL	An FCS which was of the CENTUM-XL and has been upgraded to CENTUM VP's FCS with 32-MB RAM; also referred to as upgraded FCS2-XL.

Table Glossary(2/2)

Abbreviation or Acronym	Description
L2SW	Layer 2 switch for network. Yokogawa dedicated L2SW is used for Vnet/IP.
LCS	Loop Communication card (card for communication with single-loop controller such as SLCD. Used in CENTUM V and CENTUM-XL systems.)
LCU	Loop Communication card with ULDU Loop Display Unit used in CENTUM V and CENTUM-XL systems LD1 Loop Display interface card used in CENTUM V and CENTUM-XL systems
MCU	Monitoring station Control Unit (core component of FMS) upgraded FCS2-V See KFCS2-V.
Upgraded FCS2-XL	See KFCS2-XL.
Upgraded FCS-V	See KFCS-V.
Upgraded FCS-XL	See KFCS-XL.
NC3, NC4	Nest Common card (I/O nest common card for CENTUM V and CENTUM-XL)
PDB	Power Distribution Board
PREDICTROL	Predictive control function supported with CENTUM-XL
ProSafe-RS	Safety instrumentation system
SB301, SB302	ESB bus interface card for CENTUM VP
SC	Signal Conditioner (In CENTUM V and CENTUM-XL systems, installed between field equipment and I/O card and converts signals.)
SCN	Station control nest; the CPU of a field control station (FCS) of the CENTUM V and CENTUM-XL.
SEBOL	Sequence & Batch Oriented Language (Language for sequence control)
SFCS, SFCD	Compact field control station for CENTUM VP
SI bus	Control bus that connects SCN and I/O nest in FCS of CENTUM V and CENTUM-XL
SIO	I/O for CENTUM V and CENTUM-XL field control station
STC	Self Tuning Control (Control function with automatic PID tuning)
V net	Control bus used in CENTUM CS, CENTUM CS 3000 and CENTUM VP systems
Vnet/IP	Control bus for CENTUM VP, using Ethernet technology
XLAIS	CENTUM-XL AI control station
XL-Batch	Software package for batch processes, supported with CENTUM-XL
YEWLINK	Optical communication system

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Appendix3 Corrected errors and added description in the Table “Tuning Parameters Difference between CENTUM-XL and CENTUM VP”.
Corrected errors and added description in the Table “Equations for Tuning Parameters Requiring Conversion”.

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