General Specifications

GS 33Q01B10-31E

Integrated Production
Control System
CENTUM CS 3000
System Overview

CENTUM CS 3000 R3

■ GENERAL

This GS covers the system, component and network specifications of the CENTUM CS 3000 integrated production control system.

■ COMPONENTS AND SOFTWARE

The CENTUM CS 3000 Production Control System for real-time control consists of components such as HIS Human Interface Stations and FCS Field Control Stations interconnected by the V net token-bus. Software running on HIS and FCS stations implements operation/monitoring and control functions respectively. Ethernet may also be used to interconnect HIS stations.

● Human Interface Station (HIS)

An HIS serves as a human interface for operation, monitoring, and engineering. The software packages listed below which are installed in an IBM PC/AT-compatible computer (hereinafter referred to as a general-purpose PC), or in a console HIS (*6) consisting of a general-purpose PC and Open Display Style Console Assembly, implement the respective functions. A user can install and run the operation and monitoring functions together with the engineering functions in the same HIS or in different HISs as necessary.

As for HIS hardware requirements, refer to following General Specifications:

"Enclosed Display Style Console Assembly"
(GS 33Q06B40-31E)
"Open Display Style Console Assembly"
(GS 33Q06B50-31E)
"Standard Operation and Monitoring Function"
(GS 33Q02C10-31E)

Operation and Monitoring Software

LHS1100	Standard Operation and Monitoring Function
LHS1120	Console HIS Support Package for Enclosed Display Style (*6)
LHS1130	Console HIS Support Package for Open Display Style (*6)
LHS1150	Server for Remote Operation and Monitoring Function (*9)
LHS2411	Exaopc OPC Interface Package (for HIS) (*3)
LHS2412	CENTUM Data Access Library
LHS4000	Million Tag Handling Package (*7)
LHS4100	Configured information Reference Package (*8)
LHS4150	Recorder Output Package (*2)
LHS4190	Line Printer Support Package (*2)
LHS4200	Consolidated Historical Message Viewer (Meeting FDA) (*8)
LHS4410	Control Drawing Status Display Package
LHS4420	Logic Chart Status Display Package (*1)
LHS4450	Multiple Project Connection Package (*4)
LHS4510	Expert Trend Viewer Package (*5)
LHS4600	Multiple-monitor Package (*6)
LHS4700	Advanced Alarm Filter Package (*7)
LHS4800	Consolidated Alarm Management Software for HIS (CAMS for HIS) (*10)
LHS6510	Long-term Data Archive Package
LHS6530	Report Package
LHS6600	CS Batch 3000 Process Management Package
LHS6710	FCS Data Setting/Acquisition Package (PICOT)
LHS7110	Web Monitoring Package (*1)

*1: Supported by R2.05 or later versions
*2: Supported by R2.06 or later versions
*3: Product name changed in R2.06
*4: Supported by R2.10 or later versions
*5: Supported by R2.20 or later versions
*6: Supported by R3.01 or later versions
*7: Supported by R3.02 or later versions
*8: Supported by R3.03 or later versions
*9: Supported by R3.05 or later versions
*10: Supported by R3.08.10 or later versions

For details of the above functions, see the respective GSes.

The operating system of HIS is Windows 2000 Professional, Windows XP Professional, Windows 2000 Server or Windows Server 2003. If required to run other third-party software on HIS, contact our sales department to confirm the compatibility.

Engineering Software

LHS5100 Standard Builder Function
LHS5110 Access Control Package (*4)
LHS5150 Graphic Builder
LHS5160 CS Batch 3000 Builder
LHS5161 CS Batch 3000 Recipe Management Package
LHS5170 Access Administrator Package (FDA: 21 CFR Part 11 compliant)(*4)
LHS5420 Test Function
LHS5425 Expanded Test Functions (*2)
LHS5426 FCS Simulator Package (*2)
LHS5427 HIS Simulator Package (*2)
LHS5450 Multiple Project Connection Builder (*2)
LHS5490 Self-documentation Package
SSS4510 Long Term Trend Historian (*5) (*6)
SSS4520 Event Viewer (*5) (*6)
SSS5700 Engineering Tool for Foundation Fieldbus (*1) (*6)
SSS6700 Device Management Tool for Foundation Fieldbus (*1) (*6)
SSS7700 Plant Resource Management Server (*3) (*6)
SSS7710 Plant Resource Management Client (*3) (*6)
SSS7720 Field Communications Server (*3) (*6)
*1: Supported by R2.05 or later versions.
*2: Supported by R2.10 or later versions.
*3: Supported by R3.01 or later versions.
*4: Supported by R3.02 or later versions.
*5: Supported by R3.04 or later versions.
*6: System ID license is not required.

For details of the above functions, see the respective GSes.

Documentation Software

LHS5495 Electronic Instruction Manual
For details of the above function, see GS 33Q04N30-31E.

Operation Support Software
(for general-purpose PC worked as HIS)

NTPS100 Exaplog Event Analysis Package
NTPS200 Exapilot Operation Efficiency Improvement Package (*1)
*1: Supported by R2.10 or later versions.

For details of the above functions, see "NTPS100 Exaplog Event Analysis Package" (GS 36J06A10-01E) and "Exapilot Operation Efficiency Improvement Package" (GS 36J06B20-01E).

Sequence of Event Manager

LPC6900 SOE Server Package (*1)
LPC6910 SOE Server Configurator Package (*1)
LPC6920 SOE Viewer Package (*1)
LPC6930 SEM ExaOPC Interface Package (*2)
*1: Supported by R3.03 or later versions.
*2: Supported by R3.04 or later versions.

For details of the above functions, see "SEM Sequence of Events Manager (for FIO)" (GS 33Q02N80-31E).

● Field Control Station (FCS)

The FCS performs process control and manages communication with subsystems such as PLCs. The standard type, enhanced type, and compact type are available for different applications. In addition, migration type FCS is available to achieve migration from CENTUM V or CENTUM-XL.

Standard and enhanced type FCSes are further divided into two types: one uses RIO (Remote I/O) and is connected via RIO bus. The other uses FIO (Fieldnetwork I/O) and is connected via ESB and ER buses. Compact FCSes are classified into two types: one connects to an RIO, and the other connects to an FIO. SI bus for the communication with I/O of CENTUM V and CENTUM-XL is mounted in the migration type in addition to the configuration based on the standard and enhanced type.

Standard FCS (Main Memory 16 MB)

AFS10S Field Control Unit (for RIO, 19-inch rack mountable type)
AFS10D Duplexed Field Control Unit (for RIO, 19-inch rack mountable type)
AFS20S Field Control Unit (for RIO, with cabinet)
AFS20D Duplexed Field Control Unit (for RIO, with cabinet)
AFS30S Field Control Unit (for FIO, 19-inch rack mountable type)
AFS30D Duplexed Field Control Unit (for FIO, 19-inch rack mountable type)
AFS40S Field Control Unit (for FIO, with cabinet)
AFS40D Duplexed Field Control Unit (for FIO, with cabinet)

For details of the above hardware, see the respective GSes.

Enhanced FCS (Main Memory 32 MB)

AFG10S Field Control Unit (for RIO, 19-inch rack mountable type)
AFG10D Duplexed Field Control Unit (for RIO, 19-inch rack mountable type)
AFG20S Field Control Unit (for RIO, with Cabinet)
AFG20D Duplexed Field Control Unit (for RIO, with Cabinet)
AFG30S Field Control Unit (for FIO, 19-inch rack mountable type)
AFG30D Duplexed Field Control Unit (for FIO, 19-inch rack mountable type)
AFG40S Field Control Unit (for FIO, with Cabinet)
AFG40D Duplexed Field Control Unit (for FIO, with Cabinet)

For details of the above hardware, see the respective GSes.

Compact FCS (PFC□: Main Memory 8 MB/16 MB, AFF50□: Main Memory 32 MB)

PFCS Field Control Unit (19" rack mountable type)
PFCD Duplexed Field Control Unit (19" rack mountable type)
AFF50S Control Unit (for FIO, 19" rack mountable type)
AFF50D Duplexed Field Control Unit (for FIO, 19" rack mountable type)

For details of the above hardware, see the respective GSes.

Migration Type FCS
(Enhanced Type : Main Memory 32MB)

AFG81S   Field Control Station Migration Kit for CENTUM V (for SIO/FIO)

AFG81D   Duplexed Field Control Station Migration Kit for CENTUM V (for SIO/FIO)

AFG82S   Field Control Station Migration Kit for CENTUM-XL (for SIO/FIO)

AFG82D   Duplexed Field Control Station Migration Kit for CENTUM-XL (for SIO/FIO)

AFG83S   Field Control Station Migration Kit for CENTUM V (for FIO)

AFG83D   Duplexed Field Control Station Migration Kit for CENTUM V (for FIO)

AFG84S   Field Control Station Migration Kit for CENTUM-XL (for FIO)

AFG84D   Duplexed Field Control Station Migration Kit for CENTUM-XL (for FIO)

Basic Software

LFS1100   Control Function for Standard Field Control Station (for RIO)

LFS1300   Control Function for Standard Field Control Station (for FIO) (*1)

LFS1130   Control Function for Enhanced Field Control Station (for RIO) (*2)

LFS1330   Control Function for Enhanced Field Control Station (for FIO) (*2)

LFS1350   Control Function for Compact type Field Control Unit (for FIO) (*3)

LFS1000   Control Function for Standard Field Control Station (for PFC□-S) (*4)

LFS1020   Control Function for Enhanced Field Control Station (for PFC□-E) (*4)

LFS1120   Control Function for Compact Field Control Station (for PFC□-H)

For details of the above functions, see the respective GSes.

*1:   Supported by R3.01 or later versions.
*2:   Supported by R3.02 or later versions.
*3:   Supported by R3.04 or later versions.
*4:   Supported by R3.06 or later versions.

Optional Software

LFS3132   Valve Pattern Monitor Package

LFS8620   Off-site Block Package

For details of the above functions, see the respective GSes.

Subsystem Communication Software

LFS2210   FA-M3 Communication Package (for ACM11, ACM12) (*1)

LFS2211   DARWIN Communication Package (for ACM11) (*1)

LFS2212   Gas Chromatography Communication Package (for ACM21) (*1)

LFS2220   YS Communication Package (for ACM12) (*2)

LFS2230   MELSEC-A Communication Package (for ACM71) (*2)

LFS2231   FA-M3 Communication Package (for ACM71) (*3)

LFS2232   DARWIN/DAQSTATION Communication Package (for ACM71) (*4)

LFS2253   Modbus Communication Package (for ACM71) (*5)

LFS2410   FA-M3 Communication Package (for ALR111, ALR121) (*3)

LFS2420   YS Communication Package (for ALR121) (*4)

LFS2421   YS Communication Package with direct connection (for ALR121) (*5)

LFS2430   MELSEC Communication Package (for ALE111) (*4)

LFS2431   FA-M3 Communication Package (for ALE111) (*4)

LFS2432   DARWIN/DAQSTATION Communication Package (for ALE111) (*6)

LFS2433   PLC-5/SLC 500 Communication Package (for ALE111) (*4)

LFS2453   Modbus Communication Package (for ALE111)

LFS2456   SLC500 Communication Package (for ALR111, ALR121)

LFS2457   PLC-5 Communication Package (for ALR111, ALR121)

LFS2510   Foundation Fieldbus Communication Package (for ACF11)

LFS2540   PROFIBUS Communication Package (for ACP71) (*2)

LFS2542   PROFIBUS Communication Package (for ALP111) (*6)

LFS2610   Foundation Fieldbus Communication Package (for ALF111) (*3)

LFS2710   HART Communication Package (for AAIhhh-H)

LFS9053   Modbus Communication Package (for ACM11, ACM12) (*1)

LFS9054   A-B Communication Package (for ACM11, ACM12) (*1)

LFS9055   Siemens Communication Package (for ACM11, ACM12) (*1)

LFS9056   SLC 500 Communication Package (for ACM11) (*4)

LFS9062   MELSEC-A Communication Package (for ACM11, ACM12) (*1)

LFS9063   SYSMAC Communication Package (for ACM11, ACM12) (*1)

LFS9074   PLC-5/SLC 500 Communication Package (for ACM71) (*4)

LFS9153   Modbus Communication Package (for ALR111, ALR121) (*3)

LFS9162   MELSEC-A Communication Package (for ALR111, ALR121) (*3)

*1:   LFS2211 DARWIN Communication Package supports ACM11 Communication Module, LFS2212 Gas Chromatography Communication Package supports ACM21 Communication Module, and other packages support both ACM11/ACM12.
*2:   Supported by R2.10 or later versions.
*3:   Supported by R3.01 or later versions.
*4:   Supported by R3.02 or later versions.
*5:   Supported by R3.03 or later versions.
*6:   Supported by R3.04 or later versions.

For each subsystem, optional communication software is available. For details, see the respective GSes.

● Bus Converter (BCV)

The BCV is used to link CENTUM CS 3000, CENTUM CS, CENTUM-XL, CENTUM V, CENTUM CS 1000 and µXL.

Hardware
ABC11S   Bus Converter
ABC11D   Dual-Redundant Bus Converter

Software
LBC1210   Standard Bus Converter Function
           (for HF bus-V net) (*1)
LBC1220   Standard Bus Converter Function
           (for RL bus-V net) (*1)
LBC1230   Standard Bus Converter Function
           (for V net-V net)
LBC1260   Standard Bus Converter Function
           (for VL net-V net) (*1)
  *1:   Supported by R2.10 or later versions.
For details, see GS 33Q06H20-31E.

● Communication Gateway Unit (CGW)

The CGW communication gateway unit connects an Ethernet network to a V net bus.

Hardware
ACG10S   Communication Gateway Unit

Software
LGW1240   Text Mode Gateway Unit Function
LGW1250   Frame Mode, Wide Area Communication
           Gateway Unit Function (*1)
  *1:   Supported by R2.06 or later versions.
For details, see GS 33Q06H10-31E.

● Advanced Process Control Station (APCS)

An APCS advanced process control station, which is a server computer running the following software, serves as a station to carry out advanced control for plant efficiency improvement.

LFS1200   APCS Control Functions
   Note: Supported by R3.01 or later versions.
For details, see GS 33Q03M10-31E.

● Generic Subsystem Gateway Package (GSGW) (*1)

With a general-use PC connected to a V net, Generic Subsystem Gateway Packages can collect and set data of various types of subsystem using an OPC DA server. They can easily collect and set subsystem data without creating dedicated communications programs.

LFS1250   Generic Subsystem Gateway Package
  *1:   Supported in version R3.04 or later.
For details, see GS 33Q03P10-31E.

● System Integration OPC Station (SIOS) (*1)

The System Integration OPC Station (SIOS) integrates process control systems (PCSs) from other vendors into the CENTUM CS 3000 system. It allows the CENTUM CS 3000 to exchange data with other vendors' PCSs and to receive alarms and events generated at the other vendors' PCSs through the OPC server.

LBC2100   System Integration OPC Client Package
  *1:   Supported by R3.06 or later version.
For details, see GS 33Q05P10-31E.

● Safety Instrumented Systems (ProSafe-RS) (*1)

ProSafe-RS has been approved by German safety test labs TÜV (Technische Überwachungs Verein) as the SIS (Safety Instrumented System) that meets SIL (Safety Integrity Levels) 3 established by IEC 61508.

The SCS (Safety Control Station) for ProSafe-RS monitors the safety state of plants and performs predetermined safety operation according to each request for safety control. The SENG (Safety Engineering PC) performs engineering and maintenance of SCS. Moreover, ProSafe-RS can be integrated with CENTUM CS 3000 R3 and enables operation and monitoring of SCS from HIS.

For details, see "Safety Instrumented Systems ProSafe-RS System Overview" (GS 32S01B10-21E).

  *1:   The connection with ProSafe-RS is supported by R3.06 or later versions.

● Peripherals

YNT511S, YNT511D, YNT522S (*1), and YNT522D (*1) Optical Bus Repeaters (for V net or RIO bus)
  *1:   For V net only.
YNT512S and YNT512D Bus Repeaters (for V net or RIO bus)

ACB21 and ACB41 I/O Expansion Cabinets

ANS□□ and AND□□ Node Interface Units

I/O Module Nests

ANB10S, ANB10D, ANR10S, and ANR10D Node Units

I/O Modules and Communication Modules

Bus Cables for V net, RIO bus, ESB bus, or ER bus

Since an HIS runs on the Microsoft Windows operating system, Windows-compatible peripherals, such as a printer, can be used; however, for peripherals usable for an HIS, consult YOKOGAWA.

■ SYSTEM SPECIFICATIONS

● HIS Operation/Monitoring Tags

Maximum of 100000 (When using LHS4000, up to 1000000 per system)

● Minimum System

A minimum system consists of one HIS and one FCS.

● Maximum System

In CENTUM CS 3000, a system separated by BCV is called a domain. The system configuration for one domain is shown below.

Stations	Max. No. Connectable
HIS FCS BCV CGW GSGW SIOS APCS SCS	The total number of stations can be up to 64, including up to 16 HISes.

● Expanded System

By using a BCV to connect multiple domains in a hierarchy, you can create a system that is larger than the single-domain limits given in "Max. No. Connectable". You can also integrate multiple systems in a hierarchy, with a CENTUM CS 3000 system at its center.

Total no. of interconnected domains: up to 16
Total no. of stations in multi-domain system: up to 256
Hierarchy: three-level control-bus hierarchy, i.e. three control-bus levels, linked by two bus converters
No. of tag names: Max. 100000 (When using LHS4000, up to 1000000 per system)
Connecting device: Bus Converter

● Clock Accuracy

System Clock Accuracy: ±0.01 %
The time differences among the stations: Max.1010 ms within the same domain. (between HIS and HIS)
Timer Block (TM) Accuracy: 0.01 % (The timer block accuracy varies with the scan period. The time resolution is equivalent to the control scan.)
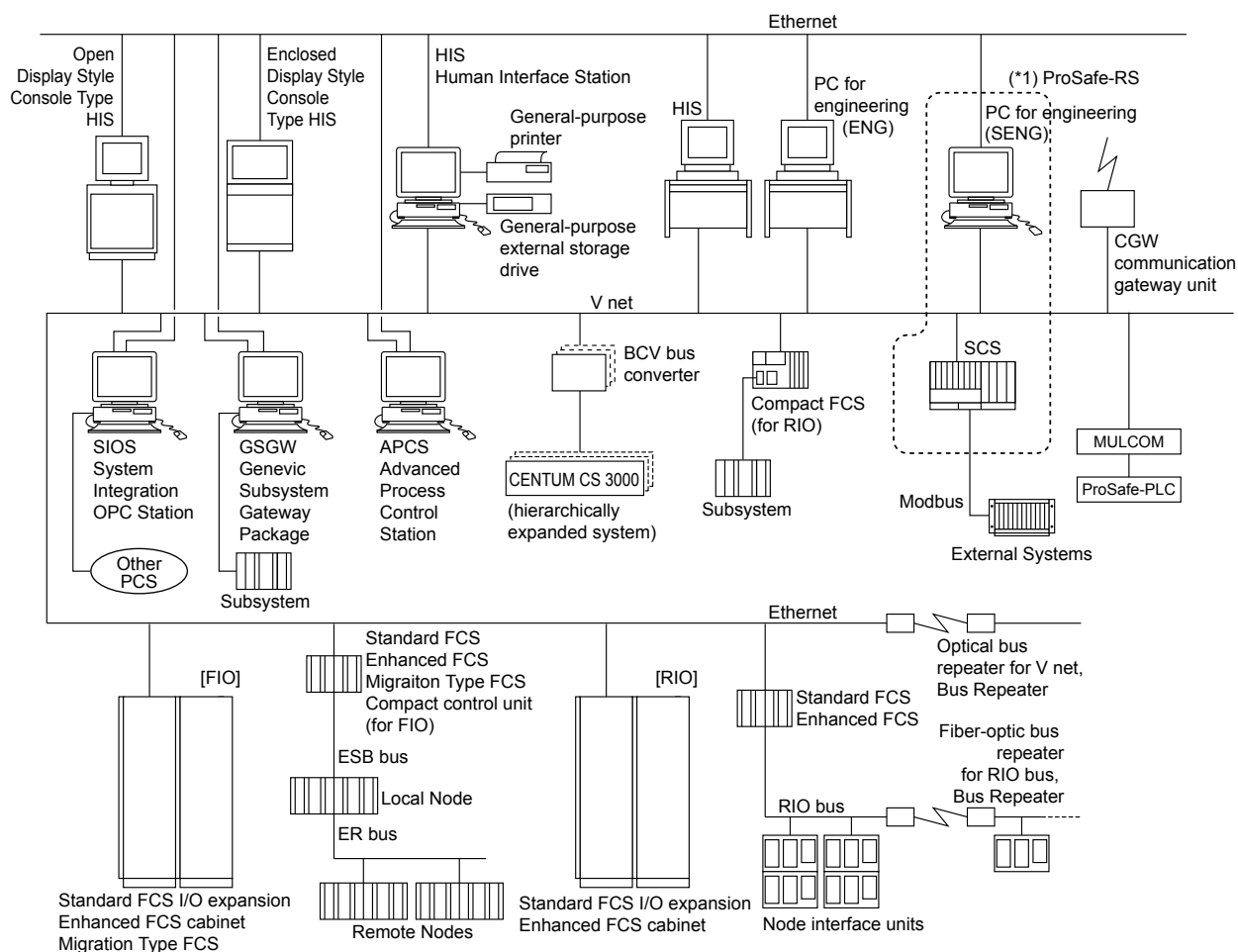
Figure System Configuration

*1: Supported by R3.06 or later versions.

■ NOTE ON SYSTEM CONFIGURATION

If the total number of connected PCs is nine or more, one or more server PCs (OS: Windows Server) are required for storing project data or audit trail data. Consult YOKOGAWA sales department for further examination.

Count the total number of connected PCs by using one of the equations shown below.

● For PC with Project Data

- When NOT using Engineering Tool for FOUNDATION fieldbus (SSS5700)
  Refer to Eq.1 of the table "Equations".
- When using Engineering Tool for FOUNDATION fieldbus (SSS5700, GS 33Y05P10-33E)
  Refer to Eq.2 of the table "Equations".
- When using Expanded Test Functions (LHS5425, GS 33Q04N11-31E)
  Running LHS5425 on three PCs requires a server computer; consult YOKOGAWA.

Table Equations

Eq.1	Total number of connected PCs = HIS + {(Eng - 1) x 2} + Exaopc
Eq.2	Total number of connected PCs = HIS + {(Eng - 1) x 2} + Exaopc + 2

HIS: Number of PCs including console type HISs with Standard Operation and Monitoring Function (Model: LHS1100 or LHM1101)
Count the total number of these packages in the project.

Eng: Number of PCs including console type HISs with Standard Builder Function (Model: LHS5100 or LHM5100)
Count the total number of these packages in the project. Count separately even if it is installed in a PC with Operation and Monitoring Function installed.

Exaopc: Number of PCs with Exaopc OPC Interface Package (Model: NTPF100, GS 36J02A10-01E)
Do not count Exaopc OPC Interface Package for HIS (Model: LHS2411, GS 33Q02L20-31E)

Multiple Project Connection Package

When using Multiple Project Connection Package (LHS4450, GS 33Q02S10-31E)
Server PCs are required to store project data both in the upper-level and the lower-level project according to the total number of connected PCs.

If CENTUM CS is used for the lower-level project, a server PC is not required for the project. Calculate the number for the upper-level project only.

Table Equation Selector when using Multiple Project Connection Package

		Engineering Tool for Fieldbus (Model: SSS5700)	
		Not used	Used
Multiple Project Connection Package (LHS4450) used in	Upper-level Projects	Eq.1	Eq.2
	Lower-level Projects	Eq.3	Eq.4

Table Equations when using Multiple Project Connection Package

Eq.3	Total number of connected PCs = HIS + {(Eng - 1) x 2} + Exaopc + α
Eq.4	Total number of connected PCs = HIS + {(Eng - 1) x 2} + Exaopc + 2 + α

Note: Refer to Eq.1, Eq 2 and the parameters of the table "Equations".
α: Number of HISs with Multiple Project Connection Package (Model: LHS4450) in the upper-level project

● For PC with Audit Trail Data

Total number of connected PCs = Eng + Recipe Management

Recipe Management: Number of PCs on which Audit Trail is running with Recipe Management
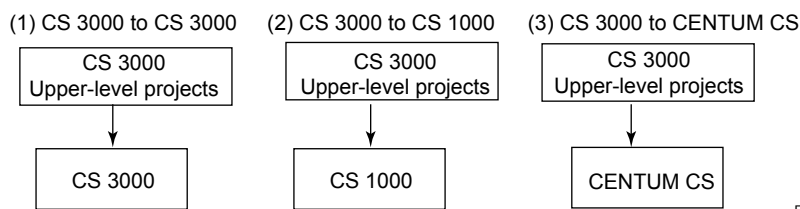
■ MULTIPLE PROJECT CONNECTION

These functions allow multiple projects involving CENTUM CS, CENTUM CS 1000, and CENTUM CS 3000 with duplicated names (duplicated tag names, project names etc. in different projects) and common resources (engineering unit codes, plant hierarchy names) to be monitored without making any changes.
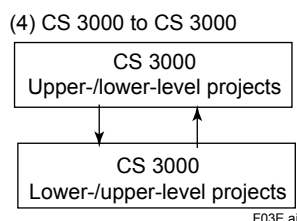
A CS 3000 project is defined as the upper-level project, by which you can operate and monitor the lower-level projects in CENTUM CS, CENTUM CS 1000, or CENTUM CS 3000.

The following interconnections are possible:

● **Hierarchical Connection**

(1) CS 3000 to CS 3000	(2) CS 3000 to CS 1000	(3) CS 3000 to CENTUM CS
CS 3000 Upper-level projects	CS 3000 Upper-level projects	CS 3000 Upper-level projects
↓	↓	↓
CS 3000	CS 1000	CENTUM CS

F02E.ai

● **Bidirectional Connection**

(4) CS 3000 to CS 3000

CS 3000
Upper-/lower-level projects

↓ ↑

CS 3000
Lower-/upper-level projects

F03E.ai

● **Format of Project Interconnection**

When there are more than one projects, the upper-level system (project) is connected by bus converter (BCV) to lower-level system (project) and could view tag data in the lower-level system (project). The Multiple Project Connection has several new functions as well as the inter-project gateway functions. The three different versions of the project interconnection functions are called Inter-Project Gateway functions, Project Integration functions, and Project Consolidation functions. The Multiple Project Connection is described in "Project Integration" below.

Inter-Project Gateway

The upper-level system (project) is CENTUM CS or CENTUM CS 3000, and the lower-level system (project) is CENTUM-XL or μXL. From the upper-level system (project), lower-level tag names can be viewed and manipulated, but not vice versa.

- Engineering must be performed for each project individually.
- FCS data can be read/written by tag name.
- The connection "key" is a "taglist". In addition to the original upper-level project taglist, you need to use a special lower-level taglist generation tool to create an additional project taglist for the lower-level project. (For example, use the CENTUM-XL taglist generation tool on CENTUM CS).

Project Integration (Multiple Project Connection)

The Multiple Project Connection has several new functions as well as the above connection functions:

- System Activity Status Display
- Sequence Table, SFC, SEBOL Status Displays
- Taglist Auto-Equalization functions (from lower-level to upper-level projects)
  When lower-level project tag data are added or deleted, the upper-level project taglist is automatically equalized.
- Bidirectional Connection (see Fig.(4) above, but only applies between CENTUM CS 3000 systems)
- Duplicate tag names (in lower-level and higher-level) resolved.

Project Consolidation

Multiple projects can be consolidated into a single project. This is quite computing-intensive work.

■ NETWORK SPECIFICATIONS

CENTUM CS 3000 uses V net, Ethernet, RIO bus , ESB bus and ER bus for communication with the configured stations.

● V net

- Application
  The V net is a real-time process control network used to connect system components.
- Communication Specifications
  Max. Number of Stations Connectable: 64 per domain
  Communication Method: Read/Write communication, message communication, link transmission
  Link Transmission Period: 100 msec
  Line Access Control: Token passing method
- Transmission Path Specifications
  Network Topology: Bus topology
  Transmission Speed: 10 megabits per sec
  Transmission Path: Dual-redundant or Single
- Conditions for Single Transmission Path
  The system should be CENTUM CS 3000 Entry class.
  The system should be composed of one V net domain.
  The domain should be composed of only the components allowing the single control bus.

Components Allowing the Single Control Bus

Station name	Station type	Note
FCS	PFCS-S Field Control Station (Standard Type)	Main Memory 8 MB
	PFCS-E Field Control Station (Enhanced Type)	Main Memory 16 MB
	GSGW Generic Subsystem Gateway	
	AFF50S Field Control Unit (for FIO, 19" Rack Mountable Type)	
HIS	General-Purpose PC with Operation and Monitoring Function	
	LPCKIT Enclosed Display Style Console Assembly	
	YPCKIT Open Display Style Console Assembly	
BCV	ABC11S-Q Bus Converter (For Single V net)	
	ABC11S-A Bus Converter (For Single VL net)	
	ABC11S-L Bus Converter (For Single RL bus)	
CGW	ACG10S-E Communication Gateway Unit (Text Mode)	
	ACG10S-F Communication Gateway Unit (Frame Mode)	

Transmission Cable:

    YCB111/YCB141 coaxial cables: HISes and Compact Field Control Unit (for FIO) are connected by YCB141, other stations by YCB111.
        Use YCB147/YCB149 Bus Adapter Unit, or YNT512□ Bus Repeater to connect a YCB141 cable to a YCB111 cable.
        One grounding unit (YCB117) per segment (*1) should be used when connecting YCB111 cable.
    Optical fiber cable: Use YNT511D/YNT522D Optical Bus Repeater

Transmission Distance:

    YCB111/YCB141 coaxial cable:
      Max. transmission distance: 500 m (for YCB111),
            185 m (for YCB141)
      Number of devices connectable when using only YCB141: 30 per segment (*1)
      When mixing YCB111 and YCB141: Length of YCB141 + 0.4 x Length of YCB111 ≤ 185
      Number of Bus Adapter Units: Max. 4 per segment (*1)
      Number of devices connectable: 30 , including Bus Adapter Units per segment (*1)
    *1:   If repeaters are used on V net, each part of the V net segregated by a repeater is referred to as a segment.

    For Bus Repeater and Optical Bus Repeater:
      Maximum extension distance per bus repeater (YNT512S, YNT512D) is 500 m.
      Maximum extension distance for a pair of optical bus repeater (YNT511S, YNT511D) is 4 km.
      Maximum extension distance for a pair of optical bus repeater (YNT522S, YNT522D) is 15 km.
      Maximum number of bus repeater and optical bus repeater mountable between any two stations is 8.
      Optical bus repeater; however, must be used in pairs.
      Transmission distance is limited by the number of bus repeater.
      L = 24 - n
        L: transmission distance (km)
        n: number of bus repeater and optical bus repeater

    Total transmission distance is the lesser of the sum of the maximum extension distance for each device and coaxial cable length, or L, calculated above.

Calculation example of transmission distance in optical bus repeater connection is shown below.
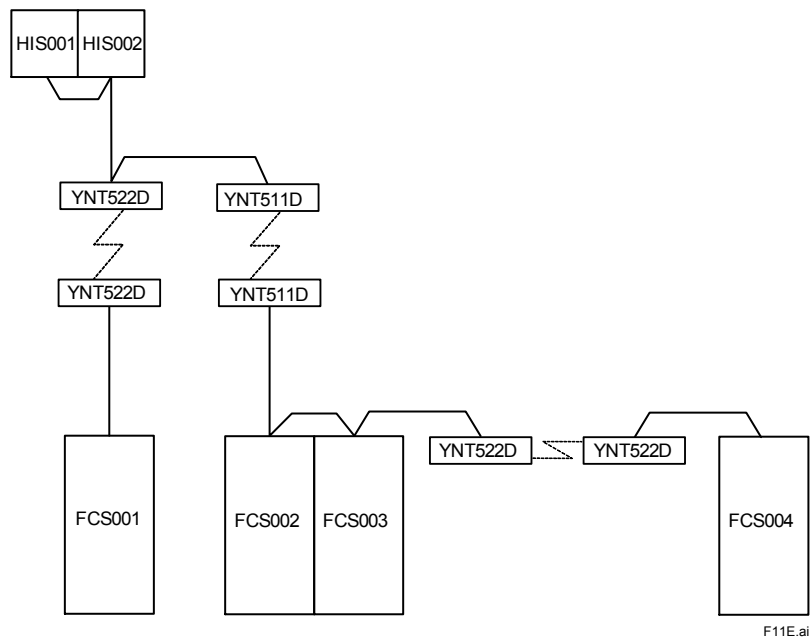

Figure: Example of Optical Bus Repeater Connection

Example 1: From HIS001 to FCS001
   When a pair of optical bus repeater for 15 km is mounted,
   transmission distance depending on the number of bus repeater and optical bus repeater = 24 - 2 = 22 km,
   the sum of the maximum extension distance for each device and coaxial cable length = 0.5 + 15 + 0.5 = 16 km.
   Therefore, the total transmission distance is 16 km.

Example 2: From HIS001 to FCS004
   When 4 optical bus repeaters (one pair of 4 km and one pair of 15 km) are mounted,
   transmission distance depending on the number of bus repeater and optical bus repeater = 24 - 4 = 20 km,
   the sum of the maximum extension distance for each device and coaxial cable length = 0.5 + 4 + 0.5 + 15 + 0.5
        = 20.5 km.
   Therefore, the total transmission distance is 20 km.

Example 3: From FCS001 to FCS004
   When 6 optical bus repeaters (one pair of 4 km and two pairs of 15 km) are mounted,
   transmission distance depending on the number of bus repeater and optical bus repeater = 24 - 6 = 18 km,
   the sum of the maximum extension distance for each device and coaxial cable length = 0.5 + 15 + 0.5 + 4 + 0.5
        + 15 + 0.5 = 36 km.
   Therefore, the total transmission distance is 18 km.

Maximum number of pairs for optical bus repeater:
  It is possible to use four sets of 2 optical bus repeaters.
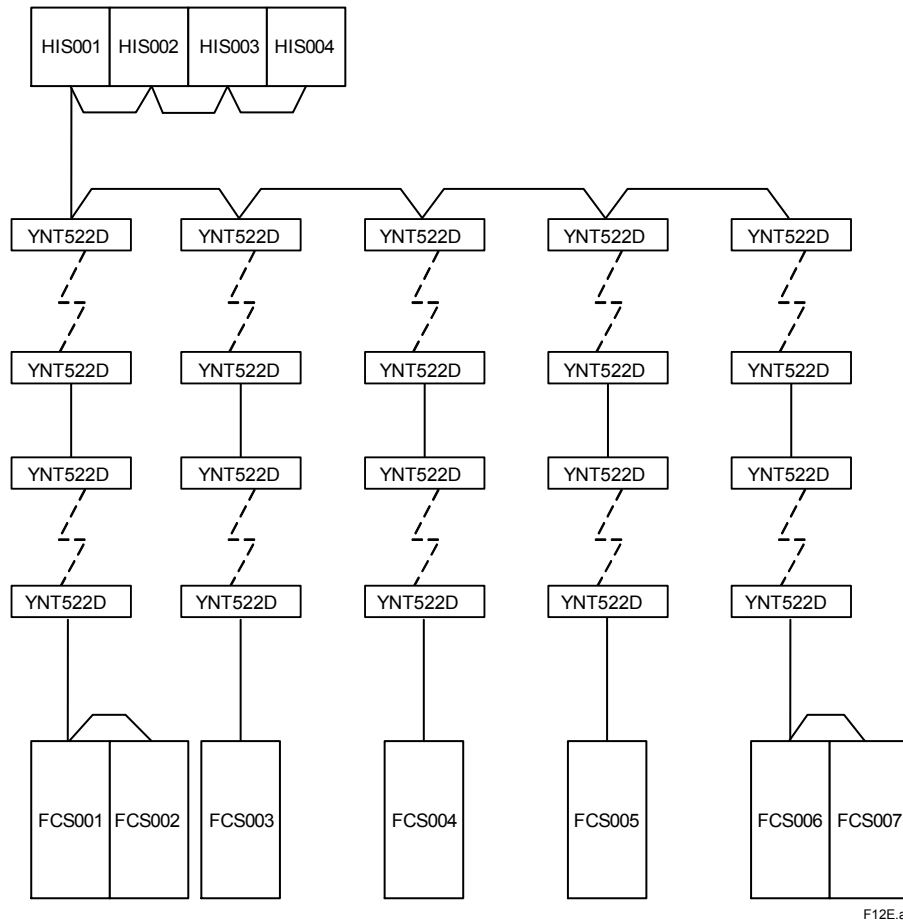 The following indicates an example of optical bus repeater connection.

```
┌──────┬──────┬──────┬──────┐
│HIS001│HIS002│HIS003│HIS004│
└──────┴──────┴──────┴──────┘


┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐
│YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│
└───────┘  └───────┘  └───────┘  └───────┘  └───────┘

┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐
│YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│
└───────┘  └───────┘  └───────┘  └───────┘  └───────┘

┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐
│YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│
└───────┘  └───────┘  └───────┘  └───────┘  └───────┘

┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐  ┌───────┐
│YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│  │YNT522D│
└───────┘  └───────┘  └───────┘  └───────┘  └───────┘

┌──────┬──────┐┌──────┐ ┌──────┐   ┌──────┐   ┌──────┬──────┐
│FCS001│FCS002││FCS003│ │FCS004│   │FCS005│   │FCS006│FCS007│
└──────┴──────┘└──────┘ └──────┘   └──────┘   └──────┴──────┘
```

F12E.ai

Figure: Example of Optical Bus Repeater in Star Type Connection

● Ethernet

• Application
  The Ethernet is an information network used to interconnect HISes within the system.
• Communication Specifications
  Connectable Devices: HIS (max. 16) and PC for builder
  IEEE 802.3 Compliant
  No Ethernet Required
  - The system should be CENTUM CS 3000 Entry class.
  - The system should be composed of one V net domain.
  However, Ethernet is necessary in the following circumstances due to addition of a component etc.
  - When there are more than one domain and the communication such as the equalization between domains is
        necessary.
  - When V net load is high.
  - When the number of graphic windows is more than 1000 or the number of trend blocks is more than 8.
  - When connecting the components requiring Ethernet.
  - When using the Consolidated Alarm Management Software (CAMS for HIS)

Components Requiring Ethernet

Station name	Station type
FCS	APCS Advanced Process Control Station
	GSGW Generic Subsystem Gateway
HIS	HIS-TSE HIS with Remote Operation and Monitoring Function
SENG	Safety Engineering PC
BCV	SIOS System Integration OPC Station

  - When more than 9 HISes are connected.
  - More than 8000 tags for monitoring in one project.

● RIO Bus (Standard FCS for RIO)

• Application
  The RIO bus is a remote I/O communication bus which connects the FCS processor and the remote I/O portion
  (node).
• Communication Specifications
  Max. No. of Connectable Devices: 8 nodes
• Transmission Path Specifications
  Network Topology: Bus topology
  Transmission Path Redundancy: Available
  Transmission Speed: 2 megabits per sec
  Transmission Cable:
          Twisted pair cable
          Optical fiber cable (Use YNT511□ Optical Bus Repeater)
  Transmission Distance:
    Twisted pair cable:
      Max. transmission distance: 750 m
    For Bus Repeater and Optical Bus Repeater:
      Maximum extension distance per bus repeater (YNT512S, YNT512D) is 750 m
      Maximum extension distance for a pair of optical bus repeater (YNT511S, YNT511D) is 4 km
      Maximum number of bus repeater and optical bus repeater mountable between any two stations is 8.
      Optical bus repeater; however, must be used in pairs
      Transmission distance is limited by the number of bus repeater.
      $L = 30 - 2.5 \times n$
        L: transmission distance (km)
        n: number of bus repeater and optical bus repeater

  Total transmission distance is the lesser of the sum of the maximum extension distance for each device and
  coaxial cable length, or L, calculated above.

● **ESB Bus (standard FCS for FIO, enhanced FCS for FIO)**

• Application
An input/output communication bus used in an FCS for FIO. The ESB bus connects the processing unit of an FCS to node units, which are thus called Local Node units.
• Communication Specifications
Connectable Devices: node units

Maximum Number of Connectable Devices

The number of local node units that can be connected to an ESB bus varies according to models and databases selected.

Model	Maximum Number of Local Nodes	Total Number of Local and Remote Node Units
Compact-type FCS (for FIO) (*1)	3	3
Enhanced FCS with expanded databases	10	15
Other than the above	10	10

*1: If local and remote node units are used, ESB Bus Coupler module (EC401) should be installed in slot 7 and slot 8 and also Node Expansion Package for Compact Field Control Unit (for FIO) is needed.

• Transmission Path Specifications
Network Topology: Bus topology
Transmission Path Redundancy: Available
Transmission Speed: 128 megabits per second
Transmission Cable: Dedicated cable (YCB301)
Transmission Distance: Max. 10 m

● **ER Bus (standard FCS for FIO, enhanced FCS for FIO)**

• Application
An input/output communication bus used in an FCS for FIO. The ER bus connects a node unit that is directly connected to an FCS's processing unit via ESB bus, to remote node units.
• Communication Specifications
Connectable Devices: Remote node units
Number of ER bus: Max. 4 per FCU

Maximum Number of Connectable Devices

The number of local node units that can be connected to an ER bus varies according to models and databases selected.

Model	Maximum Number of Remote Nodes	Total Number of Local and Remote Nodes
Compact-type FCS (for FIO)	3	3
Enhanced FCS with expanded databases	14 (*1)	15
Other than the above	9 (*1)	10

*1: Up to 8 remote nodes per ER bus can be connected.

- Transmission Path Specifications
  Network Topology: Bus topology
  Transmission Path Redundancy: Available
  Transmission Speed: 10 megabits per second
  Transmission Cable: Coaxial cable (YCB141, YCB311). Use YCB147/YCB149 Bus Adapter Unit to connect a
  YCB141 cable to a YCB311 cable.
  One grounding unit (YCB117) per segment (*1) should be used when connecting YCB311 cable.
  Transmission Distance:
  YCB141: Max.185 m
  When mixing YCB141 and YCB311:
  Length of YCB141 + (185/500) x Length of YCB311 ≤ 185
  Number of Bus Adapter Units: Max. 4 per segment (*1)
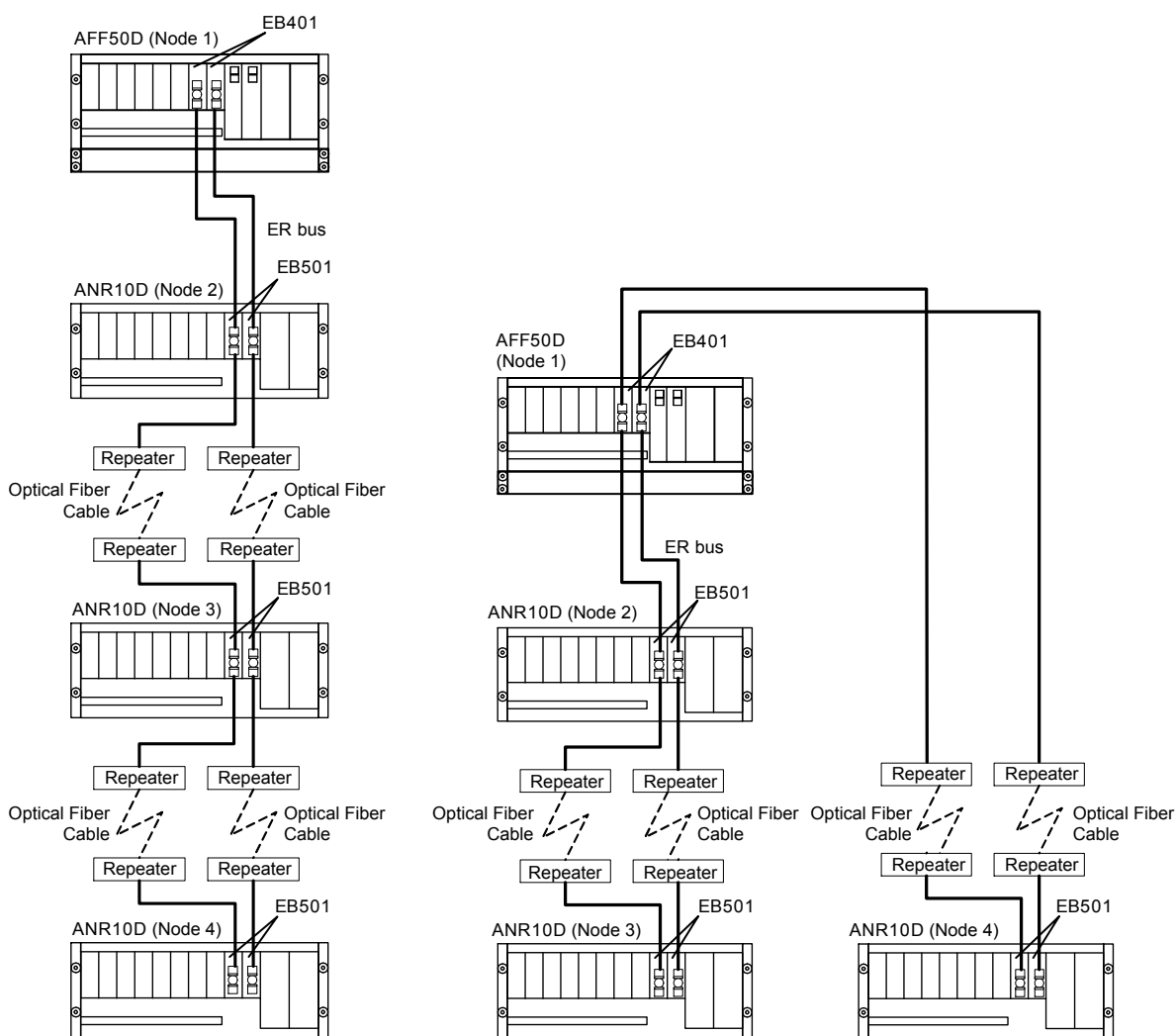 General-purpose Ethernet Repeater:
  The total transmission distance is limited by the number of repeaters.
  $L \leq 4 - 0.5 \times n$
  L: total transmission distance (km)
  n: the number of the general-purpose Ethernet repeater (Max. 4 repeaters)
  *1:   If repeaters are used on ER bus, each part of the ER bus segregated by a repeater is referred to as a segment.
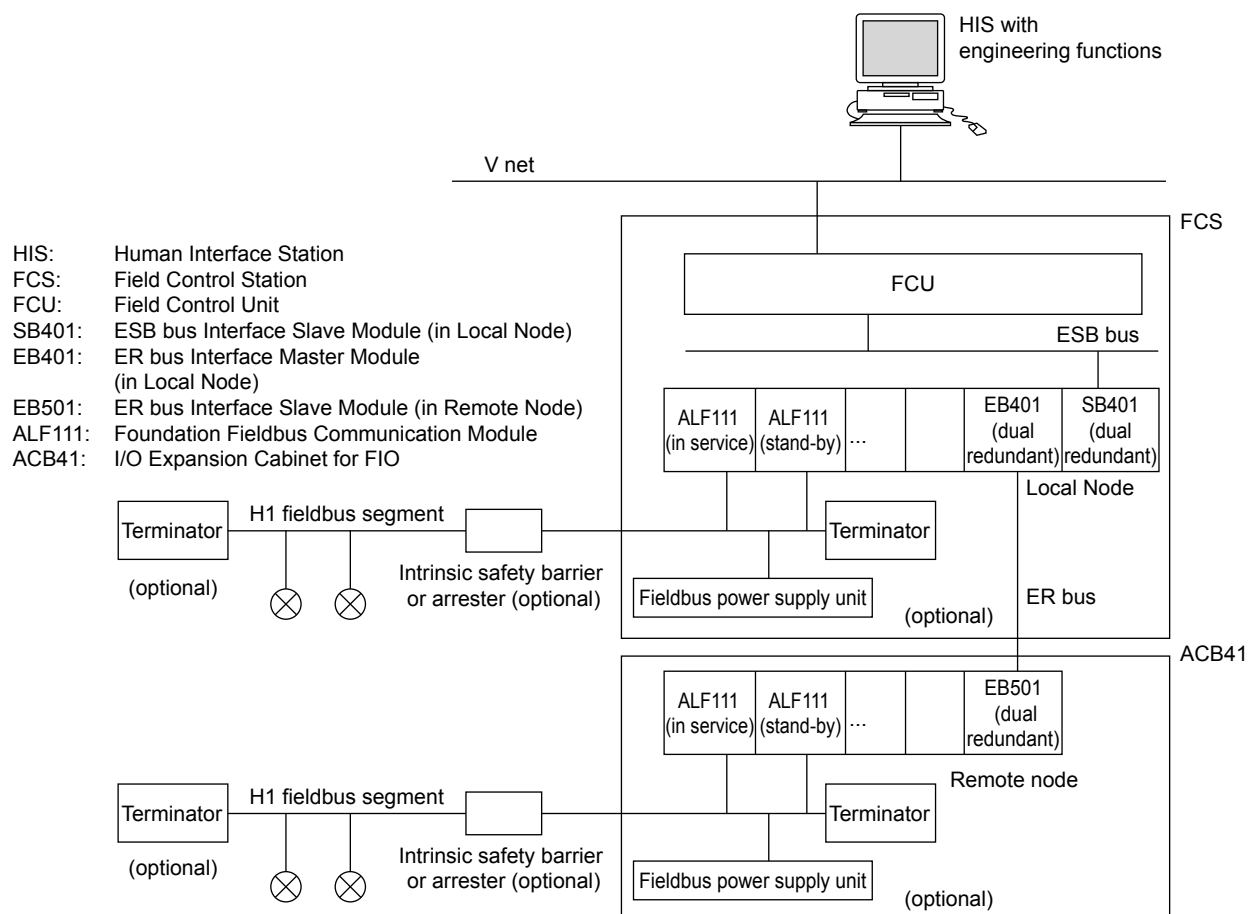

Figure Example of ER Bus Connection

■ FIELDBUS SPECIFICATIONS

● An Example of Fieldbus Connection under FIO

HIS with engineering functions

V net

FCS

FCU

ESB bus

HIS: Human Interface Station
FCS: Field Control Station
FCU: Field Control Unit
SB401: ESB bus Interface Slave Module (in Local Node)
EB401: ER bus Interface Master Module (in Local Node)
EB501: ER bus Interface Slave Module (in Remote Node)
ALF111: Foundation Fieldbus Communication Module
ACB41: I/O Expansion Cabinet for FIO

ALF111 (in service) | ALF111 (stand-by) | ⋯ | EB401 (dual redundant) | SB401 (dual redundant)

Local Node

Terminator | H1 fieldbus segment

(optional)

Intrinsic safety barrier or arrester (optional)

Terminator

Fieldbus power supply unit

(optional)

ER bus

ACB41

ALF111 (in service) | ALF111 (stand-by) | ⋯ | EB501 (dual redundant)

Remote node

Terminator | H1 fieldbus segment

(optional)

Intrinsic safety barrier or arrester (optional)

Terminator

Fieldbus power supply unit

(optional)

F05E.ai

Figure Fieldbus System Configuration (Bus with Spurs)

Fieldbus Specifications
Conforms to Foundation fieldbus. For transmission specifications, see "Foundation Fieldbus Communication Package (for ALF111)" (GS 33Q03L60-31E).

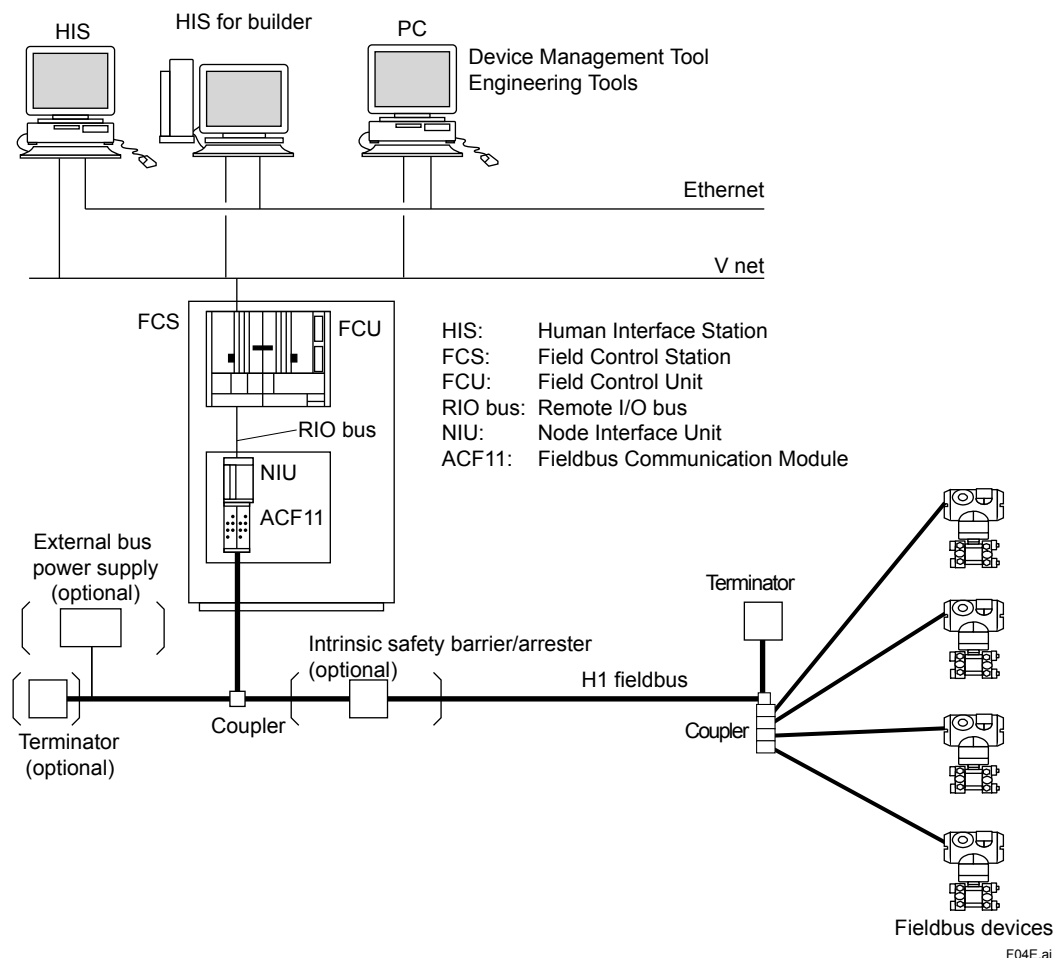● **An Example of Fieldbus Connection under RIO**

HIS:	Human Interface Station
FCS:	Field Control Station
FCU:	Field Control Unit
RIO bus:	Remote I/O bus
NIU:	Node Interface Unit
ACF11:	Fieldbus Communication Module

F04E.ai

Figure Fieldbus System Configuration (Tree Type)

Fieldbus Specifications
Conforms to Foundation fieldbus. For transmission specifications, see "Foundation Fieldbus Communication Package (for ACF11)" (GS 33Q03L50-31E).

● **Effect of AKB336 Signal Cables on the total length of Fieldbus wiring**

When connecting the ALF111 Foundation Fieldbus Communication Module to the AEF9D Terminal Board for Fieldbus, use AKB336 signal cables. These cables are used as branch cables for tree-type wiring; therefore, you should include the length of the AKB336 cable with the total length of cable for the Fieldbus.

When using Type A cables as Fieldbus cables, include twice the length of the AKB336 cable with the total length of cable for the Fieldbus. Twice the length of the AKB336 cable must be less than the maximum length of the associated branch cable. The maximum length of a tree branch when using Type A cables is limited as shown below.

 • When Type A cables are used as Fieldbus cables
 • Maximum length of branch depends on the number of devices connected:
   1 to 12 devices: 120 meters
   13 to 14 devices: 90 meters
   15 to 18 devices: 60 meters
   19 to 24 devices: 30 meters
   25 to 32 devices: 0 meter
 • Branches of less than 1 meter are not included in the above limitation.
 • Trunk cable length (trunk line cable)
   Up to {(maximum total length of Type A cable: 1900 meters) - (total branch length)}
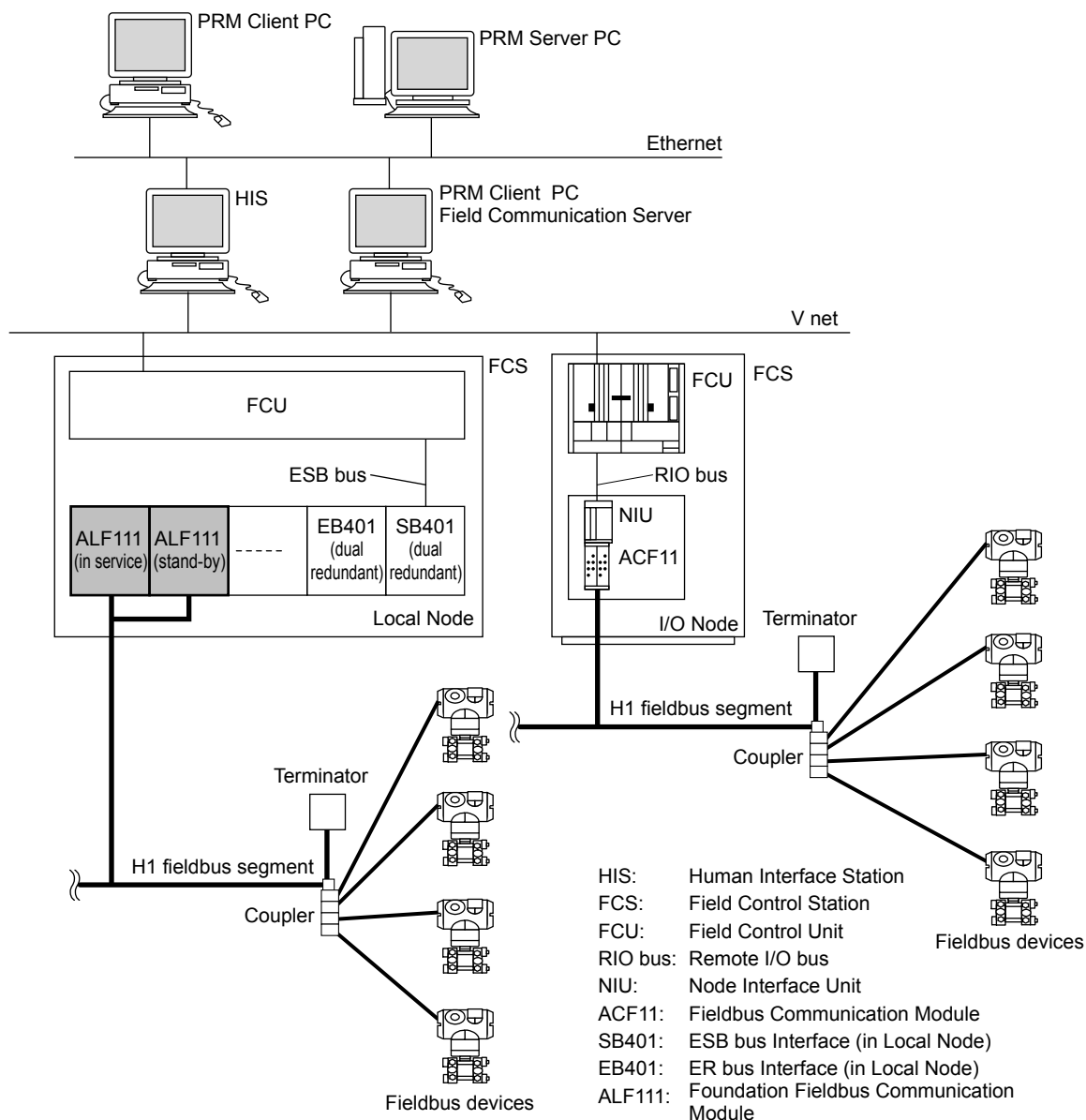
■ PLANT RESOURCE MANAGER (PRM) SPECIFICATIONS

Plant Resource Manger (hereinafter referred to as PRM) consists of three components: PRM Server, PRM Client, and Field Communications Server.

PRM supports the conventional 4 to 20 mA analog devices, Foundation Fieldbus devices (FF devices), and HART devices.

The following indicates the system configuration for Foundation Fieldbus and HART.

● System Configuration When Connecting Foundation Fieldbus

PRM Configuration

HIS: Human Interface Station
FCS: Field Control Station
FCU: Field Control Unit
RIO bus: Remote I/O bus
NIU: Node Interface Unit
ACF11:   Fieldbus Communication Module
SB401:   ESB bus Interface (in Local Node)
EB401:   ER bus Interface (in Local Node)
ALF111: Foundation Fieldbus Communication Module

F06E.ai

Figure System Configuration

PRM Specifications
For details, see GS 33Y05Q10-32E.

● System Configuration When Connecting HART

Two system configurations are available for managing HART devices as below:

• V net connection via HART Modules
• Serial port connection via Multiplexer

V net connection via HART Modules (FCS for FIO)
Field communication server communicates with HART devices via HART modules by using the on-demand communication functions of FCS.
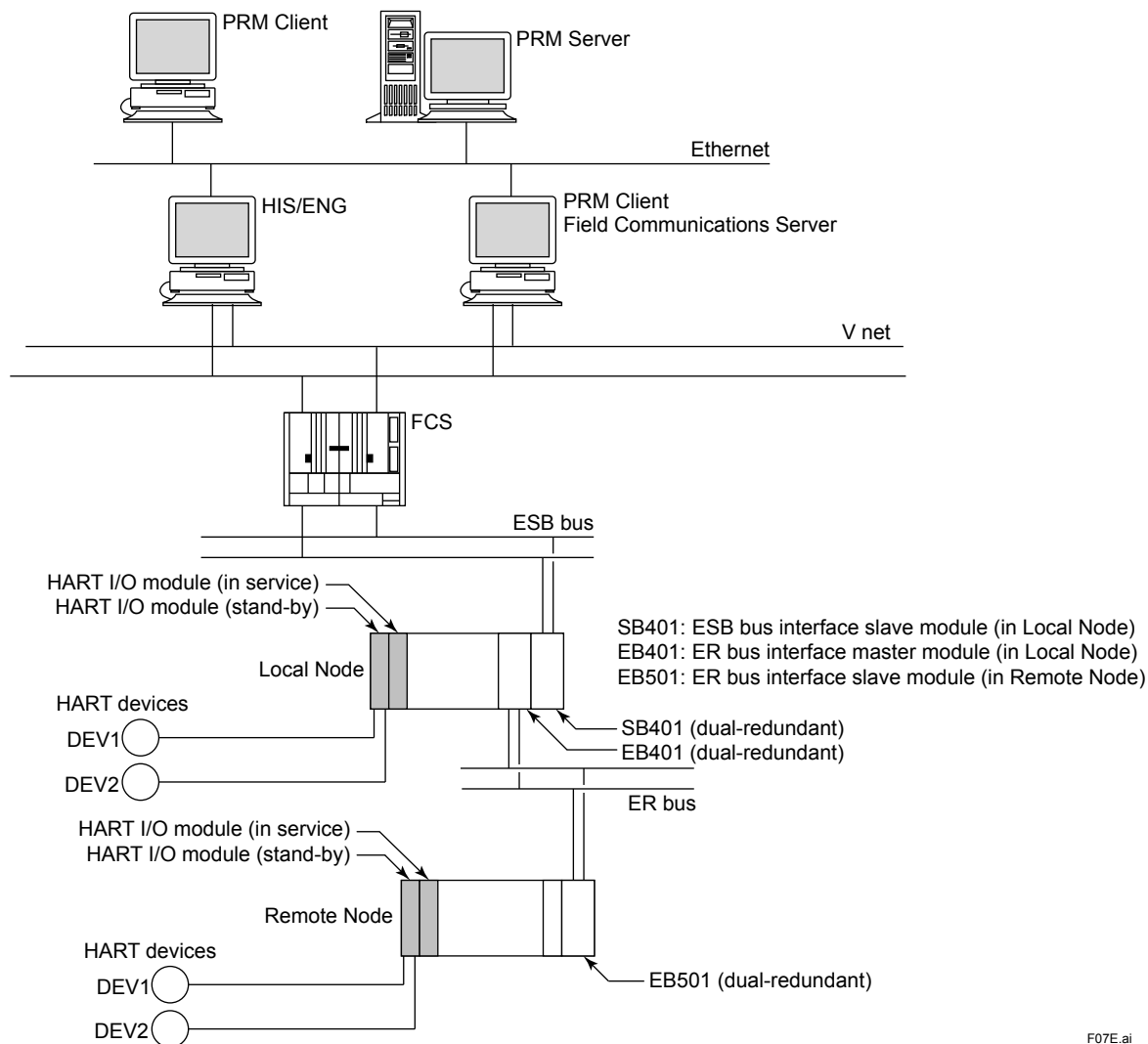
Figure V net Connection via HART Modules (FCS for FIO)

Note: PRM server, PRM client, and Field communication server can perform on the same PC.

Serial port connection via Multiplexer (FCS for RIO)
LFCS (SFCS) communicates with HART devices via Multiplexer connected with serial port of Field communication server.
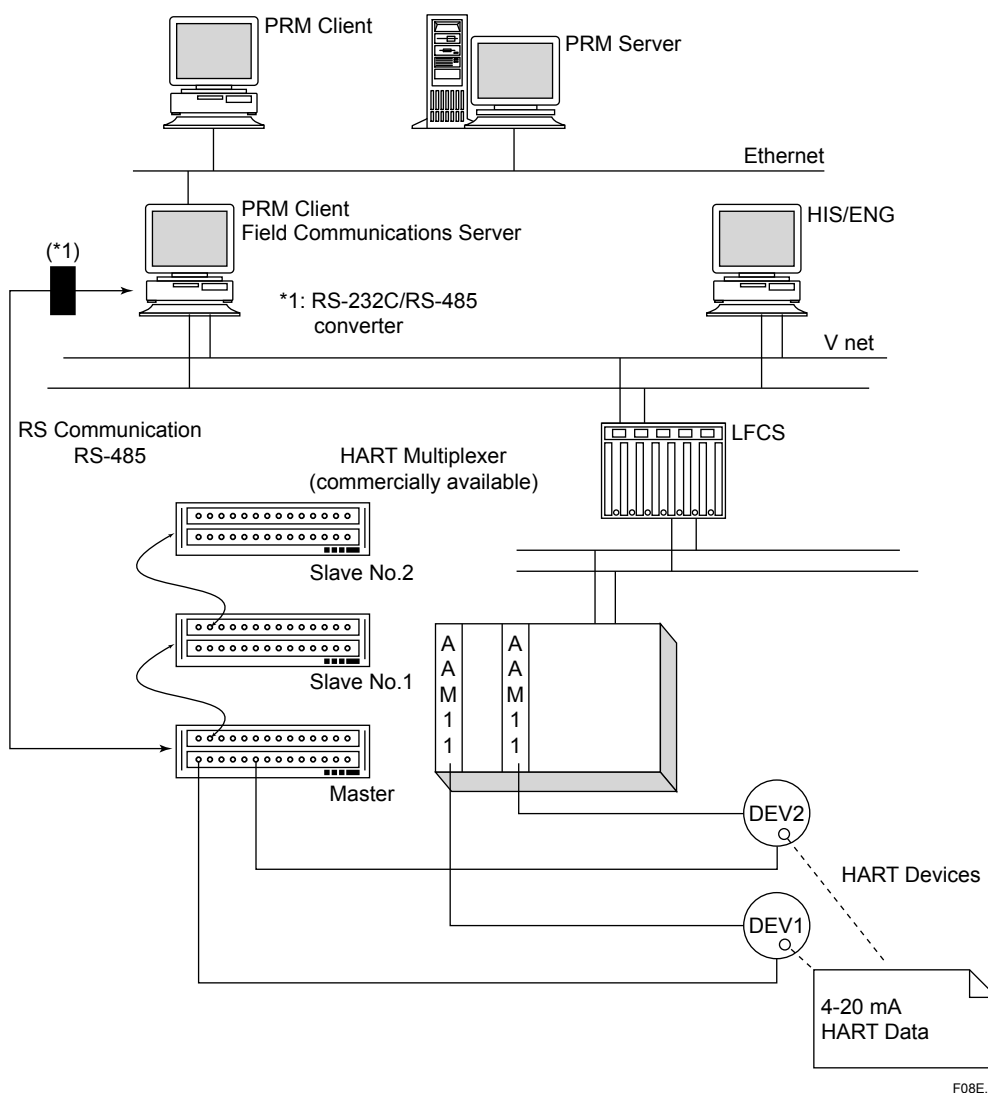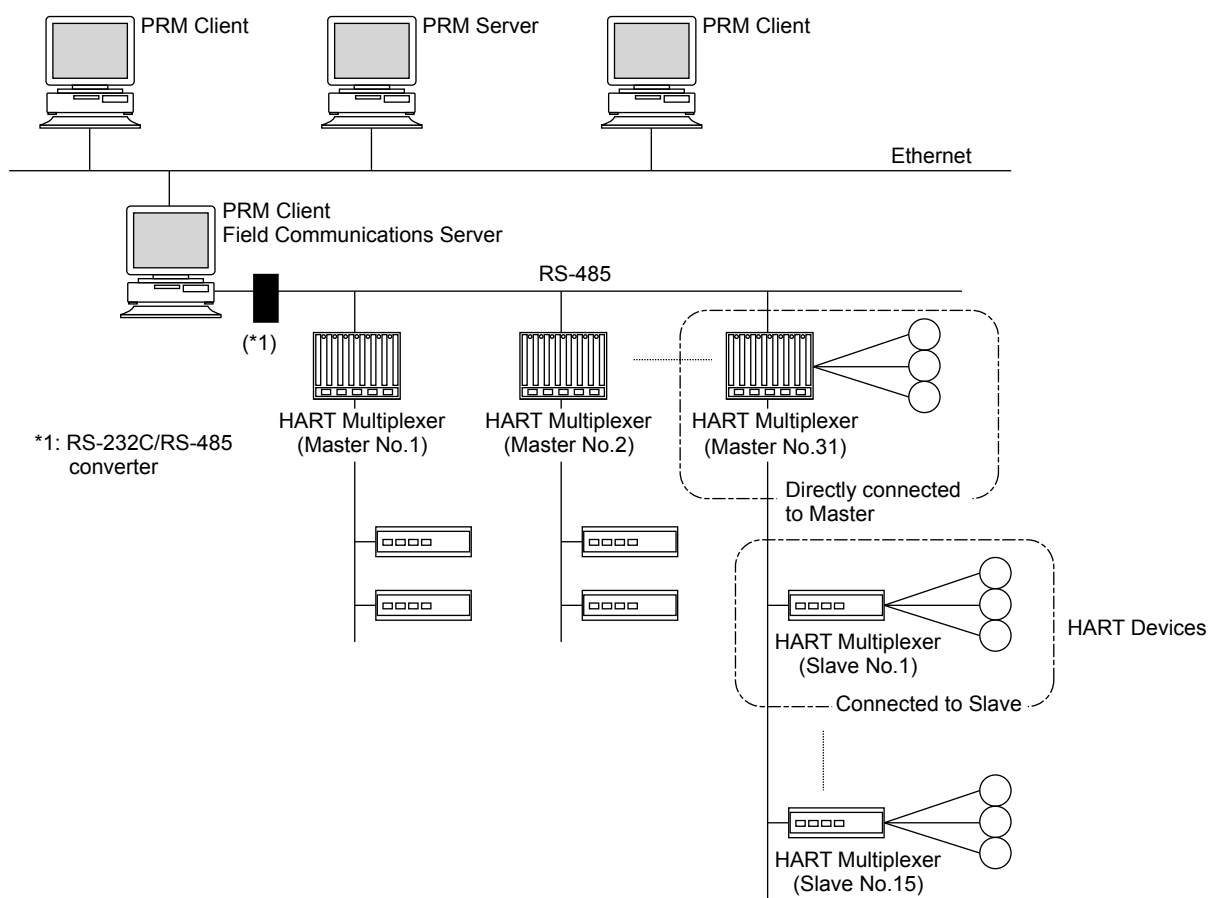

Figure Serial Port Connection via Multiplexer (Parallel Connection and Two Ways Data Flow)

Note: PRM server, PRM client, and Field communication server can perform on the same PC.

Serial port connection via Multiplexer (For using P&F Multiplexer)
When using P&F Multiplexer, can connect as follows without connecting CENTUM system.

Figure An Example of P&F Multiplexer Connection

Note: PRM server, PRM client, and Field communication server can perform on the same PC.

GS 33Q01B10-31E Oct. 22, 2007-00

■ FDA:21 CFR PART 11 COMPLIANT FUNCTIONS

This section explains the functions that are compliant with 21 CFR Part 11 in the Federal Regulations issued by US FDA (Food and Drug Administration). FDA:21 CFR Part 11 is the regulation regarding "Electronic Records" and "Electronic Signatures".

This regulation is applied to the pharmaceutical production system exported to US.

The compliant functions, required for control systems, are classified into "Personnel Authentication" and "Audit trail".

The typical items of regulation are as follows:

21 CFR Part 11 Subpart B ... Electronic Records

11.10   Controls for closed systems.

(d) Limiting system access to authorized individuals.

For above regulation, CENTUM CS 3000 has separate access control functions for operation and monitoring of operators, system maintenance of system engineers, and recipe creation of recipe engineers. Besides the conventional-personnel authentication by user name and password, CENTUM CS 3000 R3.02 (or later version) has the functions: setting the validity of password, setting the number of break-ins (alert when wrong operations for authentication are performed continuously more than the number of times set previously, and so on), and automatic user shut-out function (*1) (automatically shutting user out when keyboard or mouse is not used at the time set previously).

> *1:   Automatic user shut-out function is available only for HIS operation and monitoring basic functions.

(e) Use of secure, computer-generated, time-stamped audit trails to independently record the date and time of operator entries and actions that create, modify, or delete electronic records. Record changes shall not obscure previously recorded information. Such audit trail documentation shall be retained for a period at least as long as that required for the subject electronic records and shall be available for agency review and copying.

For above regulation, CENTUM CS 3000 has separate audit trail management functions for operation and monitoring performed by operators, system maintenance performed by system engineers(*2), report creation performed by report user and recipe creation performed by recipe engineers. CENTUM CS 3000 automatically records 5W1H (When, Who, What, Where, Why, How) as the audit trail information.

> *2:   Fieldbus tool and OPC function are not yet supported. (planned)

● System Configuration Example for FDA:21 CFR Part 11 compliant

Recipe management function is available only when using CS Batch 3000 Package.
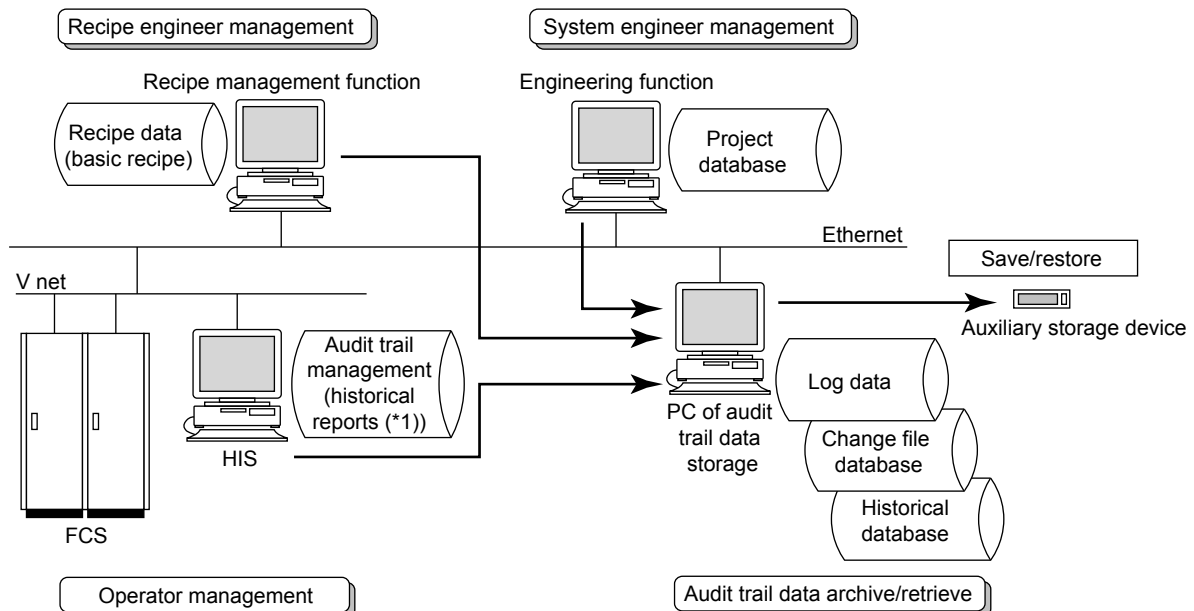
*1: Audit trail management data of operator's action is stored as historical report in the operated HIS.
The historical reports stored in multiple HISes are transferred to the PC with audit trail data to consolidate the data management.

F10E.ai

Figure System Configuration Example for FDA:21 CFR Part 11 compliant

■ CENTUM CS 3000 ENTRY CLASS

CENTUM CS 3000 Entry class is available as a system for small scale plants.

● Components and Software

In CS 3000 Entry Class, use the package for Entry Class as a package for HIS. Any model of FCS is available.

● Operation and Monitoring Software

The following software packages are available as packages for Entry Class.

For other packages, the packages common to the usual CS 3000 system can be used. However, Million Tag Handling Package (LHS4000) cannot be used in HIS in which LHM1101 is installed.

Operation and Monitoring Software

Entry Class Model Name	Software Name	Note
LHM1101	Standard Operation and Monitoring Function	Number of operation and monitoring tags is up to 8000.
LHM1150	Server for Remote Operation and Monitoring Function	-
LHM4410	Control Drawing Status Display Package	-
LHM4420	Logic Chart Status Display Package	-
LHM6600	CS Batch 3000 Process Management Package	Number of Active recipes Type A: 4 or less Type B: 10 or less Type C: 999 or less
LHM6710	FCS Data Setting/ Acquisition Package (PICOT)	-

Engineering Software

Entry Class Model Name	Software Name	Note
LHM5100	Standard Builder Function	ABC11D-H□□□□ is not available.
LHM5150	Test Function	-
LHM5490	Self-documentation Package	-

● Restrictions

For CENTUM CS 3000 Entry Class, the following restrictions apply.

- Only one domain per system
- The HIS in a CENTUM CS 3000 Entry Class project cannot access the FCSs in other projects of CENTUM CS 3000 and CENTUM CS 3000 Entry Class.
- The HIS in a CENTUM CS 3000 Entry Class project can access the FCSs in the μXL system, but not other former CENTUM systems.

■ INSTALLATION AND ENVIRONMENTAL CONDITIONS

The installation and environment conditions of Yokogawa's components (not including the general-purpose PC, Console HISs, Node Units for FIO, I/O Modules) are shown as follows.

For a general-purpose PC, see its specifications. For an Enclosed Display Style Console Type HIS, an Open Display Style Console Type HIS, a Node Unit for FIO, or an I/O Module, see General Specifications for each devices (GS 33Q06B40-31E, GS 33Q06B50-31E, or GS 33Q06Q01-31E).

Ambient Temperature:
  5 to 40 °C (YAX101, YAX801, YAX211)
  0 to 50 °C (FCS, BCV, Bus repeater, CGW, Node Unit for RIO)
Ambient Humidity:
  20 to 80 % RH
  10 to 90 % RH (FCS, BCV, Bus repeater, CGW, Node Unit for RIO)
  No condensation
Temperature Change Rate: ±10 °C per hour
Power Supply:
  100-120 V AC Spec: Voltage 100-120 V AC ±10 %; Frequency 50/60 ±3 Hz
  220-240 V AC Spec: Voltage 220-240 V AC ±10 %; Frequency 50/60 ±3 Hz
  24 V DC Spec: Voltage 24 V DC ±10 %
Withstanding Voltage:
  100-120 and 220-240 V AC: 1500 V AC for 1 minute
  24 V DC: 500 V AC for 1 minute
Insulation Resistance:
  20 MΩ at 500 V DC
  10 MΩ at 500 V DC (YAX101, YAX801, YAX211)
Grounding: Independent ground of up to 100 Ω resistance
Noise:
  Electrical Field:
    Up to 3 V/m (26 MHz to 1.0 GHz)
    Up to 3 V/m (1.4 to 2.0 GHz)
    Up to 1 V/m (2.0 to 2.7 GHz)
  Magnetic Field:
    Up to 30 A/m (AC), Up to 400 A/m (DC)
  Static: Up to 4 kV (direct discharge), Up to 8 kV (aerial discharge)
Continuous Vibration:
  Displacement amplitude: Up to 0.25 mm (1 to 14 Hz)
  Acceleration: Up to 2 m/s^2 (14 to 100 Hz)

■ REGULATORY COMPLIANCE

The standards that the CENTUM CS 3000 hardware components conform to are listed below. See respective General Specifications to confirm each device's compliance information.

Safety Standards (*1) (*2) (*3)
[CSA]
    CAN/CSA-C22.2 No.61010-1
[CE Marking] Low Voltage Directive
    EN 61010-1 and EN 61010-2-030

EMC Conformity Standards (*2)
[CE Marking] EMC Directive
    EN 55011 Class A Group 1 (*4)
    EN 61000-6-2 (*5)
    EN 61000-3-2 (*6)
    EN 61000-3-3 (*7)
[C-Tick Marking]
    EN 55011 Class A Group 1 (*4)
[KC Marking]
    Korea Electromagnetic Conformity Standard

Standards for Hazardous Location Equipment
For selecting the right products for explosion protection, please refer to TI 33Q01J30-01E without fail.

[CSA Non-Incendive] (*8)
    Class I, Division 2, Groups A, B, C and D
            Temperature code T4
    CAN/CSA-C22.2 No. 0-M91
    CAN/CSA-C22.2 No. 0.4-04
    CAN/CSA-C22.2 No. 157-92
    C22.2 No. 213-M1987
    TN-078
    (for 100-120 V AC and 24 V DC power supply)
[FM Non-Incendive] (*9)
    Class I, Division 2, Groups A, B, C and D
            Temperature code T4
    Class 3600: 1998
    Class 3611: 2004
    Class 3810: 2005
    (for 100-120 V AC, 220-240 V AC and 24 V DC
            power supply)
[Type n] (*10) (*11)
    II 3 G Ex nA IIC T4 Gc
    EN 60079-0:2009
    EN 60079-0:2012
    EN 60079-15:2010
    (for 24V DC power supply)
    II 3G EEx nA II T4
    EN 50021: 1999
    (I/O Module with built-in barrier, for 24 V DC power
            supply)
[Type i (Intrinsic Safety)]
    II (1) G D [EEx ia] II C
    EN 50014: 1997 +A1 +A2
    EN 50020: 1994
[FM Intrinsic Safety]
    Associated intrinsically safe apparatus for connection to
    Class I, II and III, Division 1, Groups A, B, C, D, E, F
            and G or
    Class I, Zone 0, Group II C
    Class 3600: 1998
    Class 3610: 2010
    ANSI/ISA-60079-0: 2009
    ANSI/ISA-60079-11: 2009

Note: According to the New Approach Directive, the manufacturer and the representative office in EU are indicated below:
Manufacturer: Yokogawa Electric Corporation (2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan).
Representative office in EU Community: Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, The Netherlands).

*1:   For ensuring all the hardware devices to satisfy the safety standards, the dedicated breakers in the power supply distribution board must conform to the following specifications.
        [CSA] CSA C22.2 No.5 or UL 489
        [CE Marking] EN 60947-1 and EN 60947-3
*2:   To conform to the safety standards and the EMC conformity standards, install the 19-inch rack mountable type devices in a keyed metallic cabinet.
*3:   Measurement inputs of this equipment are applied to Measurement category I for IEC/EN/CSA 61010-1:2001 and O (Other) for EN 61010-2-030. For details, see "CENTUM CS 3000 Installation Guidance" (TI 33Q01J10-01E).
*4:   A Class A hardware device is designed for use in the industrial environment. Please use this device in the industrial environment only.
*5:   A lightening arrestor or the like is required to meet this surge immunity standard. The length of the cable to feed the external power supply for AGS813 AO channels should not exceed 30 meters.
*6:   An external device such as a power unit with harmonic current neutralizer and an active harmonics conditioner must be connected to meet this harmonic current emission standard.
*7:   The specified limits of voltage drop across wiring must be satisfied to meet this standard.
*8:   To meet the standard for hazardous location equipment, 19-inch rack-mounted devices must be installed in a keyed metallic cabinet approved by CSA or non-incendive regulator in your area.
*9:   To meet the standard for hazardous location equipment, 19-inch rack-mounted devices must be installed in a keyed metallic cabinet approved by FM or non-incendive regulator in your area.
*10:   To be compatible with Type n, for example the requirements of cabinet must be met. For details, refer to the Explosion Protection (TI 33Q01J30-01E).
*11:   ADR541 does not comply with Type n.

■ TRADEMARKS

- CENTUM, DARWIN, DAQSTATION, ProSafe and Exaopc are registered trademarks of Yokogawa Electric Corporation.
- Exaplog and Exapilot are trademarks of Yokogawa Electric Corporation.
- Windows is a registered trademark of Microsoft Corporation in the United States and /or other countries.
- Ethernet is a registered trademark of XEROX Corporation.
- Modbus is a registered trademark of Schneider Electric and/or such related companies.
- PLC, SLC and PLC-5 are trademarks or registered trademarks of Rockwell Automation, inc.
- MELSEC and MELSEC-A is a registered trademark of Mitsubishi Electric Corporation.
- SYSMAC is a registered trademark of Omron Corporation.
- Oracle 8 is a registered trademark of Oracle Corporation.
- "FOUNDATION" of "FOUNDATION fieldbus" is a registered trademark of Fieldbus Foundation.
- HART is a registered trademark of the HART Communication Foundation.
- Other product and company names appearing in this document are trademarks or registered trademarks of their respective holders.