

GS 11B06A02-01E

■ GENERAL

Process analyzers have been typically maintained by maintenance personnel from the front of the analyzer.

However, with the implementation of an analyzer bus system, maintenance can now be done entirely by monitoring and operating the analyzers from a remote location. A personal computer can be used as a terminal for controlling the analyzers, enabling the maintenance engineer to operate the gas chromatograph and field analyzers from a comprehensive computer screen interface. The analyzer bus forms an analyzer network which enables this advanced style of maintenance.

The analyzer bus system offers the following benefits:

- Comprehensive and centrally located remote maintenance of analyzers.
- Reduction in the cost of wiring (among field analyzer to control room).
- Ease of expansion that is not limited by the physical number of available DCS process inputs.

■ FEATURES

- Easy Maintenance of Analyzers
Status of multiple analyzers can be monitored on a PC connected to the network. Data are continuously stored in a server, allowing traceability of information necessary for maintenance.
Stored data include chromatograms of detector signals as well as measured values and alarms. Even after observation of an alarm or a change in measured value, chromatograms can be checked retrospectively.

Other functions include data storage, parameter uploading/downloading, and network monitoring, with regard to the analyzers connected.

- Reduced Wiring Costs
The analyzer bus system eliminates the need for wiring between the individual field analyzers and the associated devices, such as a DCS or other host computers, and a PC for analyzer maintenance. Ethernet allows hubs and other general networking equipment to be used.
- Network Scalability
Ethernet facilitates connection to your network, thereby enabling remote monitoring. (To ensure the safety of your network, firewalls or other network security measures should be taken as appropriate.)
- High-Speed Network
Fast Ethernet supports data transfer rates of 100 Mbps, providing real-time monitoring of not only measured values and alarm information but also chromatograms.
- Optical Communication
The analyzer is available with either shielded twisted pair wire or optical fiber. The optical fiber can be advantageously used in long distance networks and electrically noisy environments.
- Redundant System for Increased Reliability
A redundant system is available for connection of analyzers with host computers such as a server and DCS.

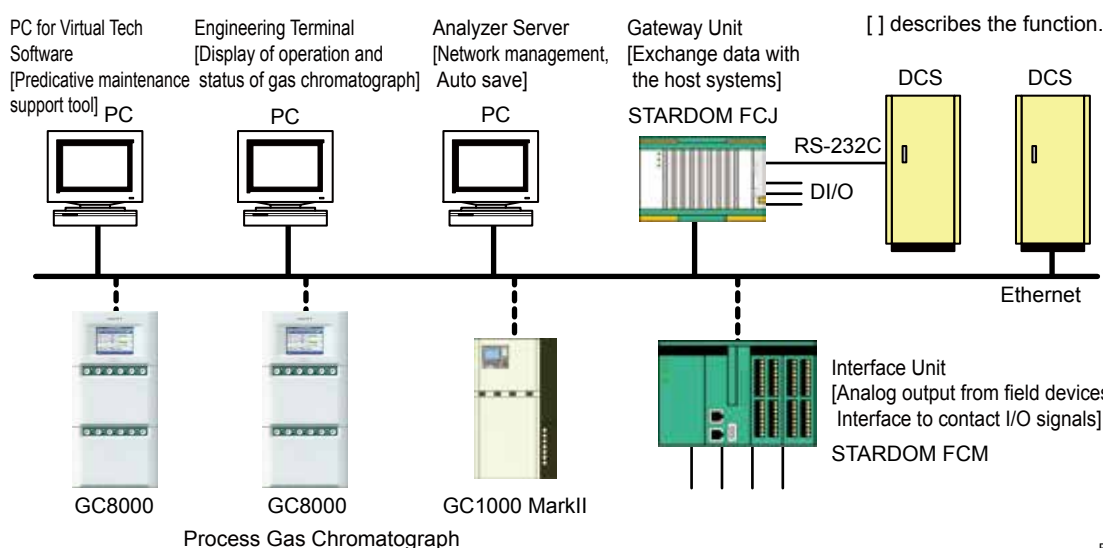


Figure 1 Typical System Configuration

■ SYSTEM CONFIGURATION

A typical network configuration of analyzer bus is shown in Figure 1.

The network consists of process gas chromatograph (GC), server, hub, etc.

(1) Process Gas Chromatograph (GC8000, GC1000 Mark II)

Analyzers that is installed in the field and connected to Ethernet network.

(2) Analyzer Server

Controls network and stores the data. It is composed of PC and Analyzer Server Software (PCAS). PC is connected to analyzers with Ethernet network.

(3) Engineering Terminal

A human machine interface for analyzer operation and data view. Its software runs on a PC connected to network.

Consists of a PC that is connected with Ethernet and Analyzer Server Engineering Software (ASET). Enables multiple analyzers to be handled via the analyzer server.

Use Single Analyzer mode to connect one analyzer. Data can also be saved in the ASET Single Analyzer mode.

(4) Gateway Unit

Exchanges data with the host systems. Consists of Yokogawa's FCJ autonomous controller and Analyzer Server Gateway Unit Software (ASGW).

This is necessary for a redundant network or address mapping.

(5) Interface Unit

Consists of Yokogawa's FCN autonomous controller and Analyzer Server Interface Unit Software (ASIU). Interfaces field analyzers other than GC with network.

(6) PC for Virtual Tech Software

A support tool for performing predicative maintenance on GC8000 Gas Chromatographs. The PC is connected to an Ethernet network. Virtual Tech Software (GCVT) is installed in this PC.

■ SPECIFICATIONS

1. Network (Ethernet)

Connection Type:

IEEE802.3U
100Base-TX (RJ-45 Shielded Twisted Pair cable) or 100Base-FX (SC Optical Fiber cable)

Protocol: TCP/IP

Communication rate: 100 Mbps

Max. number of nodes: 254

Max. distance:

50 m (100Base-TX)

2 km (100Base-FX)

Total distance can be extended using multiple levels of switching hubs* in cascade connection.

*Refer to the switching hub.

Redundant Network:

Two communication paths are provided. Both are equal and which is used is determined by device engaged in the communication.

The PC on which the analyzer server software, and PC for Virtual Tech Software are installed should have dual Ethernet ports.

The GC8000, GC1000 Mark II, analyzer server, gateway unit, interface unit, and PC for Virtual Tech Software can be made redundant.

Engineering terminals, however, cannot be made redundant.

In a redundant network, the maximum number of nodes is 75.

See "2.8 (a) Redundancy."

2. Devices

2.1 Process Gas Chromatograph

Connection Type: IEEE802.3U

100Base-TX (RJ-45 Shielded Twisted Pair cable) or 100Base-FX (SC Optical Fiber cable)

Number of channels: 1 or 2

Number of GC8000 connected to a network:

Max. 240 units

Number of analyzer servers one GC8000 can access: 2 servers

Functions: Ethernet connection allows commands, status detection and data acquisition from analyzer server.

For other functions, see the General Specifications: Process Gas Chromatograph GC8000 (GS 11B08A01-01E).

2.2 Analyzer Server

Realized by ASET software installed on PC.

An analyzer server consists of a PC on which the PCAS software is installed.

PC Specifications

OS: Microsoft Windows 7 SP1 (32-bit version/64-bit version, /ARC is only supplied 32-bit version), Windows Server 2008 SP2 (32-bit version only), Windows Server 2008 R2 SP1 (64-bit version only) English, Japanese, or Chinese (In case option /ARC is selected, Chinese is not available)

CPU: 1 GHz or more

Memory: 32-bit; 1 GB or more, 64-bit; 2 GB or more

Hard disk: 20 GB or more of free space

A data storage capacity should be secured separately according to your PC system format, in addition to the capacity for the program.

GC8000: 3.1 GB per detector (for data storage)
2.0 GB per SYS (for data storage)

Example: 5.1 GB for 1 GCM - 1 SYS - 1 detector
30.6 GB for 6 GCM - 6 SYS - 6 detectors

GC1000 Mark II: 3.5 GB per unit (for data storage)

ASIU: 1.9 GB per unit (for data storage)

Display: 1024 × 768 or more

Ethernet port:

1 port (100BaseTX or 100BaseFX)
2 ports (100BaseTX or 100BaseFX) for redundant configuration

Other: CD-ROM drive
DVD-ROM drive for redundant configuration

PCAS software specifications

Analyzer bus connection:

Number of connected analyzers and interface units: Max. 64 sets
 Number of PCAS in one network: Max. 14 sets
 Automatic data storage:
 Data of GC8000, GC1000 Mark II and ASI software are stored on the server PC.

Storage Data	Description	Remarks
Analysis results	Detailed analysis results are stored for one year. Based on this, historical data of concentration and retention time are made.	Storage capacity depends on hardware and settings.
Chromatogram history (1)	Chromatograms for every cycle for the past 2 months.	ditto
Chromatogram history (2)	Every 10 times of chromatograms for one year.	ditto
Alarm history		100 kbyte
Event history		100 kbyte

Stored data are read with ASET software.
 Network monitoring screen:
 Analyzer server communication status is monitored for troubleshooting purpose.

2.3 Engineering Terminal

Realized by ASET software installed on PC.
 ASET and PCAS can be installed on the single PC.
 PC Specifications

OS: Microsoft Windows 7 SP1 (32-bit version/64-bit version, /ARC is only supplied 32-bit version), Windows Server 2008 SP2 (32-bit version only), Windows Server 2008 R2 SP1 (64-bit version only) English, Japanese, or Chinese (In case option /ARC is selected, Chinese is not available)

CPU: 1 GHz or more

Memory: 32-bit; 1 GB or more, 64-bit; 2 GB or more

Hard disk: 20 GB or more

A data storage capacity should be secured separately according to your PC system format, in addition to the capacity for the program.

Display: 1024 × 768 or more

Number of Ethernet connection:

1 (100BaseTX or 100BaseFX)

Other: CD-ROM drive

ASET Software specifications

Function:

- Display of the status of GC8000, GC1000 Mark II, and interface unit.
- Display of the results and alarms stored on the PCAS software.
- Operation of GC8000, GC1000 Mark II and interface unit.

Screen display: a) Overview

b) Analyzer Operation

c) Analysis Result

d) Chromatogram

e) Alarm Status

f) LCD Emulator (EtherLCD)

Max. number of EtherLCD is 4.

Analyzer server connection:

Max. number of ASET connected to one PCAS: 4 sets

ASET is connectable to PCAS on the same network.

One ASET is activated on one PC.

2.4 Gateway Unit

Established by Yokogawa's FCJ Autonomous Controller and ASGW software.

It has the following two interfaces for DCS.

Modbus/TCP Server (Ethernet communication)

Modbus Slave (Serial communication)

Specifications

Ethernet Communication:

Maximum number of GC8000, GC1000 MarkII, interface unit and analyzer server: 31 devices

Maximum number of clients (DCS): 4 devices

Serial communication:

Serial connection: Modbus Slave

Communication Standard: RS-232C

Number of ports: 2

Protocol: Modbus RTU mode

Communication speed:

300/1200/2400/4800/9600/

14400/19200/28800/38400/57600/115

200 bps.

Data length: 8 bits

Stop bit: 1 bit

Parity bit: Odd parity/Even parity/None

Compliant standards

EMC standards: CE Mark, C-Tick Mark

For the detail, refer to the General specifications of FCJ.

Hardware

Model Name	Item	Remarks
NFJT100-S10x	FCJ	

Software license

License Code	Item
NT711AJ-LM05E	FCN/FCJ basic software for single CPU with Java
NT8035J-LW11A	Modbus communication portfolio license

Software media

CR-ROM Code	Item	Remarks
NT203AJ-PC11E	Resource configurator	Loading a license for installation Modification of IP address

These programs are provided on DVD-ROM.

ASGW software:

Data mapping of GC8000, GC1000 Mark II, analyzer server, interface unit and host system such as DCS for interface with host system.
 Capable of commanding, detecting status, and reading data as follows.

(a) Commands for

GC8000, GC1000 Mark II and analyzer server:

- Request for individual analyzer clock setting (sets the clock time of all GC8000 and GC1000 Mark II devices that are communicating with an analyzer server when the request is sent to the analyzer server)

GC8000, GC1000 Mark II through mapping:

- Run command
- Stop command
- Stream sequence assign
- Calibration (validation) command
- Stream (continuous) assign

Interface unit through mapping

- DO on command
- DO off command

(b) Status detection of

GC8000, GC1000 Mark II and interface unit in common

- In operation
- Communication error
- Write error

GC8000, GC1000 Mark II

- Analyzer normality/failure
- Change of analyzer alarm status
- Measurement, stop, or maintenance status
- Progress of stream sequence
- Rejection of request of stream (continuous)
- Rejection of request of calibration/validation
- Data update
- Calibration coefficient update
- Data validity
- Each alarm condition
- Concentration alarm of each peak, retention time alarm, variation coefficient alarm, tailing coefficient alarm
- Analyzer Server
- Redundant communication status of GC8000, GC1000 Mark II and interface unit that are communicating with an analyzer server

Interface unit

- Unit normality/failure
- Main power supply failure, 24 V DC failure, IO module failure
- DI data
- DO data
- AI IOP
- IOP occurs when value exceeds 106.3 % of input range or is below -6.3 %. If IOP occurs, the previous value will be held as AI data.

(c) Data of

GC8000, GC1000 Mark II

- Stream number
- First peak number
- Number of peak
- Sampling time
- Analysis result
- Retention time
- Calibration coefficient

Interface unit

- AI read data
- (Actual number in 2 words: Range 0.0-1.0)

When multiple requests are received in update period, the last request is executed.

2.5 Interface Unit

Realized by Yokogawa's FCN Autonomous Controller and ASI software .

Function: Read and Write I/O interface data every 200 ms.

Compliant standards

EMC standards: CE Mark

For the detail, refer to the specifications of FCN.

Hardware specifications

- Max. number of contact inputs: 16
- Max. number of contact outputs: 16
- Max. number of analog inputs: 16

Code	Type	Remarks
NFBU200-S□□	Base module	
NFCP100-S0□	CPU module	
NFPW441-1□	Power module	100 to 120 V AC
NFPW442-1□	Power module	220 to 240 V AC
NFPW444-1□	Power module	24 V DC
NFDV151	Digital input module	32 points, 24 V DC
NFDV551	Digital output module	32 points, 24 V DC
NFDR541	Relay output module	16 points, 24 to 110 V DC / 100 to 240 V AC
NFAI135	Analog input module	4 to 20 mA, 8 points, channel isolation
NFAI143	Analog input module	4 to 20 mA, 16 points, system isolation
NFDCV01	Dummy cover	Cover for empty I/O module
NFDCV02	Dummy cover	Cover for empty power module

Software license

Code	Description
NT711AJ-LS05A	FCN/FCJ basic software license for single CPU without Java
NT8035J-LW11A	Modbus communication portfolio license

Software media

Code	Description	Remarks
NT203AJ-PC11A	Resource configurator	Required for loading software and modifying IP addresses

These programs are provided on DVD-ROM.

ASI Software

Capable of commanding, detecting status, and reading data as follows.

(a) Command

- DO on/off command

(b) Status detection

- Unit normality/failure
- Main power supply failure, 24 V AC failure, IO module failure
- DI data
- DO data
- AI IOP
- IOP occurs when value exceeds 106.3 % of input range or is below -6.3 %. If IOP occurs, the previous value will be held as AI data.

(c) Data

- AI read data
- (Actual number in 2 words: Range 0.0-1.0)

2.6 PC for Virtual Tech Software

The PC for Virtual Tech Software is connected to an Ethernet network. Virtual Tech Software (GCVT) is installed in this PC.

PC specifications

- OS: Microsoft Windows 7 SP1 (32-bit version/64-bit version), Windows Server 2008 SP2 (32-bit version only), Windows Server 2008 R2 SP1 (64-bit version only) English, Japanese, or Chinese
- CPU: 1 GHz or higher
- Memory: 32-bit - 1 GB or more, 64-bit - 2 GB or more
- Hard disk: 20 MB or more (for program installation) Additional 3 GB or more per analyzer for saving data

- (calculated for 10 minute analysis cycle with 60 alerts per day)
- Display: 1024 × 768 or more
- Ethernet ports: 1 to 3 ports (100BaseTX or 100BaseFX)
- Other: CD-ROM drive
DVD-ROM drive for redundancy
- Virtual Tech Software (GCVT) specifications
- GC8000 monitor function:
GCVT monitors the operation status of the GC8000 via PCAS and collects analysis values, chromatograms, and other data when alerts occur.
There is no monitor function for GC1000 MarkII.

- To use GCVT, the component software versions must be updated as follows:

Software	Revision
PCAS (excluding /ARC)	2.02.01 or later
GC8000	1.02.15 or later
ASET (excluding /ARC, ASET-S)	2.02.01 or later (for displaying the trend of peak-related information)

- GCVT monitors up to 64 GC8000s. Ethernet version GC1000 MarkII and devices connected to ASIU and Arcnet are not monitored.
- A GCVT communicates with a single PCAS.
- A PCAS communicates with a single GCVT.
- GCVT and PCAS can be run on the same PC, but this is not recommended as the security level will be degraded.

E-mail communication route:

To use the e-mail transmission function, design the communication route so that packets sent using the SMTP protocol (TCP) and the specified destination port number (default number: 25) can reach the e-mail server properly and that communication can be established.

- Communication with the mail server is accomplished by inserting a third network card to the PC and communicating via a separate network.
- Communicating with a mail server using the Ch-A side is not recommended in terms of security.
- Direct connection between PCAS and GCVT using an Ethernet crossover cable is also supported.
(Redundancy cannot be achieved between PCAS and GCVT, but this creates a more secure network configuration.)
- Redundant communication with the mail server is not supported.

2.7 Network Components

(a) Hub

Switching type 100Base hub is recommended.
example; MOXA made P/N:EDS-308-MM-SC
(multi mode, wave length 1310 nm
100Base-FX (SC connector) 2 ports,
TP (RJ45) 6 ports)
(Area classification: class 1 Div 2/Zone 2)

(b) Cable

• Optical Fiber Cable

It is recommended to use optical fiber cable when extending distance, wiring between separate buildings or using the device in electrically noisy environments.

Optical fiber cable does not require a "Signal interrupter" for explosion proof.

The type of optical fiber is the multi mode which core diameter is 50/125 mm or 62.5/125 mm.

• Shielded Twisted Pair Cable

Use Category 5 or higher of ScTP (Screened twisted pair) or STP cable. CE Mark is declared on the condition with ScTP or STP cable.

Twisted pair cable requires a signal interrupter for explosionproof requirements. Refer to section 2.10, Explosion-proof.

(c) Media Converter

Since gateway unit (FCJ) and general PC do not have optical interface. Thus, a media converter is required to connect an optical fiber network.

Select the appropriate devices according to the conditions of infrastructures.

example; MOXA made P/N:IMC-101-M-SC
(multi mode, wave length 1310 nm
100Base-FX (SC connector) 1 ports,
TP (RJ45) 1 ports)
(Area classification: class 1 Div 2/Zone 2)

2.8 Analyzer Bus Network

(a) Redundancy

In a redundant network, a communication path is switched instantly and automatically to avoid an impact on applications in case of communication failure.

Redundant network requires analyzer bus gateway unit (FCJ) and its software (ASGW).

Furthermore, the following licenses and media are required to duplicate the PCs in which PCAS or GCVT is to be installed.

License Code

Licence Code	Item	Remarks
NT783AJ-LW11A	Redundant network function license for FCN/FCJ OPC Server (media:NT203AJ)	Required for each PC

Software media

CD-ROM Code	Item	Remarks
NT203AJ-PC11E	media	Software for ASGW or ASIU can be used.

These programs are provided on DVD-ROM.
Analyzer server (PCAS), Virtual Tech Software (GCVT), gateway unit, GC8000, GC1000 Mark II and interface unit can be made redundant.

Engineering terminals (ASET), however, cannot be made redundant.

For details, see "ANABUS Ethernet System Redundancy Setting Manual" (TI 11B03A03-14E).

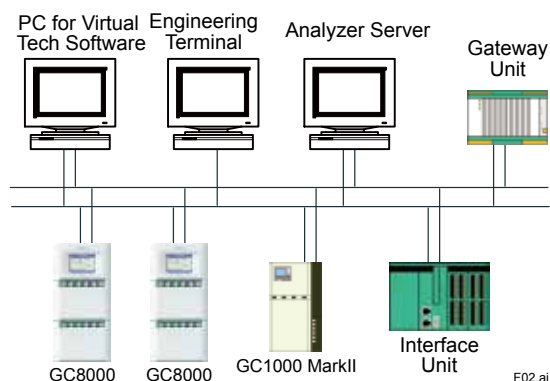


Figure 2 Conceptual diagram of redundant network configuration

(b) Restrictions on Total Distances of Network

According to the 100Base-TX standards, cables of up to 100 meters can be used. Use the cable of 50 m or shorter to ensure communication quality. Total distance can be extended using multiple levels of switching hubs* in cascade connections.

* Refer to the switching hub.

2.9 OPC

OPC requires gateway unit and OPC server software. For the detail, refer to "FCN/FCJ OPC Server for Windows" (GS 34P02Q61-01E).

In addition, redundant network function license for FCN/FCJ OPC Server software is required for connecting to the redundant network.

2.10 Explosion-proof

The following should be satisfied for explosionproof.

(a) Process Gas Chromatograph (GC8000)

See the General specifications of GC8000 (GS 11B08A01-01E).

(b) Twisted Pair Cable

When the explosionproof requirements are not kept at GC8000 with twisted pair cables, signals should be interrupted. The rack-mounted type K9806AA signal interrupter (desktop type: K9806AB) is installed in the non-hazardous area. In the hazardous area, the relevant parts must be mounted in a flameproof enclosure that has been certified by the relevant explosionproof inspection organization.

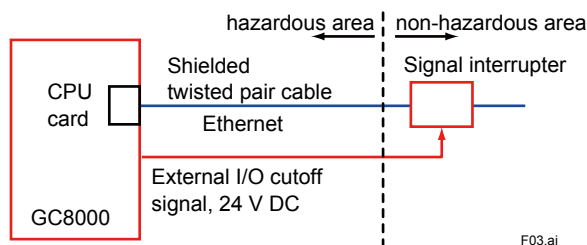


Figure 3 With twisted pair cable (except for FM-Y explosionproof specification)

(c) Optical Fiber

Optical fiber cable does not require the signal interrupter for explosion proof.

(d) Hub

Hubs can be installed in non-hazardous areas. In the hazardous area, the relevant parts must be mounted in an explosionproof enclosure that has been certified by the relevant explosionproof inspection organization.

(e) Analyzer Bus Interface Unit

FCN used as analyzer bus interface unit is approved that the product meets the non-incendive requirements of the FM Standards.

For the detail, refer to the General Specifications of FCN/FCJ (GS 34P02Q01E) and the Installation Guide of STARDOM FCN/DCJ (TI 34P02Q91-01).

2.11 Security

PC should be protected against computer viruses.

Accesses from external network should be restricted by fire-wall.

■ MODEL AND SUFFIX CODES

1. Process Gas Chromatograph (GC8000)

Any of the following Suffix Codes should be specified for the Ethernet analyzer bus.

Model	Suffix Code	Option Code	Description
GC8000	.....	.....	Gas chromatograph
...	
Ethernet connection	-A	.....	100Base-TX (RJ-45 port) dual
	-B	.....	100Base-FX (SC connector) dual
	-C	.....	100Base-TX (RJ-45 port) single
	-D	.....	100Base-FX (SC connector) single
	-E	.....	DSL single

2. PC Analyzer Server Software (PCAS)

Model	Suffix Code	Option Code	Description
PCAS	.....	.....	Software package
Function	-A01	.....	Standard
Language	E	.....	English
		.....	Japanese
—	-N	.....	Always -N
—		.....	Always N
Option		/ARC	ARCNET supported version (specialized for GC1000 Mark II)
		/UP	Version up

3. Analyzer Server Engineering Terminal Software (ASET)

Model	Suffix Code	Option Code	Description
ASET	.....	.....	Software package
Function	-A01	.....	Standard
	-S01	.....	Single analyzer mode
Language	E	.....	English
		.....	Japanese
—	-N	.....	Always -N
—		.....	Always N
Option		/ARC	ARCNET supported version (specialized for GC1000 Mark II)
		/UP	Version up

4. Analyzer Server Gateway software (ASGW)

Model	Suffix Code	Option Code	Description
ASGW	.....	.....	Software package
Function	-A01	.....	Standard
Language	E	.....	English
	J	.....	Japanese
—	-N	.....	Always -N
—	N	.....	Always N

5. Analyzer Server Interface Unit Software (ASIU)

Model	Suffix Code	Option Code	Description
ASIU	.....	.....	Software package
Function	-A01	.....	Standard
Language	E	.....	English
	J	.....	Japanese
—	-N	.....	Always -N
—	N	.....	Always N

6. Virtual Tech Software (GCVT)

Model	Suffix Code	Option Code	Description
GCVT	.....	.....	Virtual tech software
Function	-A01	.....	Standard
Language	E	.....	English
	J	.....	Japanese
—	-N	.....	Always -N
—	N	.....	Always N
Option		/UP	Upgraded