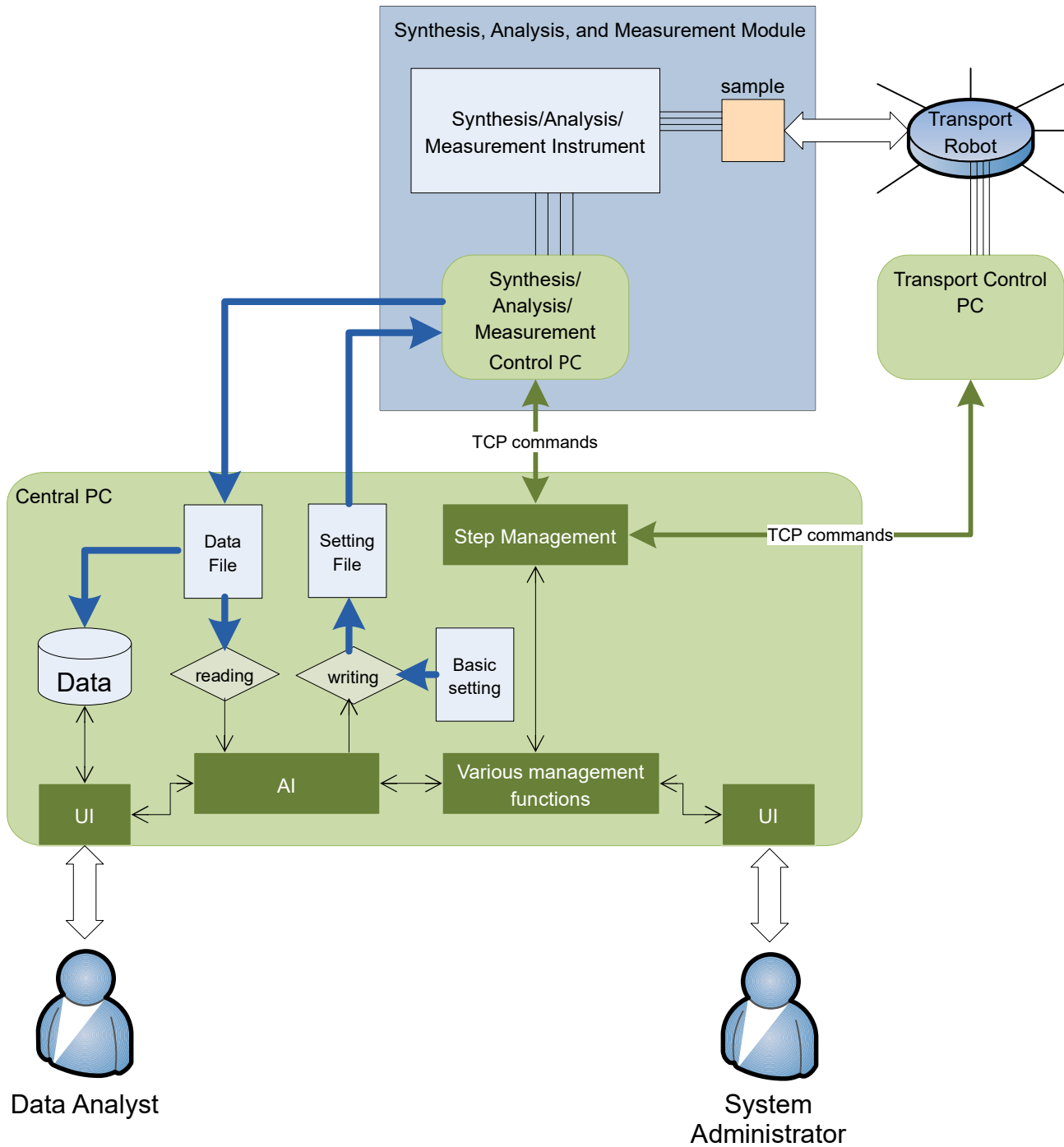# Module Configuration

Ver. 0.02

| Outline	The synthesis, analysis, and measurement module consists of synthesis, analysis, and measurement equipment, a sample folder, and a control PC. It receives the sample from the transfer robot. It executes processing according to commands and configuration files from the central PC and sends the resulting data files.

Synthesis, Analysis, and Measurement Module

- Synthesis/Analysis/Measurement Instrument
- sample
- Transport Robot
- Synthesis/Analysis/Measurement Control PC
- Transport Control PC

TCP commands

Central PC

- Data File
- Setting File
- Step Management

TCP commands

- Data
- reading
- writing
- Basic setting
- UI
- AI
- Various management functions
- UI

Data Analyst

System Administrator

LAN Configuration

Outline

In a cluster system, the main system LAN should be separated from the LANs within each subsystem to avoid excessive traffic congestion. The control PC in each subsystem must be configured to access both the main system LAN and the subsystem LAN.
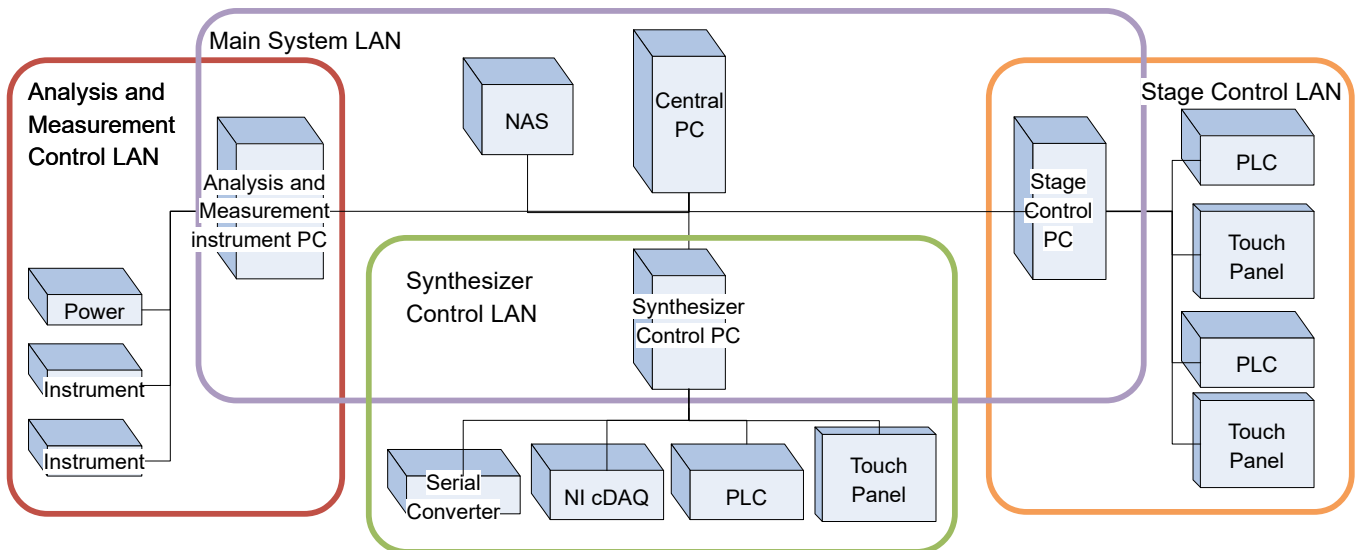
| Central LAN	IP address 192.168.0.xxx Subnet mask 255.255.255.0 Used for communication between the central PC and each subsystem control PC. Connects a NAS for storing measurement data.
Stage Control LAN	IP address 192.168.1.xxx Subnet mask 255.255.255.0 Connect PLC for chamber stage control and touch panel. Sample transfer process.
Synthesizer Control LAN	IP address 192.168.2.xxx Subnet mask 255.255.255.0 Connects NI cDAQ for synthesizer control, serial converter, PLC for sputtering, and touch panel. Controls synthesis process.
Analysis and Measurement Control LAN	IP address 192.168.3.xxx Subnet mask 255.255.255.0 Connect analytical and measuring instruments, power supplies, etc.

How to set up

To connect to 2 LANs, use 2 LAN boards (NICs) or install a router.
A USB-LAN converter can also be used as a LAN board.
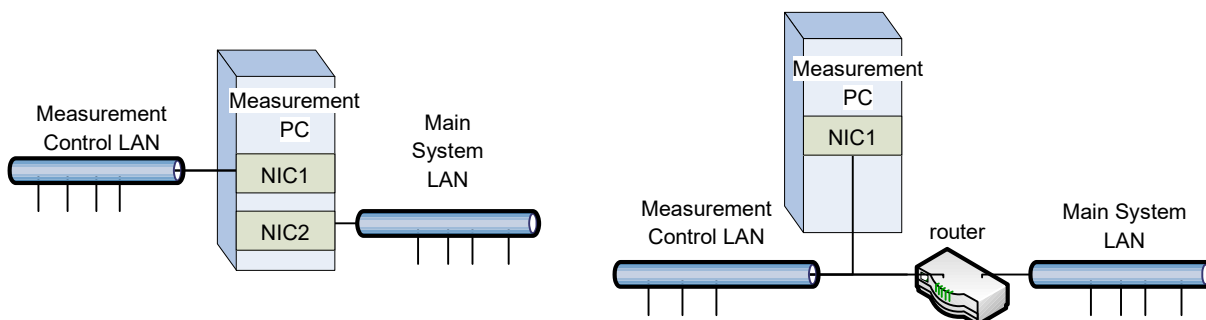
protocol	TCP/IP
port	8501
data code	ASCII code

final character	CR (0DH)

Communication Command Specifications

Ver. 0.02

Outline	The central PC for process management sends commands to the control PC for synthesis, analysis, and measurement devices. The commands tell the PC when to place samples, start measurements, etc. The synthesis, analysis, and measurement devices should respond to the command. Message reception should be performed every second to the extent possible. The communication response will operate normally even if there is a delay of several tens of seconds. The timeout on the central PC side is 120 seconds, and if there is no response, it is considered an error.

	Procedure Name	Central PC sending	Subsystem PC Reply	Description
Procedure	Status Confirmation	Status	Ready	If the sample is Ready, the sample will be installed.
	Complete installation	Placed SampleA	OK	Notifies when installation is complete.
	Measuring Condition	Setting C:¥Setting…	OK	Sends the path of the measuring setting file
	Measurement Start	Start	OK	Indicates the start of the measurement.
	Status Confirmation	Status	Busy	Returns "Busy" during measurement.
	(Status Confirmation)	Status	Done	Returns Done when measurement is complete.
	Confirms Data	Data	C:¥Data\0123.csv	Returns the file path of the measurement results.
	Sample Collected	Collected	OK	Notifies when collection is complete

Command Format	The format of the command is "Command Data". Command" is the command string, followed by a space character, and "Data" is a string of additional data. Depending on the type of command, the additional data may be omitted. A terminating character CR (0DH) is added at the end.

Command	Status	Function	Check status information
Response	Ready Busy (= Operation in progress) Done (= Measurement completed) Error (When returning Ready or Done, the sample must be ready for placement or collection.) (A space can be added after Busy or Error to attach a character string that conveys the status. Example: Busy Manual Mode)		

Command	Placed Data	Function	Informs that the sample installation is complete.
Additional Data	Sample name (e.g. Placed Sample001)		
Response	OK or Error		

Command	Setting Data	Function	Communicates the set values of the measurement conditions
Additional Data	File path of the measurement condition file (Attaching the condition as a string is also possible)		
Response	OK or Error		

Command	Start	Function	Instructs the start of measurement
Response	OK or Error		

Command	Data	Function	Check the measurement data and shift the status Done to Ready.
Response	File path of the measurement data file (Attaching data as a character string is also possible) or Error		

Command	Collected	Function	Informs that the sample collection is complete.
Response	OK or Error		

The Error response is used only if the instrument has an error and measurement cannot be continued without human intervention.
Failure of the measurement should be noted as Failure in the Status item of the measurement data file.
If the measurement value exceeds the detection limit, enter +∞ or -∞ in the floating-point measurement value according to the positive or negative direction.
If the measurement could not be performed, enter a non-number (NaN) in the measurement value.
The format of the measurement data will be determined separately.

File Specification

Ver. 0.02

Setting file	The file used to send setting values from the central PC to the synthesis/analysis/measurement control PC. It is in a tab-delimited text file format with a .txt extension. The format is as follows: (Setting value name) Tab (Value) Line feed
Example	SP1_Setting20220301_01.txt WaitStage 5.000000 WaitGasValve 5.000000 DepoFlowAr 9.000000 DepoFlowN2 0.000000 DepoFlowO2 1.000000 DepoFlowH2 0.000000 WarmUpLwLimit 1.000000 WarmUpTime 10.000000 DepoTemp 100.000000

Data Files	Sends result data from the Synthesis/Analysis/Measurement Control PC to the Central PC. It is a tab-delimited text file format with a .txt extension. The measurement result items and values are written in the header section, followed by the time-series data. The format is as follows: (Setting value name) Tab (Value) New line
Example	SP1_Log20220301_173019.txt StartTime 2022/03/01 17:30:19 SampleNameHiLo test RoomTemperature 24.415183 WaitStage 5.000000 OpenDV7 0 WaitGasValve 5.000000 DepoFlowAr 10.000000 ... Time PW1Control PW1Power PW1Current PW1Voltage PW2Control 17:30:32 0.00000 0.68297 0.36757 0.00000 0.00000 0.24929 0.22958 0.00000 17:30:37 0.00000 0.05217 0.05217 0.00000 0.00000 0.32814 0.24929 0.00000 17:30:37 0.00000 0.15073 -0.14496 0.00000 0.00000 0.62383 0.07188 0.00000 17:30:40 0.00000 0.24929 -0.06611 0.00000 0.00000 0.44642 0.28872 0.00000

The above formats are examples used in the current system.
The format may change or another format may be added.