User's Manual

GC8000
Process Gas Chromatograph

IM 11B08A01-01E

vigilantplant.

YOKOGAWA

Yokogawa Electric Corporation

IM 11B08A01-01E
1st Edition

Notice

Regarding This Manual

- This Manual should be passed on to the end user.
- Read this manual carefully and fully understand how to operate this product before you start operation.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- The contents of this manual are subject to change without prior notice.
- Great effort has been made to ensure that the descriptions in this Manual are correct. However, if you notice any error or inconsistency, please inform Yokogawa Electric Corporation.

Regarding Protection, Safety, and Prohibition Against Unauthorized Modification

- For the protection and safe use of the product and the system controlled by it, be sure to follow the safety instructions described in this manual. Safety is not guaranteed if you do not follow these instructions.
- The following safety symbol marks are used on the product concerned or in this Manual:

WARNING

A WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

CAUTION

A CAUTION sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

NOTE

Draws attention to information essential for understanding the operation and features.

TIP

Gives information that complements the present topic.

See Also

Gives reference locations for further information on the topic.

Protective ground terminal:

In order to provide protection against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground prior to operation of equipment.

Function ground terminal:

In order to provide protection against noise. This symbol indicates that the terminal must be connected to ground prior to operation of equipment.

Media No. IM 11B08A01-01E 1st Edition : Nov. 2011 (YK)

- If protection/safety circuits are to be used for the product or the system controlled by it, they should be installed outside of the product.
- When you replace parts or consumables of the product, use those specified by us.
- Do not modify the product.

■ Exemption from Responsibility

- Yokogawa Electric Corporation does not make any warranties regarding the product except for those mentioned in the WARRANTY that is provided separately.
- Yokogawa Electric Corporation assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the product.

ATEX Documentation

The procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά.
Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

SK

Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ

Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT

Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norėdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës “Yokogawa” biuru arba atstovu.

LV

Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST

Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima Iokagava (Yokogawa) kontori või esindaja poole.

PL

Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja. obsługi w Państwa lokalnym ję zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO

Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v anglišèini, nemšèini ter francošèini. Èe so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H

Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG

Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO

Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M

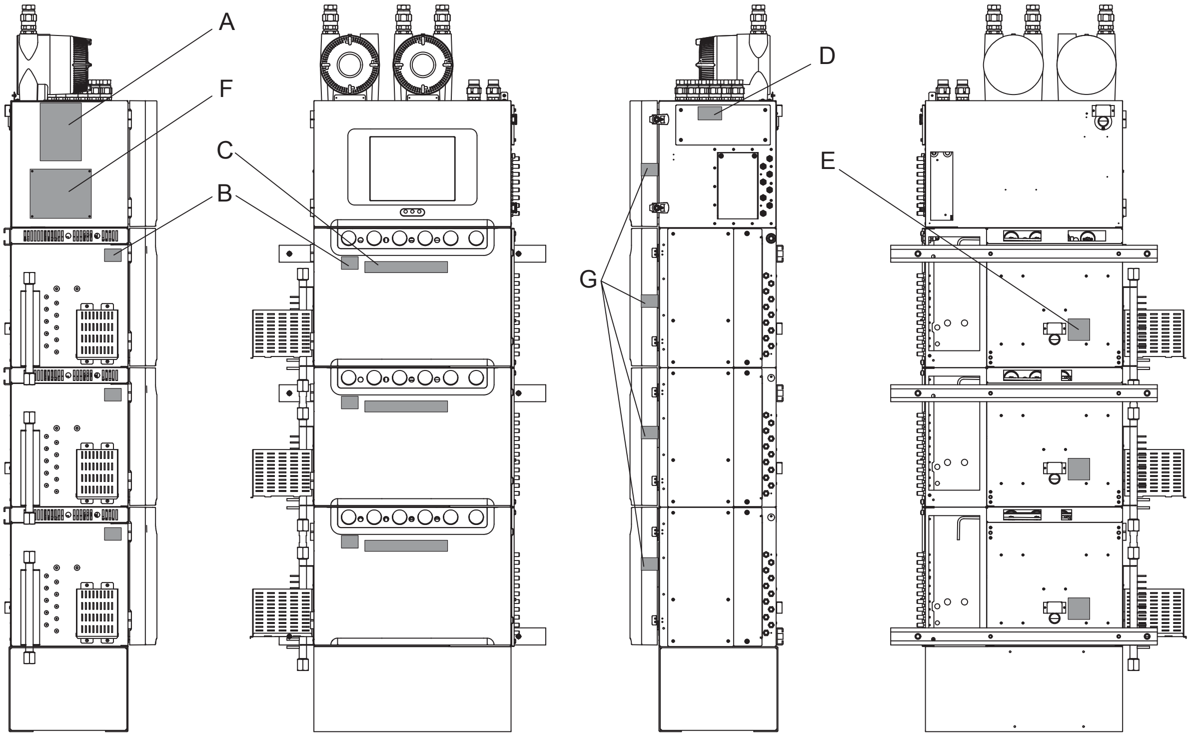
Il manwali kollha ta l istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta' Yokogawa

.

◆ Labeling

Labels are attached to the product for safety. Read each description.

Label D is applicable only to TIIS explosion protection.



B

⚠ WARNING

Hot surfaces

⚠ 警告

表面が高温です。
注意して下さい。

D

⚠ CAUTION

Use heat-resistant cables with maximum allowable temperature of 80˚C or above for pressurized enclosure.

⚠ 注意

内圧容器の外部導線は、最高許容温度が80℃以上のものを使用すること。

E

⚠ WARNING

High Temperature oven exhaust air. Keep hands, electrical cables, gas lines, chart paper and other items safely clear of exhaust stream.

⚠ 警告

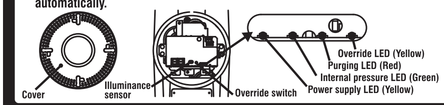
排気エアーが高温です。注意して下さい。
手や電気のケーブル、ガスライン、
チャートペーパーなどを排気口に
近づけないで下さい。

A

Read the instruction manual thoroughly before use override function.

Override function manual

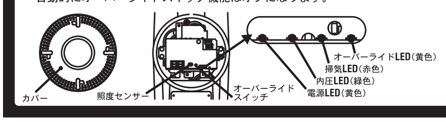
1. Ensure that the surrounding gas atmosphere is well below the lower explosive limit or cometely safe (the area is safe and non-hazard) by using gas detector, then remove the cover of flameproof enclosure.
2. When the illuminance sensor detects light and pressing the override switch, the power is supplied to electric circuit , isothermal oven and programmed temperature oven even if the internal pressure dropped below the specified minimum value.
3. When the cover is replaced to safety device again , this function turns off automatically.



オーバーライド機能を使用する場合は、
取扱説明書の注意事項を必ず読んでからお使いください。

オーバーライド機能の使用手順

1. 周囲の雰囲気が充分に爆発下限界以下になっていることを、ガス検知器などで確認しながら、耐圧容器のカバーを取り外してください。
2. 照度センサが光を感知してオーバーライドスイッチを押すと、規定の最小内圧が保たれない状態で、電気回路部、恒温槽、昇温槽に電源が供給されます。
3. 修理等が終了した後にカバーを取り付けると、自動的にオーバーライドスイッチ機能はオフになります。



C

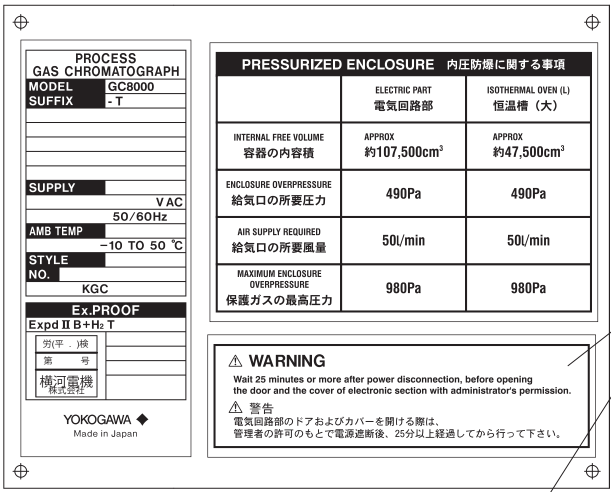
⚠ CAUTION HIGH TEMPERATURE

Do not touch the oven and parts inside oven as temperature inside the oven is hot even after power off. Allow one hour for cool down with purge air.

⚠ 高温注意

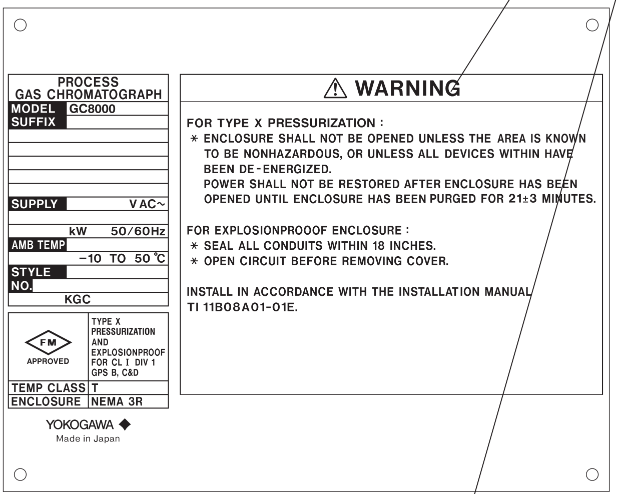
通電停止直後は，内部が高温になっています。通電を停止した後 1時間以上保護ガスの供給を保ち，内部および内部の部品に触れないでください。

TIIS

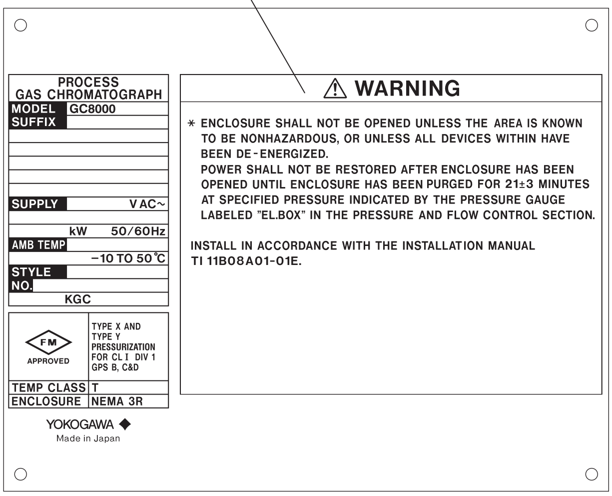


F

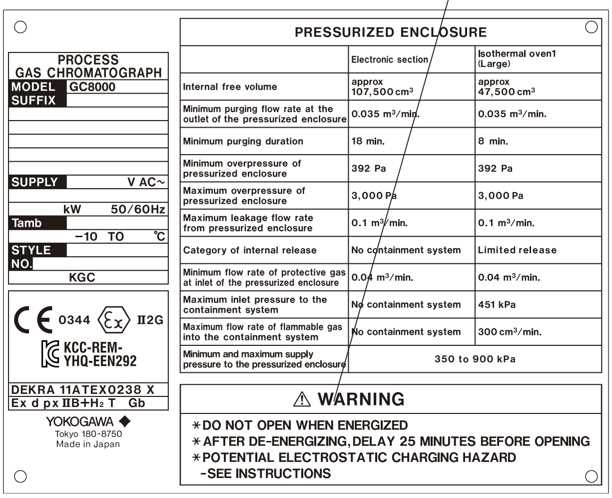
FM-X



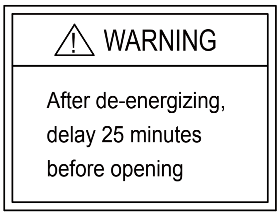
FM-Y



ATEX (Approval pending)



G (only ATEX)



◆ Introduction

Thank you for purchasing the GC8000 process gas chromatograph.

This manual describes the meintenance and inspection of Model GC8000 Process Gas Chromatograph.

Please lead the following repective documents before installing and using the GC8000 system.

■ Documents Related to the GC8000 Process Gas Chromatograph

● User's manuals

The product comes with the following user's manuals.

- **User's manuals that do not depend upon the specifications of the product:**
  Operation Manual (IM 11B08A01-01E)
- **User's manuals for related products:**
  PCAS PC Analyzer Server Software (IM 11B06B01-01E)
  ASET Analyzer Server Engineering Terminal Software (IM 11B06C01-01E)
  ASGW Analyzer Server Gateway Software (IM 11B06E01-01E)
  ASIU Analyzer Server Interface Unit Software (IM 11B06F01-01E)
  ANABUS Ethernet System Redundancy Setting Manual (TI 11B03A03-14E)

● Operation Data

Operation data is supplied with the operation manuals in the delivered package and contains the following application specific information required to use the GC8000 Process Gas Chromatograph.

- Process conditions and measurement range
- Instrument specifications and operating conditions
- Standard sample for calibration
- Column system and column
- Miscellaneous data
  Chromatogram, base line, repeatability, etc.
- Analyzer flow diagram and installation
- Parts composition table
- General connection diagram
- Sampling system diagram (when supplied by Yokogawa)

■ General Precautions

⚠ WARNING

In order to analyze gases, process gas chromatographs use various kinds of process gases and utility gases.

Since these gases are typically combustible, combustion-sustaining, toxic, odorous, resolvable, polymerizing, or corrosive, refer to the "Safety Information" in our approval drawings and others to ensure safety thoroughly before using them.

WARNING

- The GC8000 weighs about 100 to 220 kg. Unpack it near the installation site. Use a transportation machine to move it. Handle it carefully to prevent it from falling.
- Up to two protection system may be included, each of which weighs approximately 7 kg, are installed on top of the GC8000. Therefore, the center of gravity is higher than the center of the analyzer body.

CAUTION

- Since the GC8000 is a precision instrument, take care when handling it to avoid impact.
- Use the GC8000 within the range of your purchase specifications.

  Yokogawa assumes no responsibility for problems resulting from use by the customer outside the purchase specifications.

  If the GC8000 needs to be modified or repaired, please contact your nearest Yokogawa representative. Yokogawa assumes no responsibility for results where the customer or any third party has attempted to modify or repair this product.
- EMC Conformity Standards (ATEX only)

  EN61326-1 Class A (Emission)

  EN61326-1, EN61326-2-3 (Immunity)

  CAUTION: This instrument is a Class A product, and is designed for use in an industrial environment. Please use this instrument in an industrial environment only.

IMPORTANT

- Read the attached instruction manual before operating the GC8000.
- The instruments must be installed and operated according to the installation manual, instruction manual, approval drawings, and operation data.

● Precautions Against Electrostatic Damage

IMPORTANT

Electrostatic discharge may damage the operation panel. Handle them after discharging static electricity.

When handling cards with IC components mounted on them for maintenance or setting changes, take full precautions against electrostatic problems.

- When storing or carrying cards, enclose them in a conductive bag or antistatic bag. (Cards as shipped by Yokogawa are enclosed in a conductive bag or antistatic bag labeled with cautions against electrostatic problems.)
- When servicing cards, wear a wrist strap grounded via a 1 MΩ resistance. Connect the wrist strap to a ground terminal.

- When servicing cards on the bench, wear a wrist strap and place them on a conductive sheet grounded via a 1 MΩ resistance. Keep easily-chargeable plastic materials away from the bench.
- Never touch components mounted on the cards, the pattern side, connectors, pin components, etc. with bare hands, unless using a wrist strap and a conductive sheet.

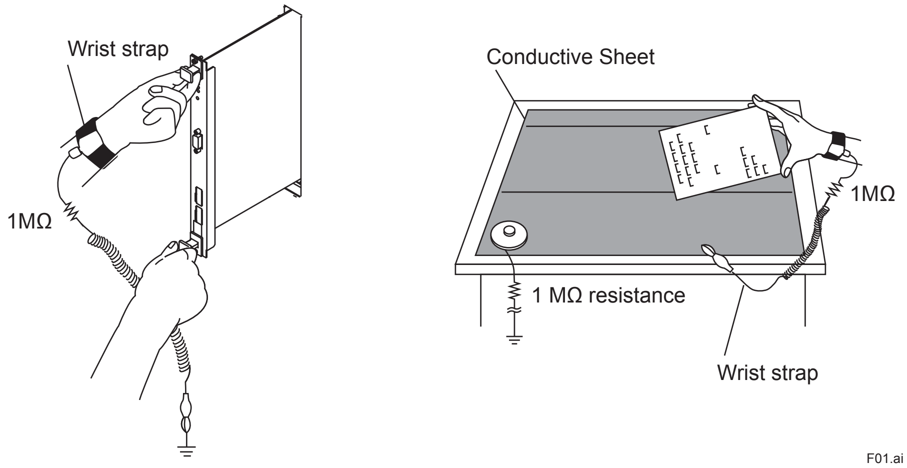


Figure 1 Example of wrist strap and conductive sheet

■ CAUTIONS WHEN USING EXPLOSION-PROTECTED INSTRUMENTS

The GC8000 is designed to protect against explosion.

When the analyzer is used in a hazardous area, observe the following precautions.

Since the applicable standard differs depending on the specifications of the analyzer to be used, check the specifications of your analyzer.

● Type of explosion protection

To assure explosion protection, the GC8000 has a pressurized and flameproof enclosure, meeting the following standards (flameproof enclosure is not provided in FM-Y):

<GC8000-F (FM-X), GC8000-G (FM-Y)>

Type X pressurization and Explosionproof for Class I, Division 1, Group B, C and D

(Described as FM-X hereafter)

Type X and Y pressurization for Class I, Division 1, Group B, C & D

(Described as FM-Y hereafter)

T1 (programmed-temperature oven 320°C max., isothermal oven 225°C max., liquid-sample valve 250°C max.)

T2 (programmed-temperature oven 225°C max., isothermal oven 225°C max., liquid-sample valve 225°C max.)

T3 (programmed-temperature oven 145°C max., isothermal oven 145°C max., liquid-sample valve 145°C max.)

T4 (programmed-temperature oven 95°C max., isothermal oven 95°C max., liquid-sample valve 95°C max.)

<GC8000-A (ATEX)>

ATEX: Group II Category 2G, DEKRA 11ATEX0238 X * (Pending)

Ex d px II B +H_2 T1 Gb (programmed-temperature oven 320°C max., isothermal oven 225°C max., liquid-sample valve 250°C max.)

Ex d px II B + H_2 T2 Gb (programmed-temperature oven 225°C max., isothermal oven 225°C max., liquid-sample valve 225°C max.)

Ex d px II B + H_2 T3 Gb (programmed-temperature oven 145°C max., isothermal oven 145°C max., liquid-sample valve 145°C max.)

Ex d px II B + H_2 T4 Gb (programmed-temperature oven 95°C max., isothermal oven 95°C max., liquid-sample valve 95°C max.)

* symbol "X": symbol used to denote specific conditions of use
  The symbol "X" is used to provide a means of identifying that essential information for the installation, use, and maintenance of the equipment is contained within the certificate.
  - Warning in the label refers you to read the instruction manual for an avoidance of static risk.
  - The threaded type and size of the flameproof enclosure is only uses "M25x1.5".
    That is the reason why no indication on the flameproof enclosure.
    On the other hand, the threaded adapter has the indication of its own type and size.
  - The gap between flameproof joints is different from the standard values of the flameproof standard.
    The joint dimensions of the flameproof enclosure differ from the minimum or maximum values asa mentioned in the Ex d standard.
    Since the modification is not allowed, this manual gives out no detailed information.
  - The instrument modification or parts replacement by any person other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the flameproof certifications.

<GC8000-T (TIIS)>

TIIS (The Technology Institution of Industrial Safety)

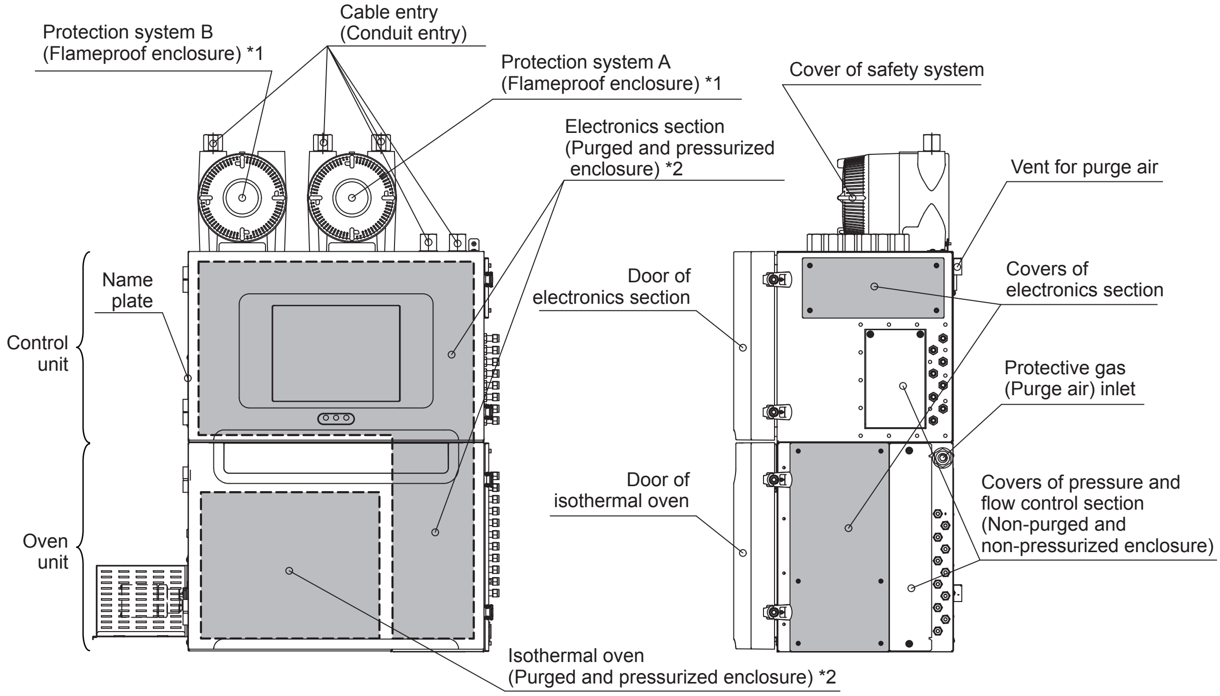
Ex pd II B +H_2 T1 (programmed-temperature oven 320°C max., isothermal oven 225°C max., liquid-sample valve 250°C max.)

Ex pd II B +H_2 T2 (programmed-temperature oven 225°C max., isothermal oven 225°C max., liquid-sample valve 225°C max.)

Ex pd II B +H_2 T3 (programmed-temperature oven 145°C max., isothermal oven 145°C max., liquid-sample valve 145°C max.)

Ex pd II B +H_2 T4 (programmed-temperature oven 95°C max., isothermal oven 95°C max., liquid-sample valve 95°C max.)

Analyzer component names



Note: Replace the following term for FM explosionproof models.
*1: Protection system A or B (explosionproof enclosure)
*2: Type X pressurization enclosure or Type Y pressurization enclosure

Figure 2 Analyzer component names for explosionproof type

Opening/closing the door

The control unit, large isothermal oven, and standard isothermal oven have a door fastener with a lock.

Lock the door when operating these devices. The same key is used for all the door fasteners. Do not lose it.

Confirm that the lever cannot be lifted up after locking.

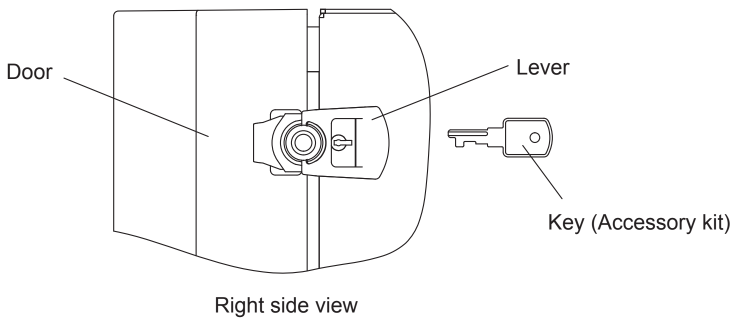


Figure 3 Door fastener

Electronics section

The electronics section of the control unit, large isothermal oven and standard isothermal oven is a pressurized enclosure.

Use a hex wrench (an accessory) to open/close the cover of the electronic chamber.

Precautions for protection system (The analyzer with FM-Y does not have the protection system.)

WARNING

When the cover of the protection system is uninstalled, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.

The protection system is a flameproof enclosure.

When handling the screws on the cover of the protection system, note the following to avoid damaging the screws since they cannot be repaired.

- Use a hex wrench (option) to tighten/loosen the hexagon socketset screw.
- The cover should be placed in a clean plastic bag or on a clean space to prevent it from contamination.

  Before installing the cover, confirm that the body and screws are not contaminated. If they are, make sure to clean them.
- Since the screws are coated with MOLYKOTE, do not lubricate them.
- When installing the cover, tighten the screws by hand; never use tools.

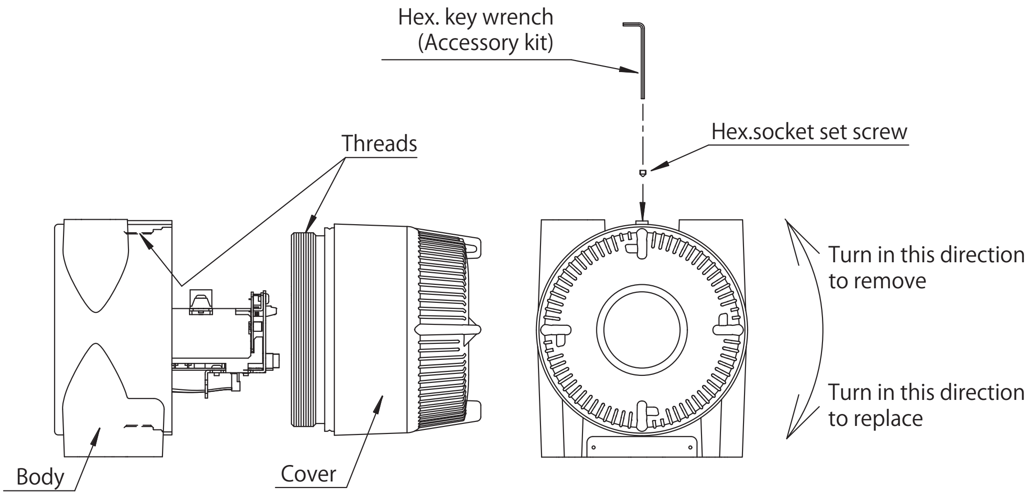


Figure4 Opening/closing the cover of the protection system

Precautions for hydrogen gas

When using hydrogen gas as the carrier gas, the FID or FPD combustion gas, install the analyzer in a location equipped with a ventilator or where there is sufficient ventilation to ensure safety.

Check for leaks regularly to make sure there are no gas leaks from the pipe joints.

Provide a regulator separately and supply hydrogen gas to this analyzer at 500 kPa.

Protection gas (Air) pipe

This is the pipe for supplying air to the analyzer for purging pressurized enclosures.

An air pressure of 350 to 900 kPa is required. Use general instrument air as the source and connect the piping to the analyzer PURGE AIR port. A pressure regulator should be installed in-between.

Installation site and environment

The analyzer specifications allow it to be used in hazardous areas as defined by DIV1, GPS B, C & D, T1, T2, T3, T4 (FM) or Zone 1 IIB + H2T1, T2, T3, T4 (ATEX/TIIS). However, never install the analyzer in an area where dense explosive gas exists for a long time.

For the class of hazardous areas:

For FM, refer to Article 500 of the National Electrical Code (NEC).

For ATEX, see BS EN60079-10E.

For TIIS explosion protection, refer to Article 1 (15) to (17) of the Constructional Requirements for Electrical Equipment for Explosive Atmospheres (Japanese only).

Wiring works

<FM>

WARNING

- All wiring shall comply with National Electric Code ANSI/NFP A 70 and Local Electric Codes.
- In a hazardous area, use conduits for wiring in the protection system or to electronics sections.

CAUTION

- The unused electrical connection ports should be closed with an appropriate flameproof-certified plug.
- Analyzers have pressurized enclosures. The cable end should be sealed in order to maintain pressure to the pressurized enclosure. Otherwise, power is not supplied to the electronics section.

<ATEX>

WARNING

- All wiring shall comply with Local Electric Codes and Requirements.
- In a hazardous area, use appropriate flameproof-certified parts for connecting cables.

CAUTION

- The unused electrical connection ports should be closed with an appropriate flameproof-certified plug.
- Analyzers have pressurized enclosures. The cable end should be sealed in order to maintain pressure to the pressurized enclosure. Otherwise, power is not supplied to the electronics section.

<TIIS>

WARNING

- In case of TIIS-certified wiring, the attached sealing fittings or cable packing adapter should be used.
  Otherwise, the product does not comply with TIIS explosion protection.
- Use the wiring to the pressurized enclosure, whose allowable temperature is more than 80°C.

IMPORTANT

Cables should be arranged in an orderly manner in the protection system.

Otherwise, they may damage other parts (e.g. relay).

● Maintenance and inspection

Before opening the door or cover of the explosionproof section for maintenance and inspection, be sure to turn off the power and wait for at least 25 minutes. After completing inspections, close the door or cover tightly, check that the specified explosionproof performance is ensured, and then turn on the power. The parts to be checked are described in “6. Maintenance”.

If any of the following damage occurs, contact a Yokogawa sales representative or the Yokogawa sales division.

- The screws securing the Protection System (explosionproof construction) are damaged
- The exterior of the enclosures is damaged
- Packings are cracked or deformed

● Override function (The analyzer with FM-Y does not have this function.)

WARNING

When the override function is used, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.

In this analyzer, if the pressure of the pressurized enclosure (electronics section) drops below a specified level while the power is on, the protection system is activated to stop power supply.

Therefore, if the door of the electronics section is inadvertently opened for maintenance while the power is on, the protection system is activated to cut off the power.

The override function forcibly disables this function.

This function allows operators to open the door or cover of the pressurized enclosure while the power is still on.

This function is activated by opening the cover of the protection system and pressing the override switch while the light sensor is detecting more than 100 (lx) of light.

The function becomes invalid automatically when the cover of the protection system is closed.

Checking the pressure in the pressurized enclosure

The LED (Green) of "POWER" is turned ON and the LED (Red) of "ALARM" is turned OFF when the pressure is in the normal condition. See Figure.5.

The pressurized enclosure is divided into "Electronics section" and "Isothermal oven". How to check the pressure in each enclosure is as follows.

<Electronics section>

WARNING

When the cover of the protection system is uninstalled, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.

The status of the protection system can be checked with the LEDs as shown in Figure 5.

The meaning of each LED is written on the status display.

POWER: ON when power is supplied to the protection system

PRESSURE: ON when the specified internal pressure is applied to the electronics section. This LED is ON in the normal condition. If the internal pressure becomes low, it turns off.

PURGING: ON when purging the electronics section. After purging, it turns off.

When power is supplied and “PRESSURE” LED is on, this LED turns ON and purging begins.

After the electronics section is purged for 21 ± 3 min, the LED turns off and power is supplied to the electronics section.

The LED is OFF in the normal condition after purging.

If purging ends incompletely, the status of purging is reset and purging begins again.

OVERRIDE: ON when the override function is activated.

<Isothermal oven>

If the internal pressure in the isothermal oven becomes low, the following alarms appear on the operation panel.

Top isothermal oven: Alarm for low internal pressure No. 112 “OVEN1 PRESS DOWN”

Middle isothermal oven: Alarm for low internal pressure No. 113 “OVEN2 PRESS DOWN”

Bottom isothermal oven: Alarm for low internal pressure No. 114 “OVEN3 PRESS DOWN”

Alarms are displayed on the “ASET” PC software for the specification without the operation panel on GC8000.

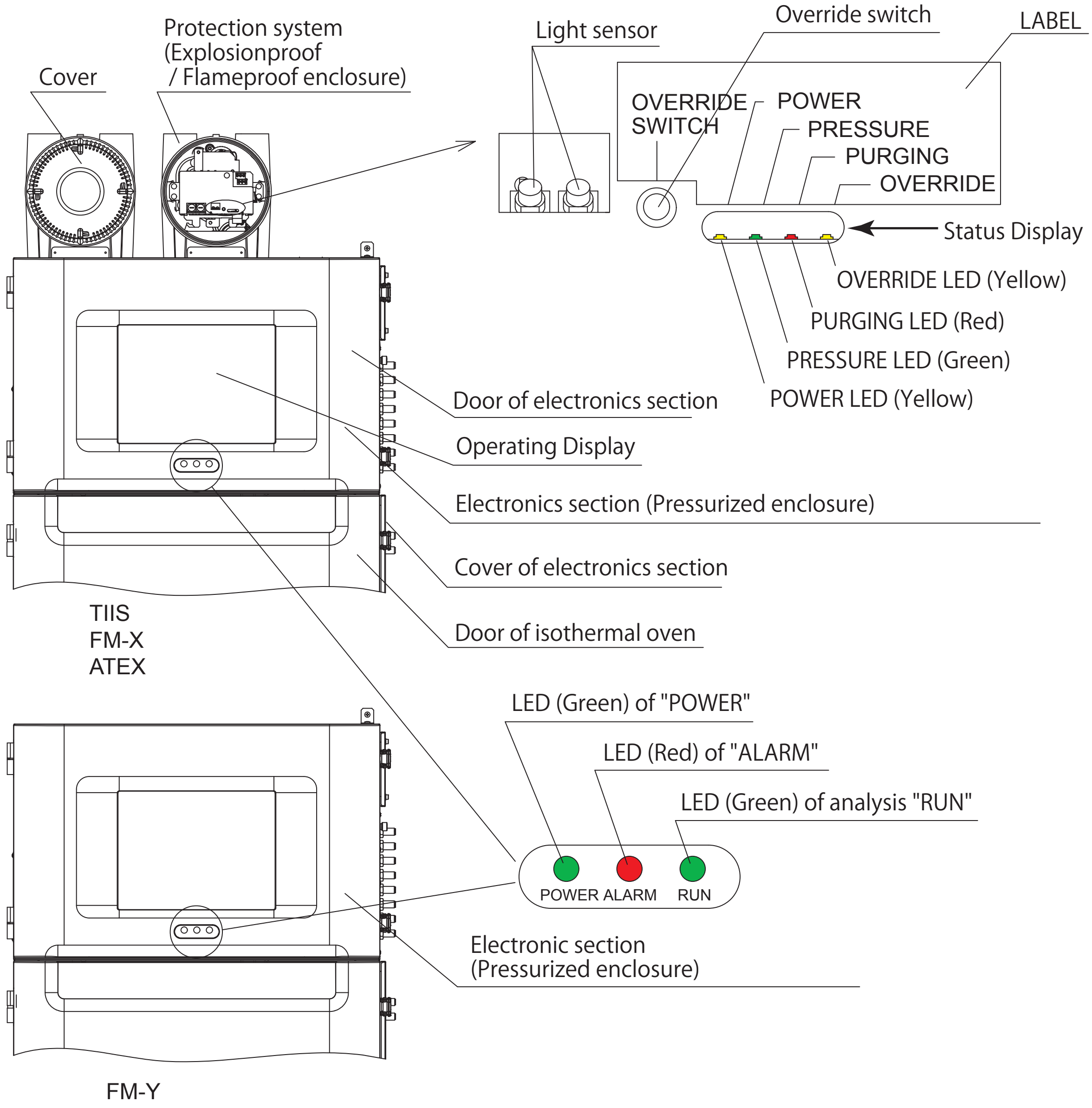


Figure 5

● Operation

WARNING

- When the door or cover of the pressurized enclosure is opened, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.
- Before opening the door and cover of the electronics section, turn off the power and wait for at least 25 minutes after obtaining the permission of the administrator.
- Electrostatic charge may cause an explosion hazard.

  Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the protection gas supplied for more than an hour after turning off the power. Keep hands away from the oven components.

FM-X, ATEX, TIIS

<Power on>

(1) Power is supplied to the protection system (flameproof enclosure).

(2) Protective gas (air) is supplied to the protective gas (Purging air) inlet.

(3) When the internal pressure in the electronics section, which is the control unit and oven unit 1 to 3, exceeds 392 ±20 (Pa), purging to each electronics section begins.

(4) After 21 ±3 minutes purging, power is applied to the electronics section of the control unit. On the other hand, it does not be applied to the electronics section of the oven unit 1 to 3, the heater and detector in the oven yet.

(5) When the internal pressure in the oven unit 1 to 3 exceeds 392 ±20 (Pa), purging to each oven unit begins independently.

(6) After the purging time as follows, power is applied to the electronics section of the oven unit. Then the hydrogen limiting unit, the heater and detector in the oven are ready for operation. The purging time depends on the flameproof certifications.

TIIS, FM:	9 ±2.5 minutes
ATEX:	11 ±3 minutes

<Power off>

(1) The operation and supply of sample to be measured are stopped. For the detail procedure, refer to “3.3.4 Stopping operation”.

(2) The detector is turned off. For the detail procedure, refer to “3.2.4 Stopping operation”.

In case of FID, FID with methanizer and FPD, the detector should be “Frame out” with stopping the supply of make-up gas, combustion gas and combustion air. Then, wait for over 4 hours.

(3) Each heater of the isothermal oven, LSV and FPD is turned off. For the detail procedure, refer to “Procedure to Turn off the Heater” in “3.3.4 Stopping operation”.

(4) Wait until the oven temperature drops to near room temperature. Usually it takes over one hour. For the detail procedure, refer to “3.1.3 How to Check the Temperature at Each Part”.

(5) The supply of power to the protection system is stopped.

(6) After the oven temperature drops, the supply of the Protective gas (air) is stopped. For long-term operation stop, refer to “3.3.7 Precautions for long-term operation stop.

IMPORTANT

In case of emergency, stop the supply of power immediately. In this case, it may damage to the analyzer.

<Low pressure in the pressureized enclosure>

A. Electronics section (control unit, oven unit 1 to 3)

(1) When the internal pressure in the electronics section falls below 392 ±20 (Pa), the protection system immediately shuts off the power supply to the control unit and oven unit 1 to 3.

(2) When the internal pressure described above returns to normal, the procedure starts automatically from item (4) in <Power on>.

B. Each isothermal oven in the oven unit 1 to 3

(1) When any of internal pressure in the oven falls below 392 ±20 (Pa), the control unit immediately shuts off the power supply to the electronics section of the relevant oven.

(2) When the internal pressure in the oven returns to normal, the procedure starts automatically at item (6) in <Power on>.

FM-Y

<Power on>

(1) Protective gas (air) is supplied to the protective gas (Purging air) inlet.

(2) The pressure value is checked if it is indicated the specified one at the pressure gauge.

(3) Wait for 21±3 minutes to keep the protective gas (air) supplied.

(4) Power is supplied to the electronics section of the control unit.

(5) Check if the “Elec. Press. Down” error is not outputted. When this alarm is outputted, stop the supply of power. In this case, the procedure starts automatically described in “A. Electronics section (control unit, oven unit 1 to 3)” in <Low pressure in the pressurized enclosure>.

(6) When the internal pressure in the oven unit 1 to 3 exceeds 392 ±20 (Pa), purging to the oven unit begins.

(7) After 9 ±2.5 minutes the purging, power is applied to the electronics section of the oven unit. Then the hydrogen limiting unit, the heater and detector in the oven are ready for operation.

<Power off>

(1) The operation and the supply of sample to be measured are stopped. For the detail procedure, refer to “3.3.4 Stopping operation”

(2) The detector is turned off. For the detail procedure, refer to “3.2.4 Stopping operation”.

In case of FID, FID with methanizer and FPD, the detector should be “Frame out” with stopping the supply of make-up gas, combustion gas and combustion air. Then, wait for over 4 hours.

(3) Each heater of the isothermal oven, LSV and FPD is turned off. For the detail procedure, refer to “Procedure to Turn off the Heater” in “3.3.4 Stopping operation”.

(4) Wait until the oven temperature drops to near room temperature. Usually it takes over one hour. For the detail procedure, refer to “3.1.3 How to Check the Temperature at Each Part”.

(5) The supply of power to the protection system is stopped.

(6) After the oven temperature drops, the supply of the Protective gas (air) is stopped. For long-term operation stop, refer to “3.3.7 Precautions for long-term operation stop.

IMPORTANT

In case of emergency, stop the supply of power immediately. In this case, it may damage to the analyzer.

<Low pressure in the pressureized enclosure>

A. Electronics section (control unit, oven unit 1 to 3)

When the internal pressure in the electronics section falls below 392 ±20 (Pa), the following function is activated.

The power supply is not shut off automatically. It should be done manually.

- The alarm is outputted from the contact output.
- The pressure low alarm is indicated on the operation panel.
- The “ALARM” LED is turned on.

B. Each isothermal oven in the oven unit 1 to 3

When the internal pressure in any of the ovens falls below 392 ±20 (Pa), the control unit immediately shuts off the power supply to the heater and detector in the respective ovens.

The function as follows is also activated at the same time.

- The alarm is outputted from the contact output.
- The pressure low alarm is indicated on the operation panel.
- The “ALARM” LED is turned on.

When the internal pressure in the oven returns to normal, the procedure starts automatically from item (7) in <Power on>.

● Replacing parts

Always use parts specified by Yokogawa when replacing parts. For replacement, see “6. Maintenance”.

● Maintenance and Repair

Instrument modification or parts replacement by any person other than an authorized representative of Yokogawa Electric Corporation is prohibited.

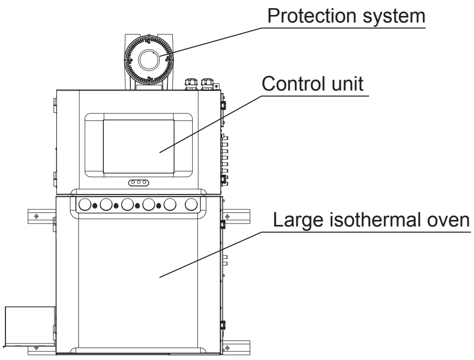
GC8000
Process Gas Chromatograph

IM 11B08A01-01E 1st Edition

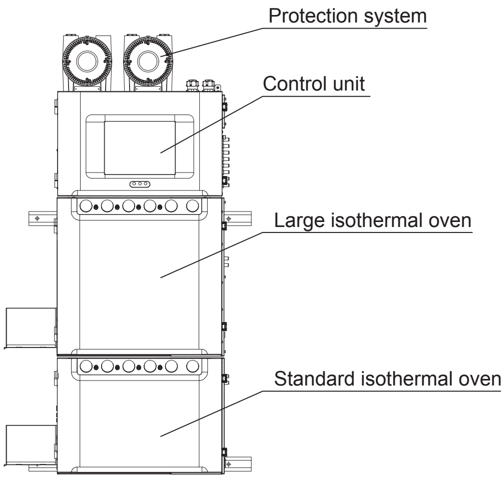
CONTENTS

1. Overview

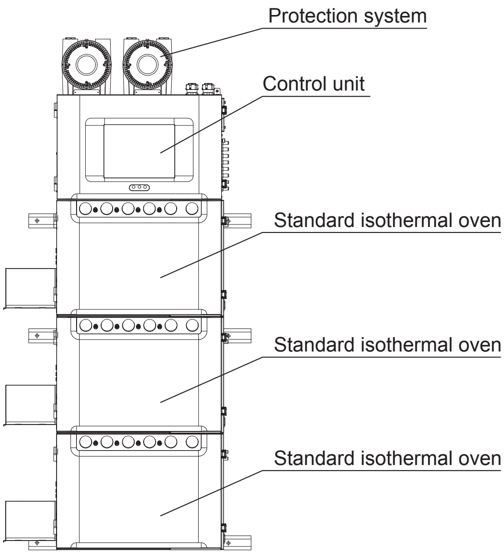
Three types of GC8000 are available (Type 1 to 3). And each type has a wall-mounting version and a self-standing version.



Type 1 (Wall-mounting)



Type 2 (Wall-mounting)



Type 3 (Wall-mounting)

* The self-standing type is equipped with a GCSMP (Type 1 and Type 2). External sampling systems can be connected as needed.

Figure 1.1 GC8000 configuration example

● System configuration

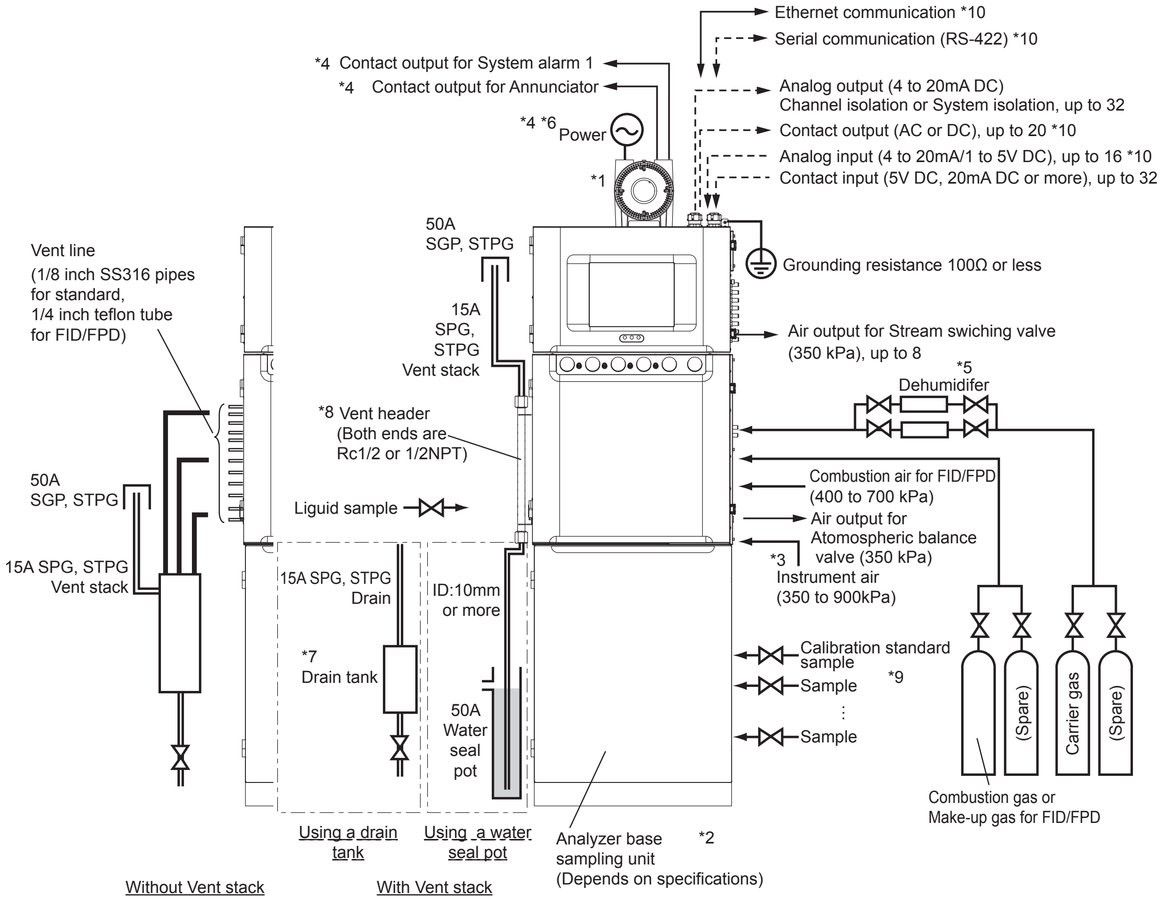
The following equipment is used to construct a process gas chromatograph system with the GC8000 analyzer:

- External sample conditioning equipment
- Personal computer
- Computer for upper system, Analog equipment
- Analyzer network system

The system configuration may differ according to the specifications.

See the General Specifications for details.

1.1 Wiring and Piping Diagram



*1: The specification determines the number of Explosion proof enclosures. No enclosures is needed for FM-Y type.

*2: If an analyzer base sampling unit is provided, most applications require no external sampling equipment. In addition, optimum sampling systems are prepared depending on various conditions. (For details, consult Yokogawa. Optimal sampling systems will be offered.)

*3: For air purge piping, use stainless steel pipe of 1/2 inch or more.

*4: Power and contact output for system alarm 1 or annunciator are connected to control unit in case of FM-Y type.

*5: Dehumidifier can be optionally provided by Yokogawa. Other wiring cables, piping and installation materials should be supplied by the user.

*6: Circuit breaker (30 AT or less) shall be suitable for the item of the power supply described in the specification, and located near the analyzer.

*7: Drain tank is needed only for GCs using FID/FPD. This is not used for GCs using TCD.

*8: Fix venting pipes properly so that the load of the venting pipes does not apply to the assembling vents of this analyzer.

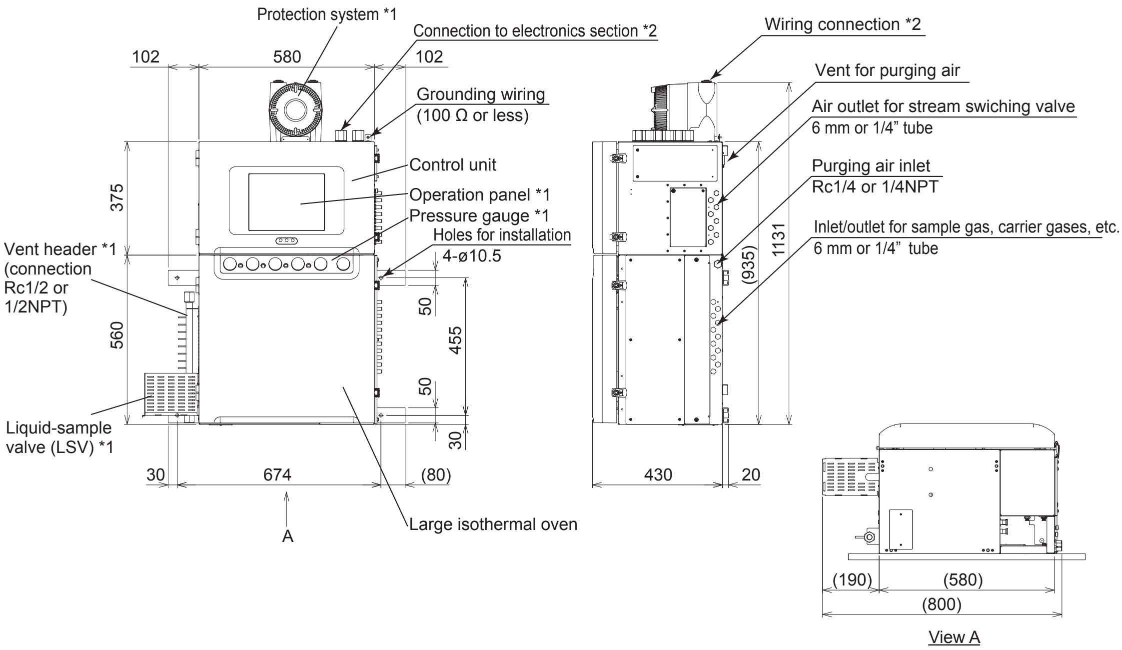
*9: The number of streams including one for calibration standard sample is as follows, in case of using GCSMP.
Type 1: Maximum of 7
Type 2: Maximum of 4

*10: Signal interrupters (disconnects) are required depending on the specification.

1.2 External Dimensions

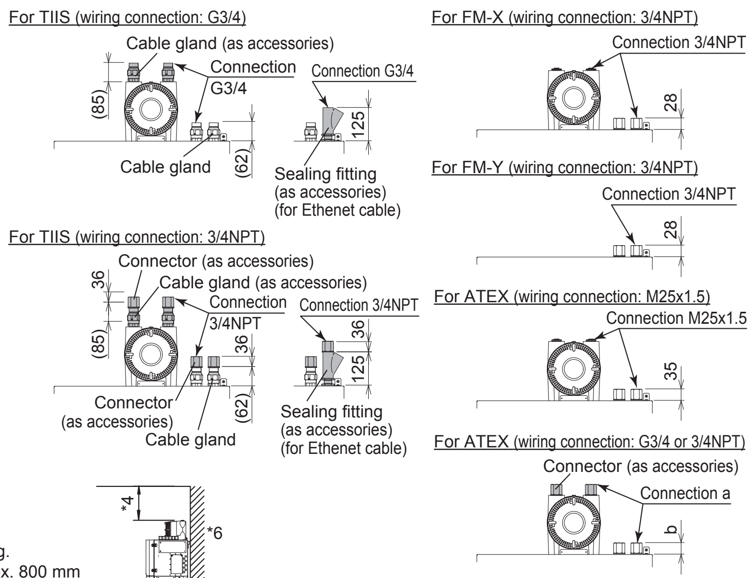
Type 1 (Wall-mounting)

Unit: mm



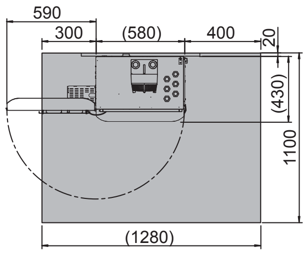
Weight: approx. 100 kg

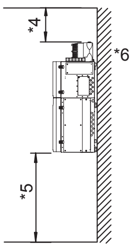
*1: It depends on specifications.
*2: Wiring connections are shown in right figures.



Wiring connection	a	b
G3/4		31
3/4NPT		29

<Maintenance space>

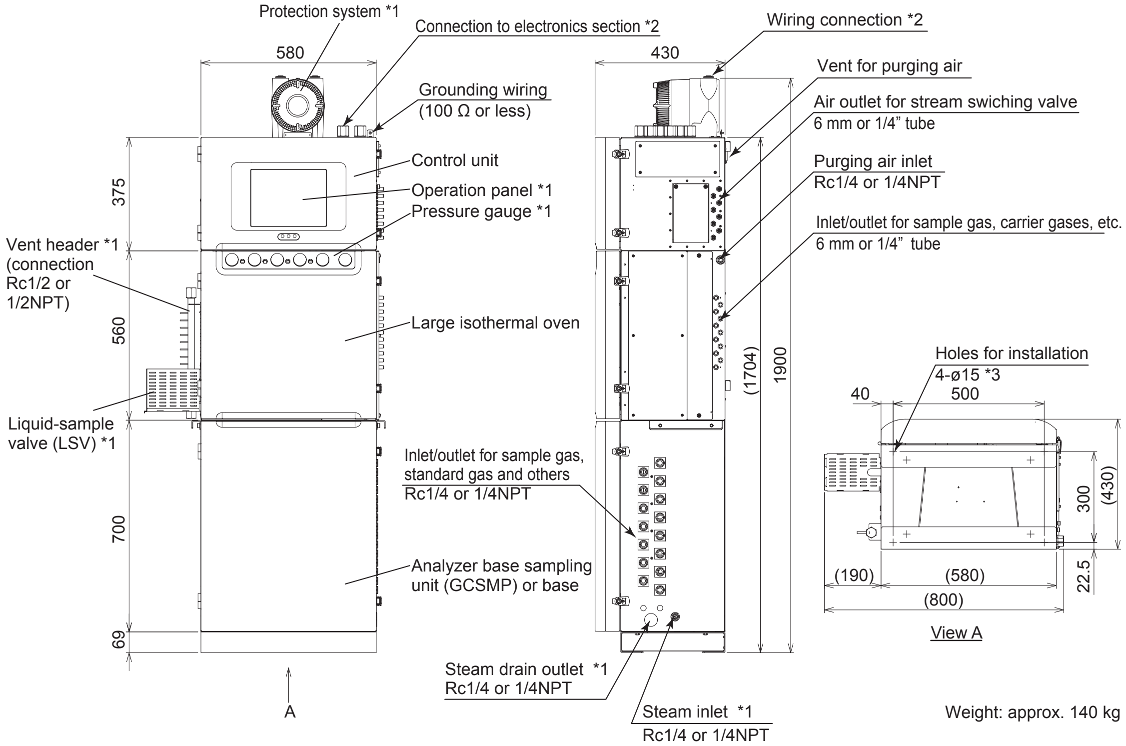




*4: Required clearance needed for wiring.
*5: It is recommended to mount at approx. 800 mm above the floor for easy operation or maintenance.
*6: The wall construction for mounting has to be designed for 4 times the weight of the analyzer.

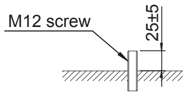
Type 1 (Self-standing)

Unit: mm



Weight: approx. 140 kg

*1: It depends on specifications.
*2: Wiring connections are shown in right figures.
*3: The four outer holes are used for installation. The height of M12 screw (prepared by user) is 25 ±5 mm from the floor.



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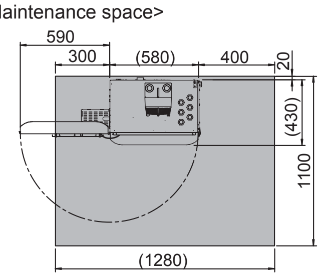
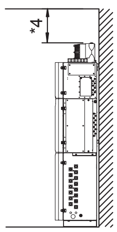
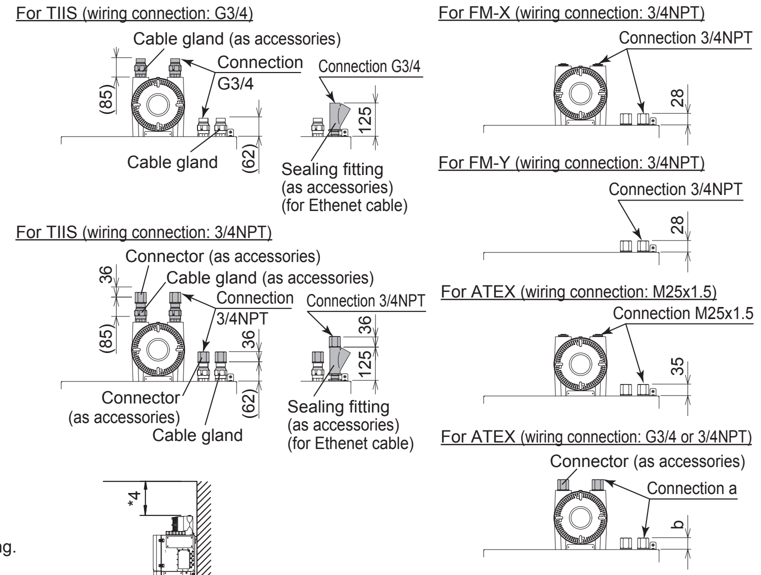


*4: Required clearance needed for wiring.

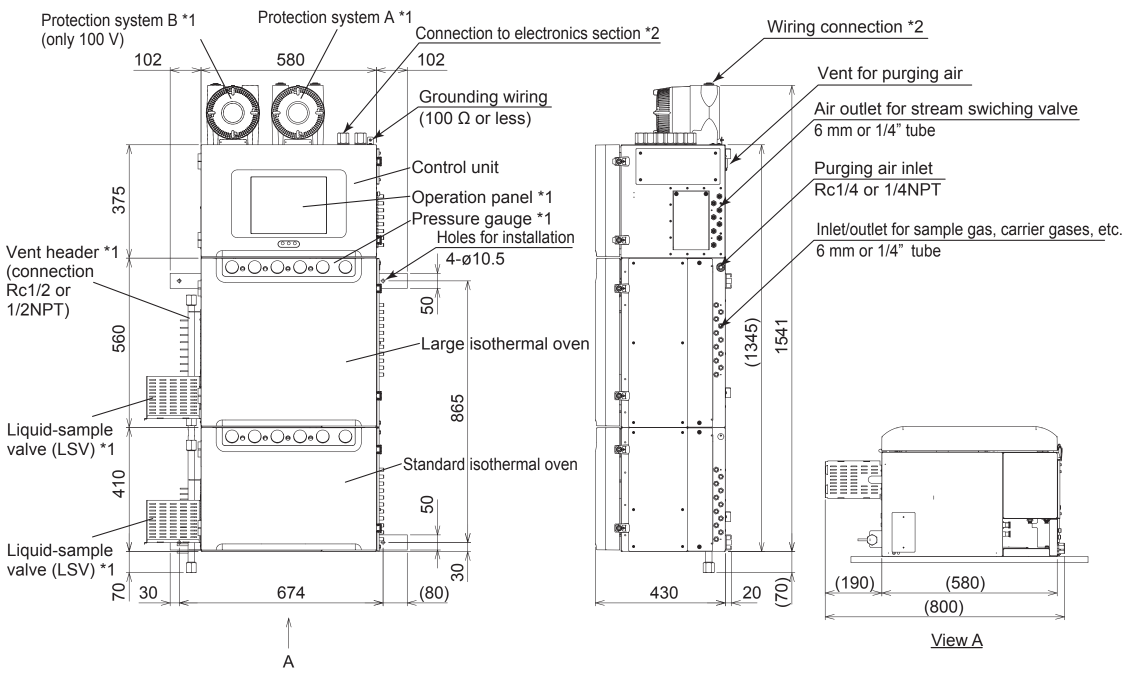




Wiring connection a	b
G3/4	31
3/4NPT	29

Type 2 (Wall-mounting)

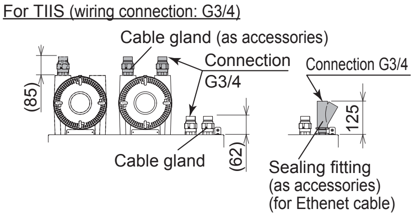
Unit: mm



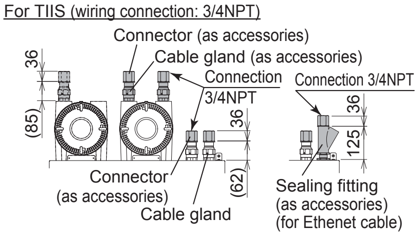
Weight: approx. 155 kg

*1: It depends on specifications.
*2: Wiring connections are shown in right figures.

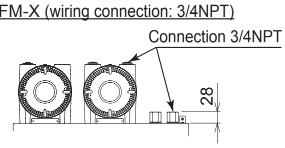
For TIIS (wiring connection: G3/4)



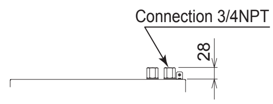
For TIIS (wiring connection: 3/4NPT)



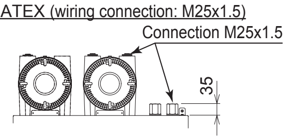
For FM-X (wiring connection: 3/4NPT)



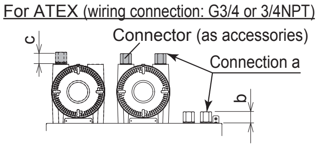
For FM-Y (wiring connection: 3/4NPT)



For ATEX (wiring connection: M25x1.5)

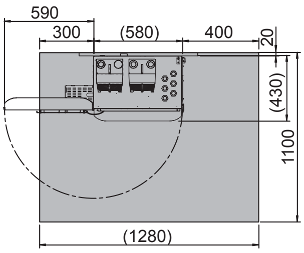


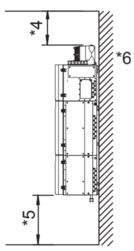
For ATEX (wiring connection: G3/4 or 3/4NPT)



Wiring connection a	b	c
G3/4	31	30
3/4NPT	29	28

<Maintenance space>

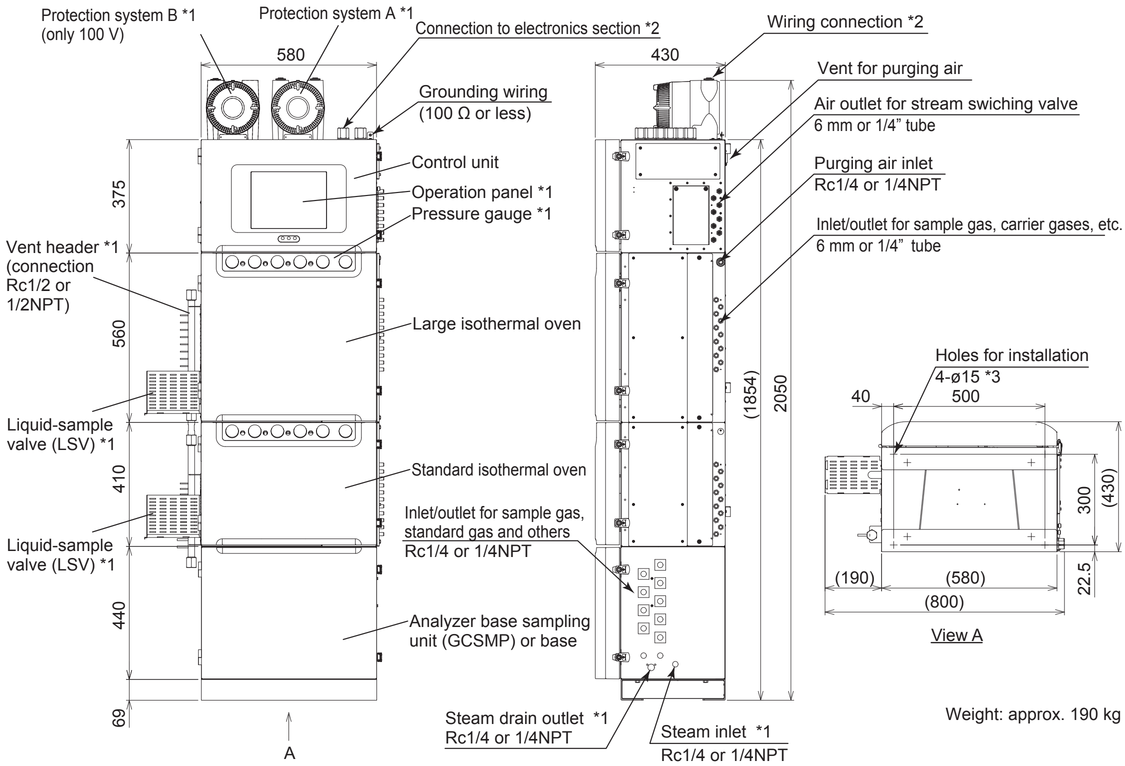




*4: Required clearance needed for wiring.
*5: It is recommended to mount at approx. 500 mm above the floor for easy operation or maintenance.
*6: The wall construction for mounting has to be designed for 4 times the weight of the analyzer.

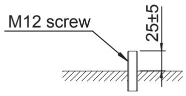
Type 2 (Self-standing)

Unit: mm



Weight: approx. 190 kg

*1: It depends on specifications.
*2: Wiring connections are shown in right figures.
*3: The four outer holes are used for installation. The height of M12 screw (prepared by user) is 25 ±5 mm from the floor.



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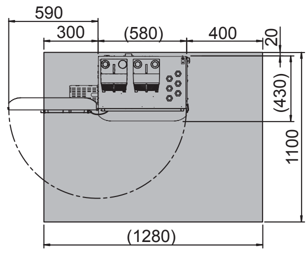
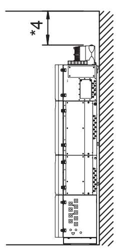
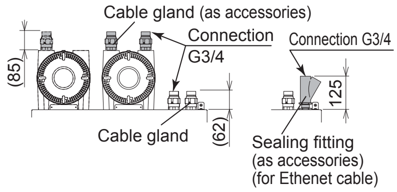


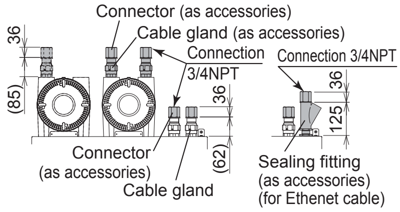


*4: Required clearance needed for wiring.

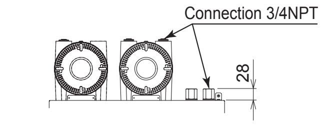
For TIIS (wiring connection: G3/4)



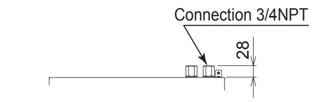
For TIIS (wiring connection: 3/4NPT)



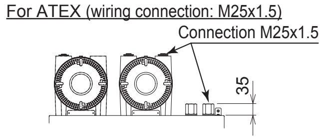
For FM-X (wiring connection: 3/4NPT)



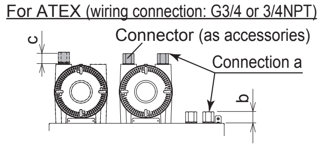
For FM-Y (wiring connection: 3/4NPT)



For ATEX (wiring connection: M25x1.5)



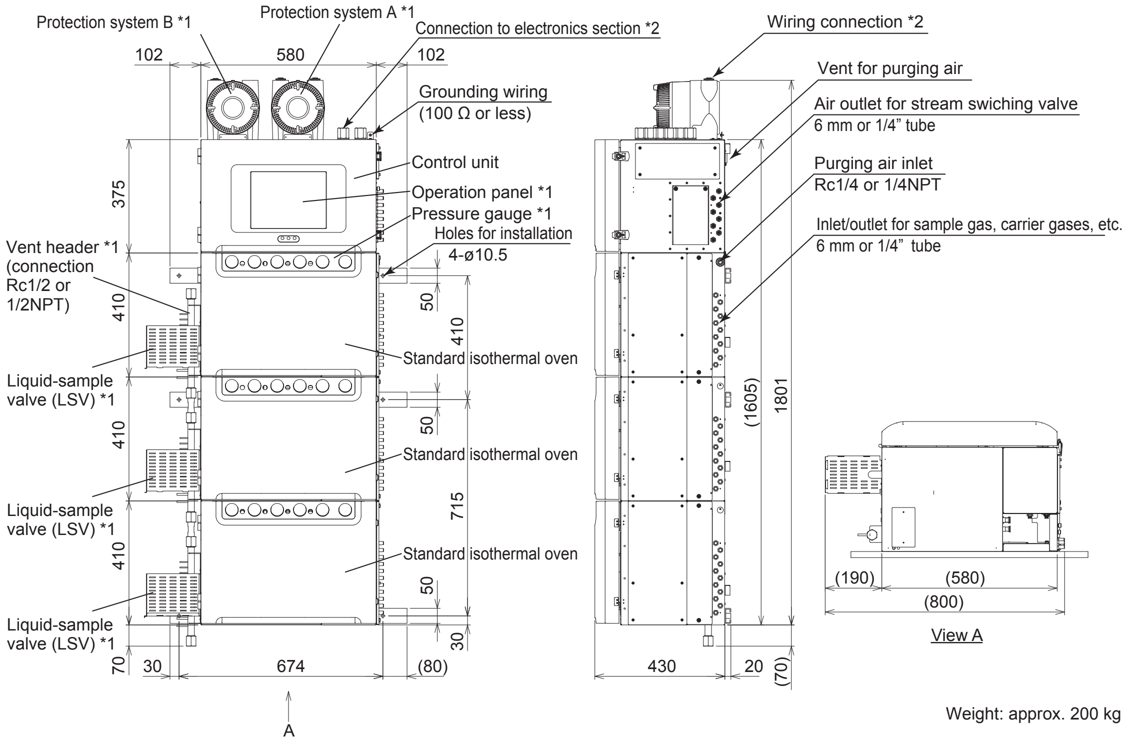
For ATEX (wiring connection: G3/4 or 3/4NPT)



Wiring connection	a	b	c
G3/4		31	30
3/4NPT		29	28

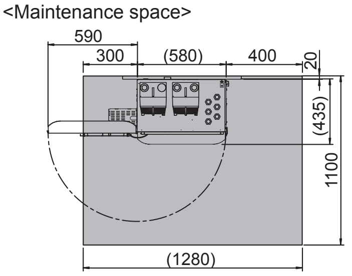
Type 3 (Wall-mounting)

Unit: mm

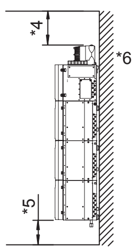


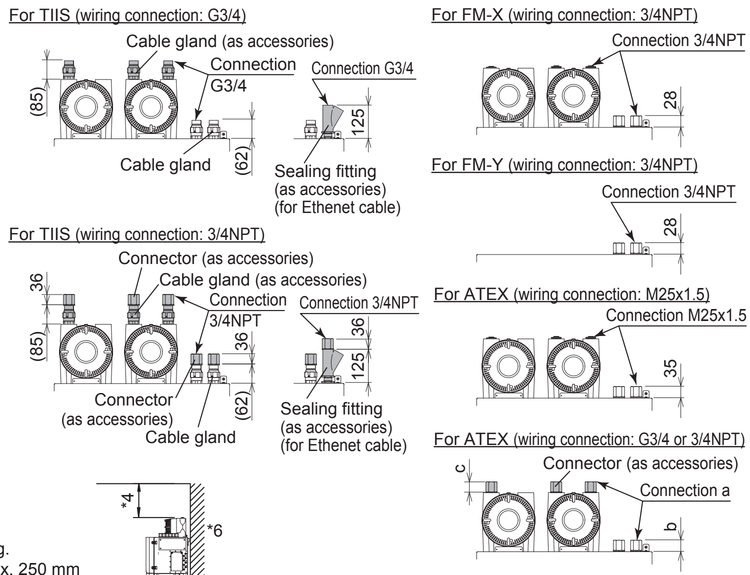
*1: It depends on specifications.
*2: Wiring connections are shown in right figures.

<Maintenance space>



*4: Required clearance needed for wiring.
*5: It is recommended to mount at approx. 250 mm above the floor for easy operation or maintenance.
*6: The wall construction for mounting has to be designed for 4 times the weight of the analyzer.

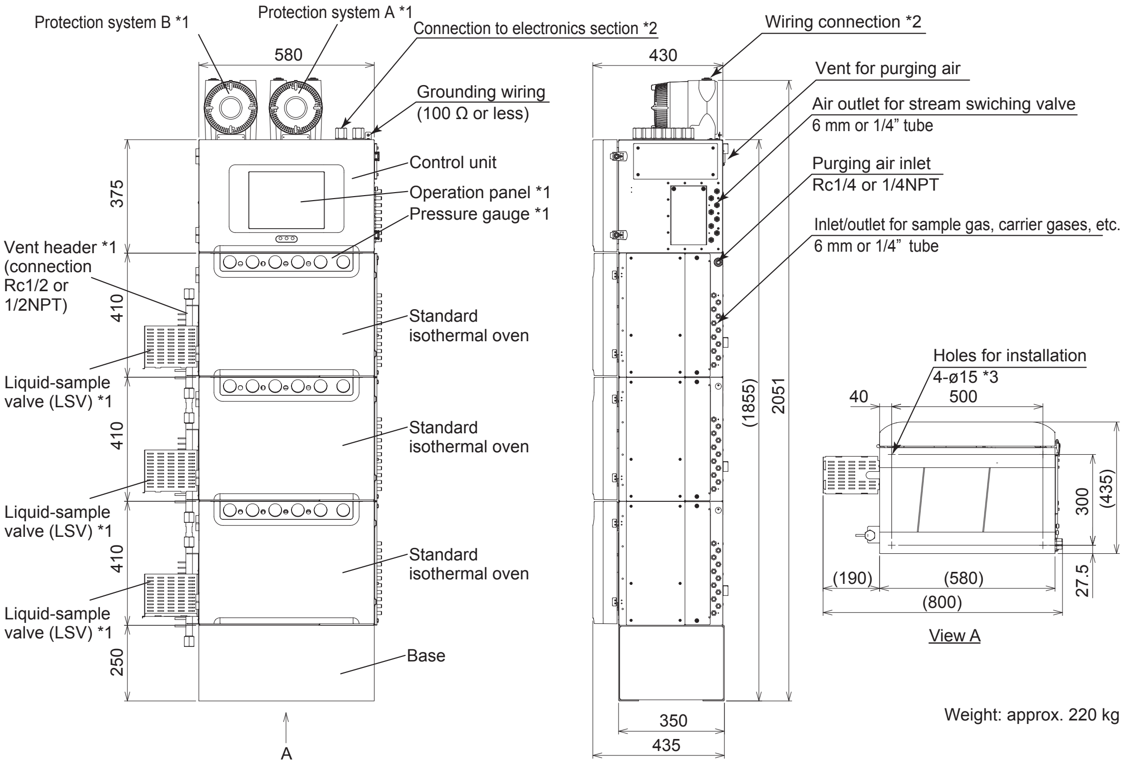




Wiring connection a	b	c
G3/4	31	30
3/4NPT	29	28

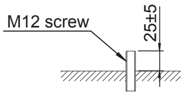
Type 3 (Self-standing)

Unit: mm

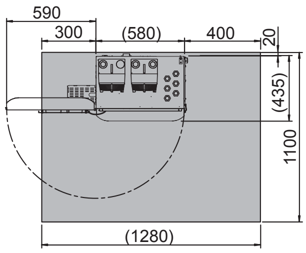


Weight: approx. 220 kg

*1: It depends on specifications.
*2: Wiring connections are shown in right figures.
*3: The four outer holes are used for installation.
The height of M12 screw (prepared by user) is 25 ±5 mm from the floor.

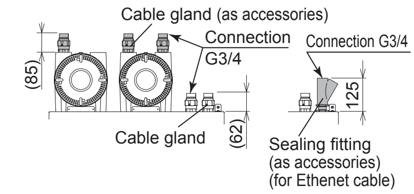


<Maintenance space>

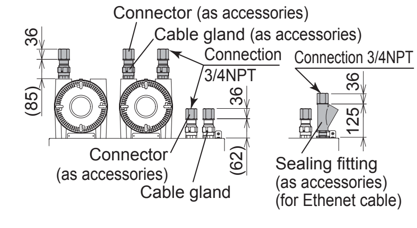


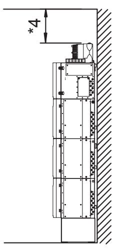
*4: Required clearance needed for wiring.

For TIIS (wiring connection: G3/4)

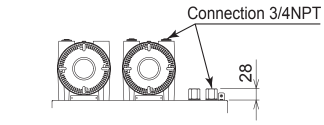


For TIIS (wiring connection: 3/4NPT)

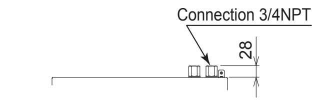




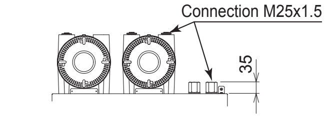
For FM-X (wiring connection: 3/4NPT)



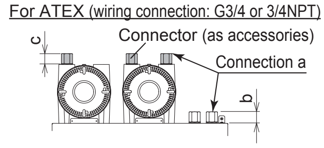
For FM-Y (wiring connection: 3/4NPT)



For ATEX (wiring connection: M25x1.5)



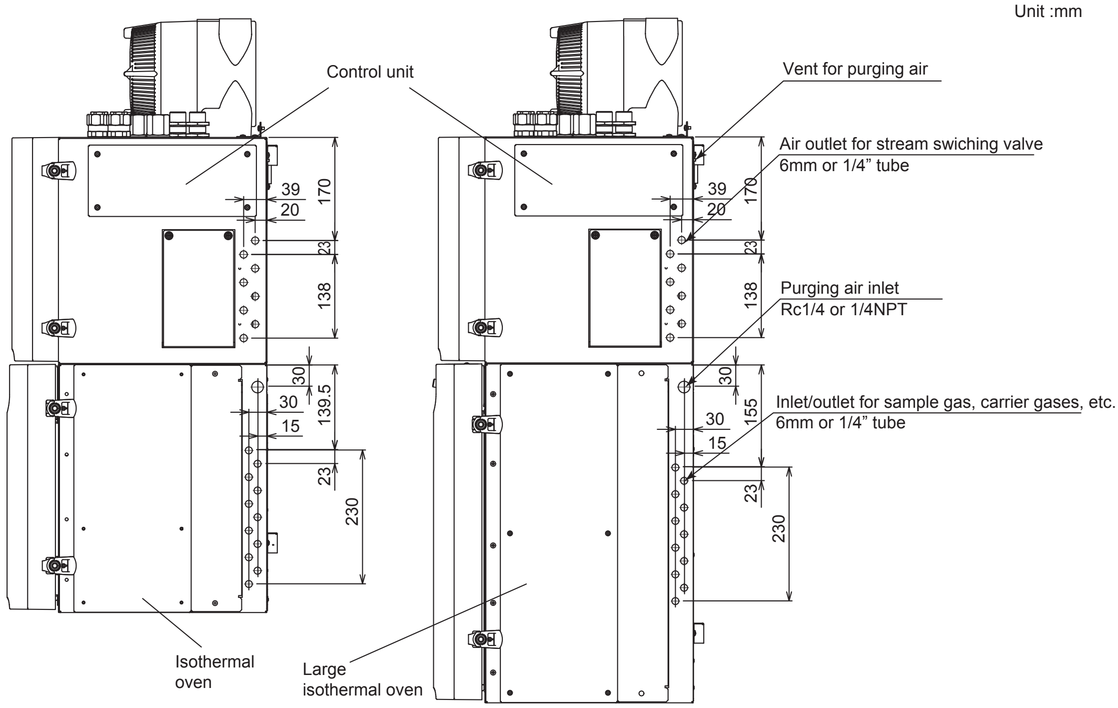
For ATEX (wiring connection: G3/4 or 3/4NPT)



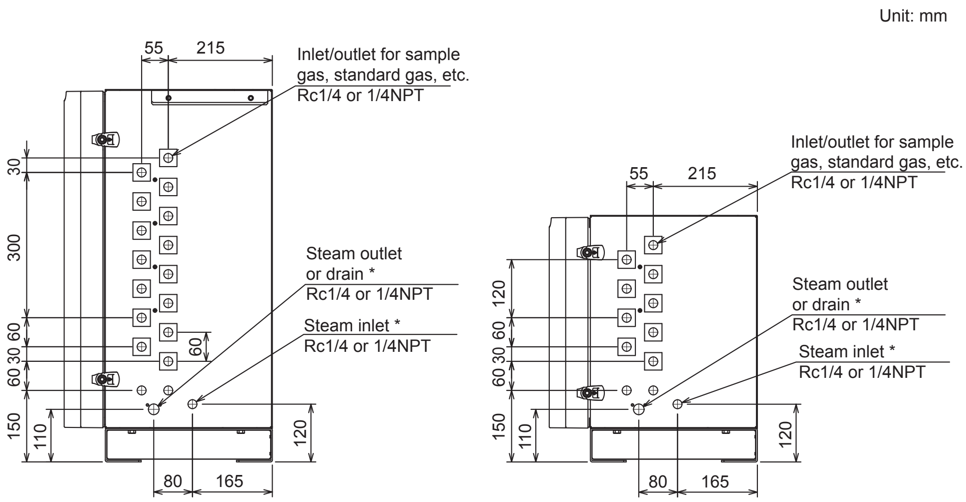
Wiring connection a	b	c
G3/4	31	30
3/4NPT	29	28

1

● Piping connection of control unit, isothermal oven, and large isothermal oven



● Analyzer base sampling system (GCSMP)



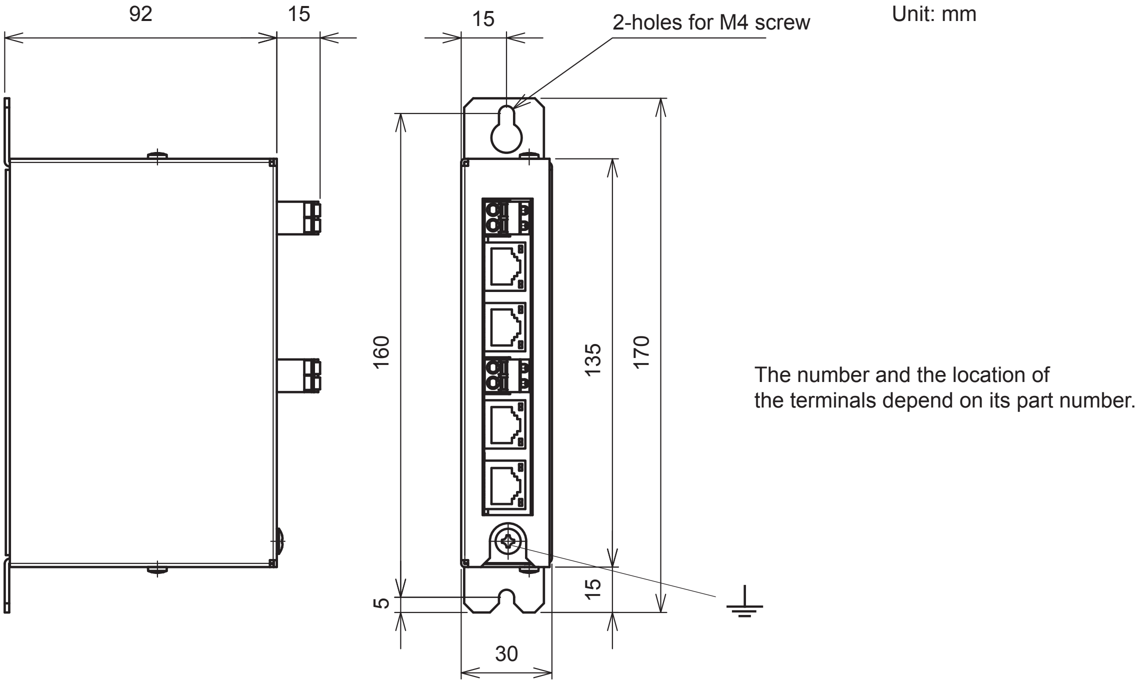
*: It depends on specifications.

* Some specifications do not have these connections.

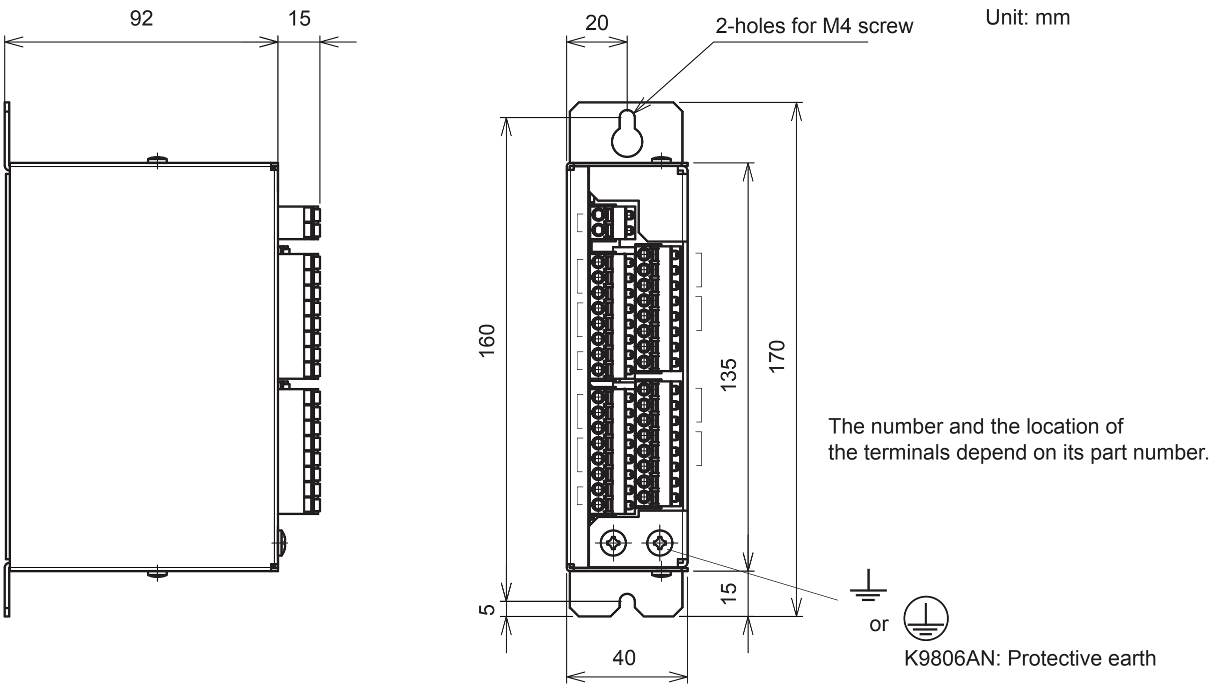
Communication converter/Signal interrupter (disconnecter)

Rack-mounted type

- **Converter for RS-422/RS-232C: K9806AS***
- **Signal interrupter for Ethernet twisted pair cable: K9806AA**
- **Signal interrupter for RS-422 output, analog input: K9806AE**



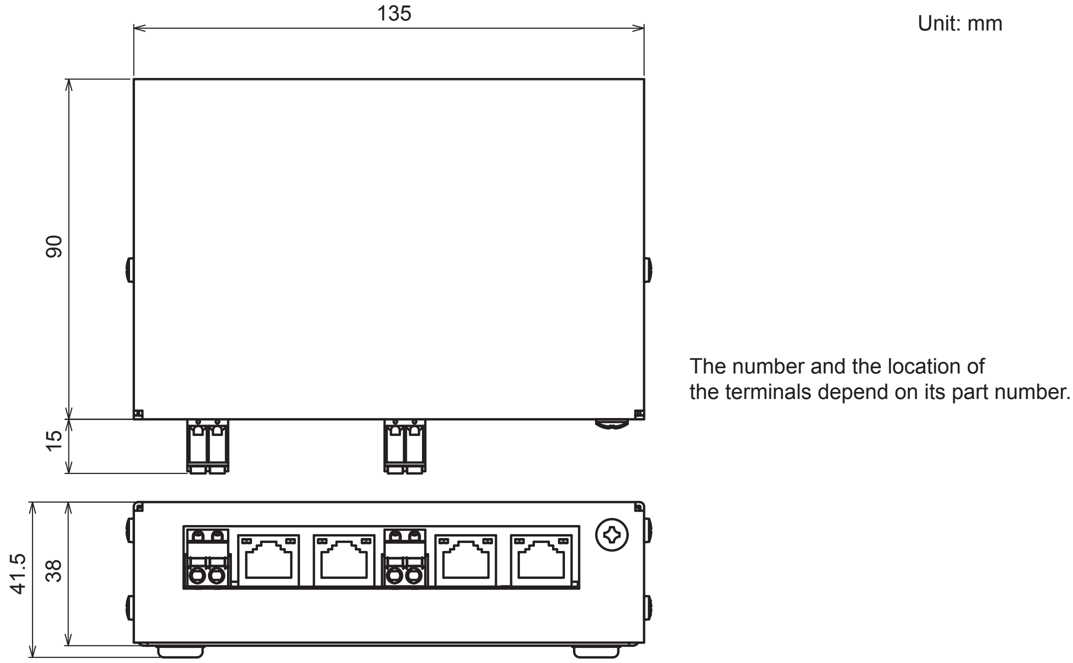
- **Signal interrupter for contact output (AC): K9806AN***
- **Signal interrupter for contact output (DC): K9806AJ***



Note: Rack-mounted type should be installed vertically. The space between the converters/the signal interrupters with mark (*) should be kept more than 10 mm.

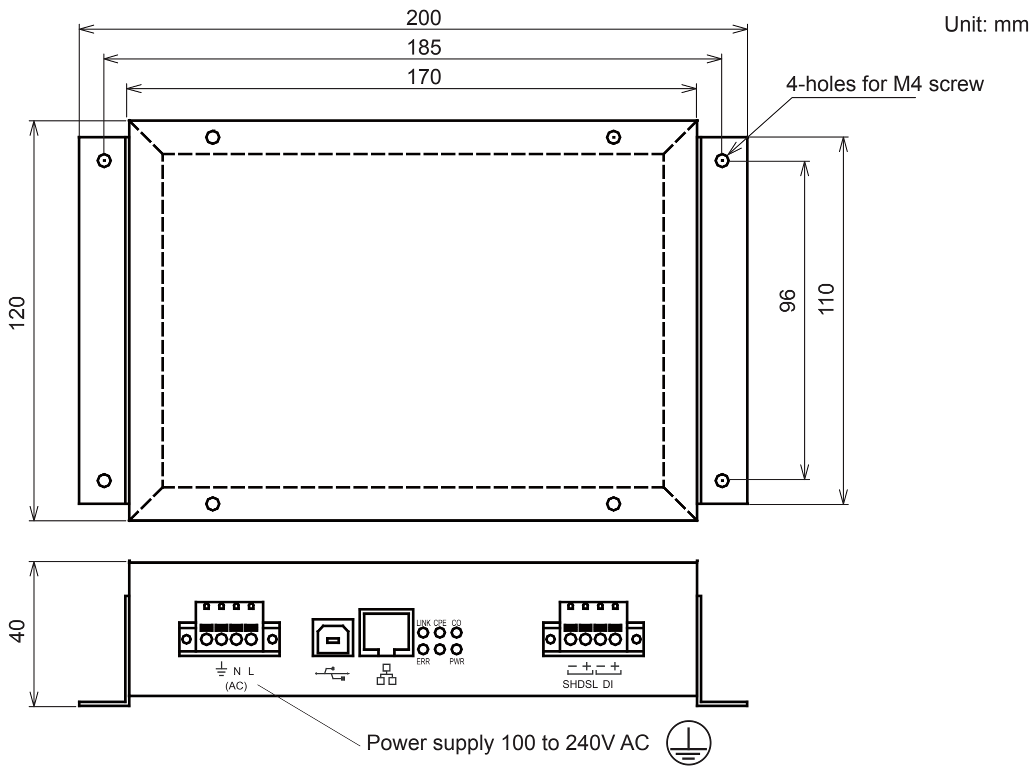
Desk-top type

- **Converter for RS-422/RS-232C: K9806AT**
- **Signal interrupter for Ethernet twisted pair cable: K9806AB**



Note: Desk-top type should be installed horizontally.

Converter for Ethernet/SHDSL: K9802PB (to be announced)



1.3 Auxiliary Hardware

(1) Cylinders (carrier gas, standard gases, etc.)

These cylinders are filled with a carrier gas or standard gas.

The maximum filling pressure is limited to 15 MPa considering the strength of the cylinders.

(2) Regulator for cylinder

This valve reduces a cylinder pressure to a safe degree to facilitate handling. The valve is directly mounted to the cylinder.

(3) Stop valve

This valve shuts down the lines for the sample gas, instrument gas, and so on. It is operated manually.

(4) Dehumidifier

Any moisture in the carrier gas affects the columns. Therefore, if the carrier gas contains moisture over 10 ppm, it is recommended to use a desiccant, such as a molecular sieve, to prevent deterioration of the columns.

(5) Vent stacks

These are pipes to discharge sample bypass vent, sample vent, backflush vent, foreflush vent, detector vent, measurement gas vent, and others to the atmosphere collectively.

Direct the exhaust gas to an area where the gas sufficiently disperses and diffuses before discharging.

(6) Regulator for sample

This valve reduces the sample pressure to a specified degree.

To vaporize a liquid sample, use a regulator with a steam-heated vaporizer.

(7) Pipings

The pipes for the sample inlet, carrier gas inlet, standard gas inlet, air for valve driving, air for FID/FPD, FID/FPD hydrogen, steam, sampling bypass, and various vents are provided.

(8) Joints

The joints are used to connect pipes.

1.4 Gases Required for Operation

The following gases are required for the analyzer:

(1) Sample gas

The gas to be analyzed from the process line

(2) Carrier gas

Prepare a gas cylinder for the carrier gas. Keep spare cylinders at hand, too.

If two different carrier gases are used, two gas cylinders are needed.

The gas must satisfy the following conditions. (Gas with higher purity may be required depending on the specifications. See the delivery specifications for details.)

Purity: Measuring range from 0 to 50 ppm or more: 99.99% minimum

Moisture: 10 ppm or less; organic components: 5 ppm or less

Measuring range from 0 to less than 50 ppm: 99.999% minimum

Moisture: 5 ppm or less; organic components: 0.1 ppm or less

(3) Standard gas

This gas is used for calibration. Prepare a gas cylinder including measurement component.

Since up to three different standard gases can be used for automatic calibration, prepare gas cylinders suitable for calibration.

(4) FID/FPD combustion hydrogen gas

Hydrogen gas is necessary when either FID or FPD is used as a detector. Prepare pure hydrogen gas in a cylinder, and keep spare cylinders at hand.

The gas must satisfy the following conditions. (Gas with higher purity may be required depending on the specifications. See the delivery specifications for details.)

Purity: Measuring range from 0 to 50 ppm or more: 99.99% minimum

Moisture: 10 ppm or less; organic components: 5 ppm or less

Measuring range from 0 to less than 50 ppm: 99.999% minimum

Moisture: 5 ppm or less; organic components: 0.1 ppm or less

(5) Instrument air

This air is used for valve actuation and purging.

Pressure: 350 to 900 kPa

Flowrate: Type 1: 100 to 140 L/min (130 to 100 L/min for FPD)

Type 2: 150 to 210 L/min (180 to 270 L/min for FPD)

Type 3: 200 to 280 L/min

(6) FID/FPD combustion air

This air is used to burn hydrogen gas in an FID or FPD.

The air must satisfy the following conditions.

Purity: Measuring range from 0 to 50 ppm or more: moisture: 10 ppm or less; organic components: 5 ppm or less

Measuring range from 0 to less than 50 ppm: moisture: 5 ppm or less; organic components: 0.1 ppm or less

(7) Steam

Steam is required to steam-heat a sample. Prepare a steam source that can apply the pressure listed in “Operation Data.”

1.5 Conformance Standards

(1) Safety Standard

Complying Standard:

- CE Marking: EN61010-1
- CSA: CSA61010-1
- FM: FM3810 (IEC61010-1)

CAUTION

This instrument is a Class A product, and is designed for use in an industrial environment. Please use this instrument in an industrial environment only.

(2) EMC Standard

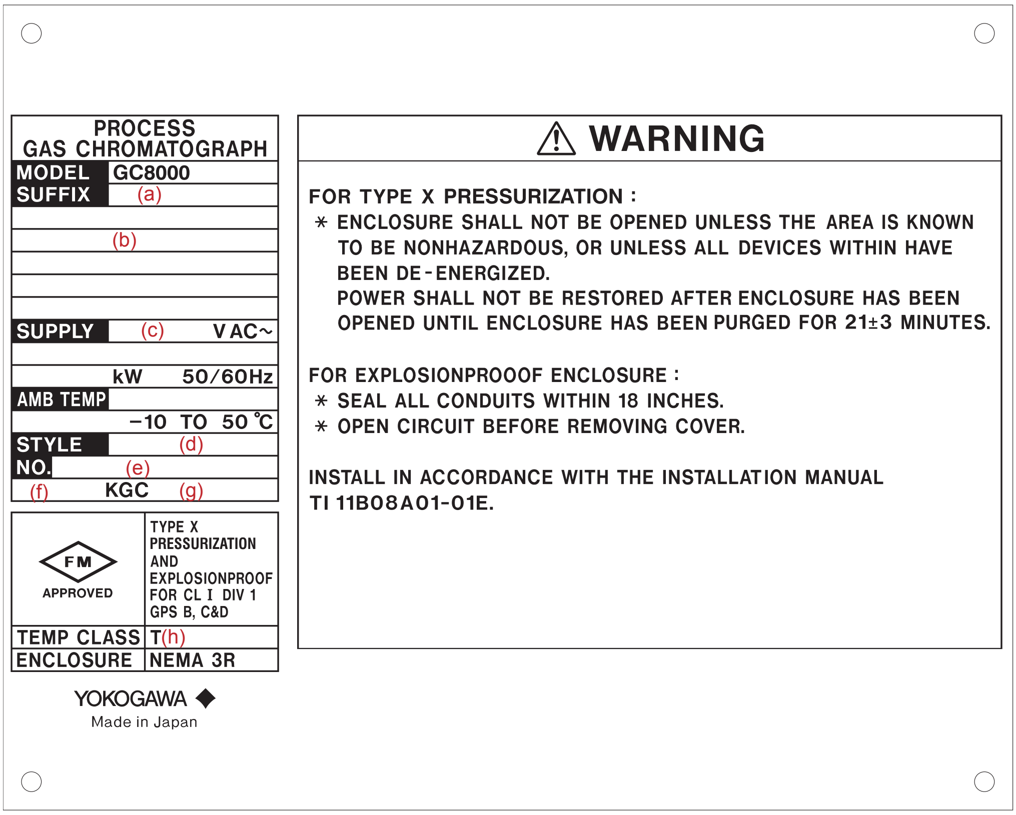
Complying Standard for ATEX (pending):

- EN61326-1 Class A (Emission)
- EN613216-1, EN61326-2-3 (Immunity)

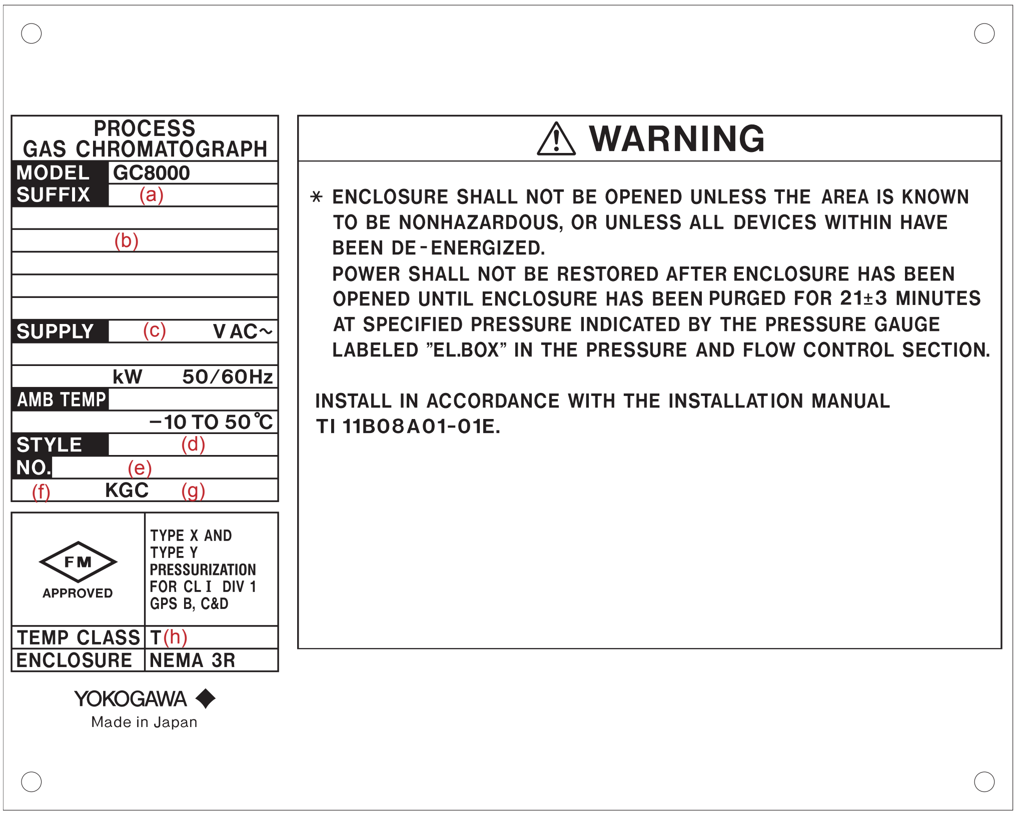
1.6 Data Plate

■ FM

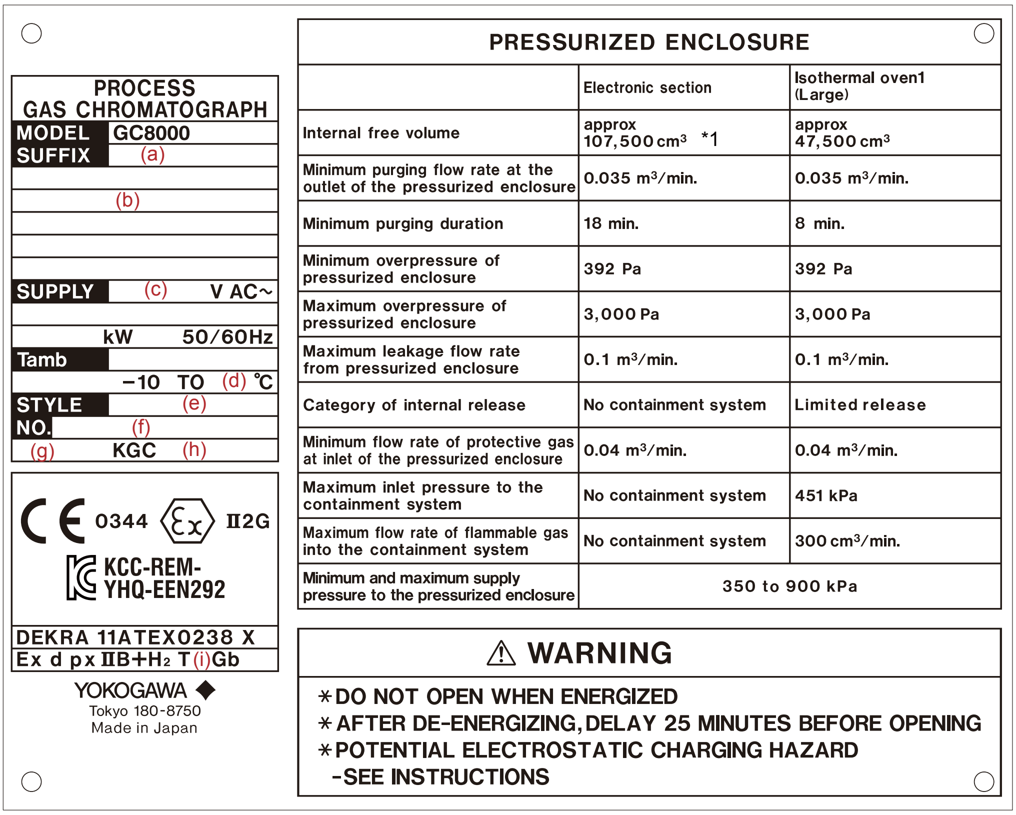
● FM-X



● FM-Y


PROCESS
GAS CHROMATOGRAPH
MODEL GC8000
SUFFIX (a)
(b)
SUPPLY (c) V AC~
kW 50/60Hz
AMB TEMP
−10 TO 50℃
STYLE (d)
NO. (e)
(f) KGC (g)
FM
APPROVED
TYPE X AND
TYPE Y
PRESSURIZATION
FOR CL I DIV 1
GPS B, C&D
TEMP CLASS T(h)
ENCLOSURE NEMA 3R
YOKOGAWA ◆
Made in Japan
WARNING
* ENCLOSURE SHALL NOT BE OPENED UNLESS THE AREA IS KNOWN TO BE NONHAZARDOUS, OR UNLESS ALL DEVICES WITHIN HAVE BEEN DE-ENERGIZED.
POWER SHALL NOT BE RESTORED AFTER ENCLOSURE HAS BEEN OPENED UNTIL ENCLOSURE HAS BEEN PURGED FOR 21±3 MINUTES AT SPECIFIED PRESSURE INDICATED BY THE PRESSURE GAUGE LABELED "EL.BOX" IN THE PRESSURE AND FLOW CONTROL SECTION.
INSTALL IN ACCORDANCE WITH THE INSTALLATION MANUAL TI 11B08A01-01E.

■ ATEX



In case of Type 2

	Electronic section	Isothermal oven 1	Isothermal oven 2
Internal free volume	approx. 124,000 cm^3 *2	approx. 47,500 cm^3	approx. 31,000 cm^3
Minimum purging flow rate at the outlet of the pressurized enclosure	0.035 m^3/min	0.035 m^3/min	0.035 m^3/min
Minimum purging duration	18 min	8 min	8 min
Minimum overpressure of pressurized enclosure	392 Pa	392 Pa	392 Pa
Maximum overpressure of pressurized enclosure	3,000 Pa	3,000 Pa	3,000 Pa
Maximum leakage flow rate from pressurized enclosure	0.1 m^3/min	0.1 m^3/min	0.1 m^3/min
Minimum leakage flow rate from pressurized enclosure	0.005 m^3/min	0.005 m^3/min	0.005 m^3/min
Category of internal release	No containment system	Limited release	Limited release
Minimum flow rate of protective gas at inlet of the pressurized enclosure	0.04 m^3/min	0.04 m^3/min	0.04 m^3/min
Maximum inlet pressure to the containment system	No containment system	451 kPa	451 kPa
Maximum flow rate of flammable gas into the containment system	No containment system	300 cm^3/min	300 cm^3/min
Minimum and maximum supply pressure to the pressurized enclosure	350 to 900 kPa		

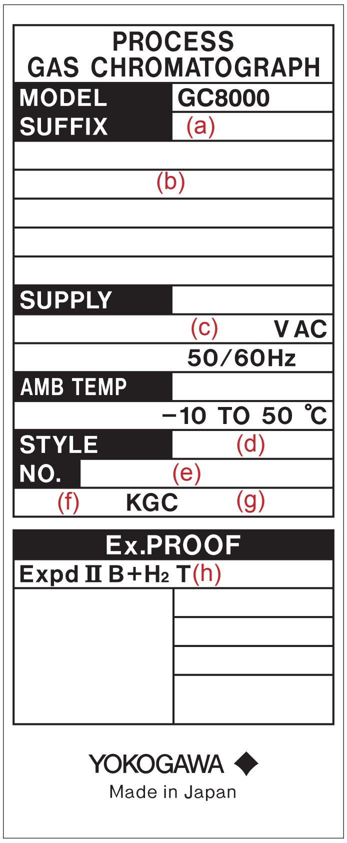
In case of Type 3

	Electronic section	Isothermal oven 2 x 3 (each of them)
Internal free volume	approx. 134,500 cm^3 *3	approx. 31,000 cm^3
Minimum purging flow rate at the outlet of the pressurized enclosure	0.035 m^3/min	0.035 m^3/min
Minimum purging duration	18 min	8 min
Minimum overpressure of pressurized enclosure	392 Pa	392 Pa
Maximum overpressure of pressurized enclosure	3,000 Pa	3,000 Pa
Maximum leakage flow rate from pressurized enclosure	0.1 m^3/min	0.1 m^3/min
Minimum leakage flow rate from pressurized enclosure	0.005 m^3/min	0.005 m^3/min
Category of internal release	No containment system	Limited release
Minimum flow rate of protective gas at inlet of the pressurized enclosure	0.04 m^3/min	0.04 m^3/min
Maximum inlet pressure to the containment system	No containment system	451 kPa
Maximum flow rate of flammable gas into the containment system	No containment system	300 cm^3/min
Minimum and maximum supply pressure to the pressurized enclosure	350 to 900 kPa	

*1: Approx. 110,000 cm^3 with EPC
*2: Approx. 129,000 cm^3 with EPC
*3: Approx. 142,000 cm^3 with EPC

No.	Text	Remarks
(a)	-A	ATEX
(b)	Model and suffix codes	With additional code
(c)	100 ±10%, 110 ±10%, 115 ±10%, 120 ±10%, 200 ±10%, 220 ±10%, 230 ±10%, 240 ±10%	Depends on power specifications (-A to -H)
(d)	40, 45, 50	T1, T2: 40 °C, T3: 45 °C, T4: 50 °C
(e)	Latest style number	
(f)	Instrument number	
(g)	Year of production	In A.D. year
(h)	KGC number	
(i)	(T)1 to (T)4	Depends on temperature class specifications

■ TIIS



PRESSURIZED ENCLOSURE 内圧防爆に関する事項		
	ELECTRIC PART 電気回路部	ISOTHERMAL OVEN (L) 恒温槽（大）
INTERNAL FREE VOLUME 容器の内容積	APPROX *1 約107,500cm³	APPROX 約47,500cm³
ENCLOSURE OVERPRESSURE 給気口の所要圧力	490Pa	490Pa
AIR SUPPLY REQUIRED 給気口の所要風量	50l/min	50l/min
MAXIMUM ENCLOSURE OVERPRESSURE 保護ガスの最高圧力	980Pa	980Pa

⚠ **WARNING**

Wait 25 minutes or more after power disconnection, before opening the door and the cover of electronic section with administrator's permission.

⚠ 警告

電気回路部のドアおよびカバーを開ける際は、
管理者の許可のもとで電源遮断後、25分以上経過してから行って下さい。

In case of Type 2

PRESSURIZED ENCLOSURE 内圧防爆に関する事項			
	ELECTRIC PART 電気回路部	ISOTHERMAL OVEN(L) 恒温槽（大）	ISOTHERMAL OVEN 恒温槽
INTERNAL FREE VOLUME 容器の内容積	APPROX *2 約124,000cm³	APPROX 約47,500cm³	APPROX 約31,000cm³
ENCLOSURE OVERPRESSURE 給気口の所要圧力	490Pa	490Pa	490Pa
AIR SUPPLY REQUIRED 給気口の所要風量	50l/min	50l/min	50l/min
MAXIMUM ENCLOSURE OVERPRESSURE 保護ガスの最高圧力	980Pa	980Pa	980Pa

In case of Type 3

PRESSURIZED ENCLOSURE 内圧防爆に関する事項		
	ELECTRIC PART 電気回路部	ISOTHERMAL OVEN × 3 (EACH OF THEM) 恒温槽×3台（1台あたり）
INTERNAL FREE VOLUME 容器の内容積	APPROX *3 約134,500cm³	APPROX 約31,000cm³
ENCLOSURE OVERPRESSURE 給気口の所要圧力	490Pa	490Pa
AIR SUPPLY REQUIRED 給気口の所要風量	50l/min	50l/min
MAXIMUM ENCLOSURE OVERPRESSURE 保護ガスの最高圧力	980Pa	980Pa

*1: Approx. 110,000 cm^3 with EPC
*2: Approx. 129,000 cm^3 with EPC
*3: Approx. 142,000 cm^3 with EPC

No.	Text	Remarks
(a)	-T	TIIS
(b)	Model and suffix codes	With additional code
(c)	100 ±10%, 110 ±10%, 115 ±10%, 120 ±10%, 200 ±10%, 220 ±10%, 230 ±10%, 240 ±10%	Depends on power specifications (-A to -H)
(d)	Latest style number	
(e)	Instrument number	
(f)	Year of production	In A.D. year
(g)	KGC number	
(h)	(T)1 to (T)4	Depends on temperature class specifications

1.7 Features

● Simple operation by touching the screen

The GC-HMI (Human Machine Interface: a 12-inch color LCD touch panel) dramatically improves operation and simplifies maintenance.

● GC modules enable parallel chromatography

Parallel chromatography is made practical with the introduction of the GC Module concept. Complex applications are divided into smaller simultaneous measurements, reducing the analysis time and allowing configurations to be tailored to customers' needs.

- Gas Chromatograph Module (GCM)

  As a single GCM is equivalent to a single virtual GC, virtual GCs set up on the GC8000 can measure multiple streams simultaneously.
- System (SYS)

  SYS is the smallest segment for analysis, and SYSs can be set up in a single GCM. Therefore, individual SYS configurations allow the GC8000 to measure only the most important element with a shorter analysis time among the elements. Each SYS assigned to a specific GCM analyzes simultaneously, whereas each SYS assigned to a different GCM does not.

● Flexible and secure GC network design

- The communications network of the GC8000 is based on the Ethernet structure to transmit data to GC workstations and the DCS system. The GC8000 can be set up for either a single Ethernet network or a redundant network.
- Modbus TCP/IP protocol support eliminates the need for communication gateways to DCS systems in many situations. This not only simplifies the network architecture, but also removes a potential point of failure in delivering analytical data to the DCS system. For communication systems that still require Serial Modbus gateways, the ASGW is available.
- For customer sites with an existing Ethernet network for the GC1000 Mark II, the GC8000 is fully compatible without having to modify the network.

● State-of-the-art maintenance software

- Re-analysis function of ASET

  Conventional process chromatographs measure concentrations in accordance with the preset configuration for chromatogram analysis. The appropriate configuration is determined by trial-and-error based on the results of many analyses.

  With this function, the GC8000 can measure concentrations in accordance with the most appropriate configuration for chromatograms saved in a file after measurements. The result can be sent to the analyzer and reused for other measurements. This feature dramatically reduces the maintenance time and improves troubleshooting such as mixtures of process samples with uncertain components.
- Custom software capability

  With the programming in YM-BASIC (Yokogawa's original programming language based on BASIC), calculation formulas for analysis results and various measurement statuses such as stream switching can be changed. This function also allows special calculations using analog inputs from other analyzers and contact inputs.
- Gate tracking function

  The automatic peak tracking function of GC1000 Mark II was improved. The setting of tracking (correction) conditions of the gate time setting to detect peaks has become flexible, from simultaneously setting all GCs to setting each SYS or each detector. This enables precise measurement even in multicomponent analysis such as PIONA.

- Gas Chromatograph File Converter (GCFC) software (option)

  Chromatogram data saved in a file on the GC8000 can be converted to the AIA/ANDI format (complying with the ASTME1947-98 Reapproved 2004 and E1948-98 Reapproved 2004).

  The file of converted chromatogram data can be opened with EZchrom Elite, which is a chromatography data system from Agilent Technologies, for comparison with the currently used data.

● Highly reliable hardware

The GC8000 uses the same proven components including detectors and valves as used in our previous GC model for reliable, precise performance. It is possible to share service parts with the previous model.

1.8 GCM

■ Configuration of a flexible system achieved by multiple ovens/ detectors and the GC module

The GC8000 is capable of holding up to three ovens. Each oven can accommodate up to two detectors (up to six detectors for the entire GC). Furthermore, a new GC module (GCM) concept has been introduced into the GC8000. With the combination of multiple ovens/detectors and the GCM concept, complex applications can be segmented into simple column systems, enabling far more flexible system configuration to address customers' requests. For example, it is applicable to parallel chromatography (parallel GC) to conduct simultaneous analysis of multiple streams and high-speed analysis of components which require relatively short-time analysis.

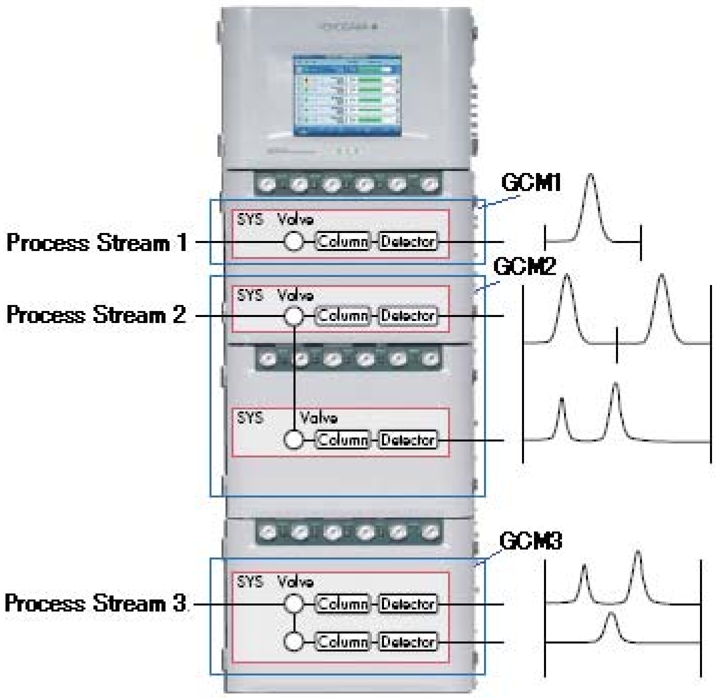


Figure 1.2

■ GC Module (GCM)

The GCM is a virtual GC that measures process streams which exist in one GC. Up to six GCMs can be configured for one GC8000 unit, each of which operates as an independent GC. Through this approach, one GC8000 unit can have functions equal to multiple GCs. The GCM can hold multiple independent analysis cycles, which are called SYSs.

■ SYS

SYS is the smallest analysis unit with an independent analysis cycle. Up to six SYSs can be set in the GCM. This enables the GCM to repeat the measurement of only components which require relatively short-time analysis among the process stream component group, in a short period of time. Respective SYSs in the same GCM synchronously analyze. SYSs in different GCMs asynchronously analyze.

1.9 User Program Function

The user program function is to achieve a more complex and advanced value analyses and GC operation, based on scripts created by the user. The script is described using an interpreter-type language based on the YM-BASIC developed by Yodogawa. There are two timing options to execute the script: at the end of peak detection and regular cycle.

Specific examples of functions achieved by the user program function are as follows:

- Calculations (temperature correction, atmospheric pressure correction, etc.) by acquiring analog input or contact input from other analyzers
- Range changes depending on concentration values
- BTU value calculations
- Backup GC analysis start command when a malfunction arises in the main GC

* This function is optional. To use it, an UP card is necessary

1.10 Configuration

1.10.1 Type and Appearance

The GC8000 Process Gas Chromatograph consists of a protection system*, control unit, oven unit, and stanchion or analyzer base sampling unit (GCSMP)**.

* The specification decides the number of the flameproof enclosure.

** A GCSMP can be mounted on the self-standing type. External sampling systems can be connected as needed.

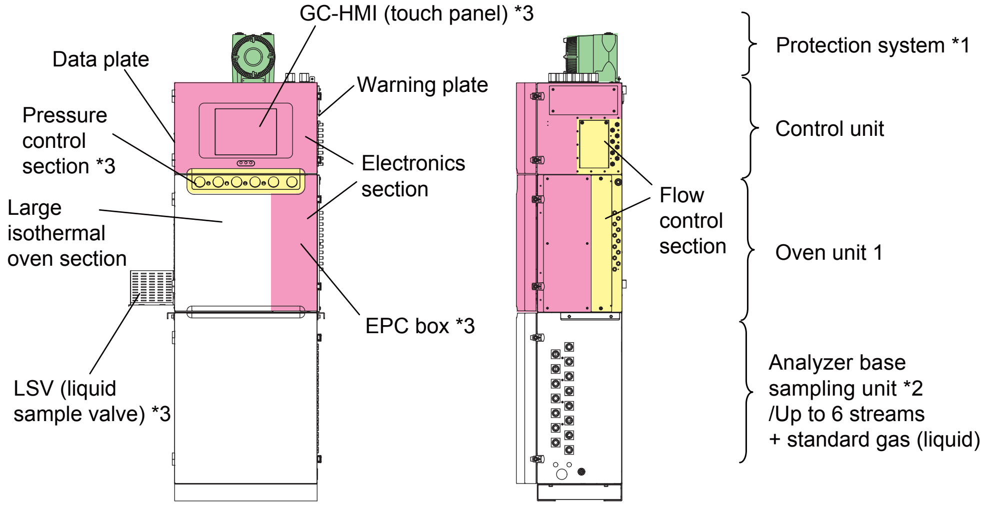
The oven unit can contain a large isothermal oven (volume: 40 L), isothermal oven (31 L), or programmed temperature oven (10 L). Thus, the GC8000 has four major models by type and number of oven units. Moreover, each model comes with the self-standing type and wall-mounting type.

The control unit consists of the electronic section and the flow control section. In some specifications, a 12-inch color LCD touch panel is mounted on the front as the GC-HMI.

Each oven unit can contain a large isothermal oven, isothermal oven, or programmed temperature oven and its pressure and flow control section and electronic section. An EPC box is mounted in the electronic section depending on the specifications.

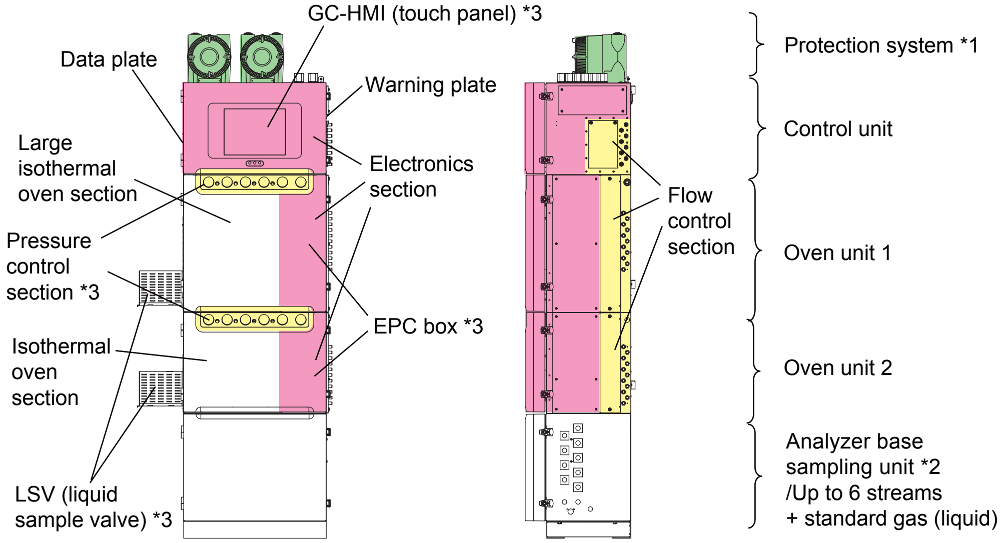
The electronic section of the control unit and the electronic section of oven units 1-3 (including the EPC box) connect with one another to form a single pressurized enclosure.

Refer to Figures 1.3 to 1.5.



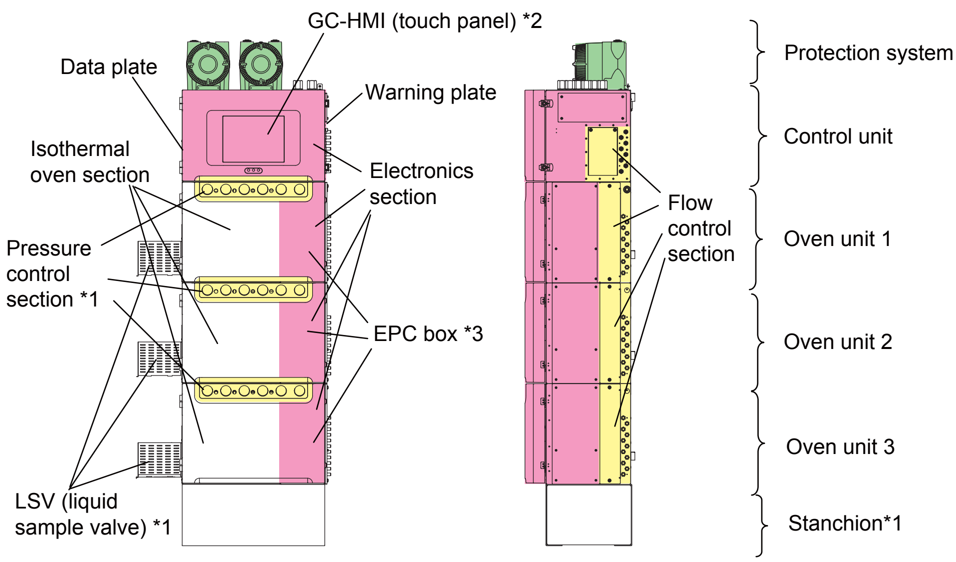
*1 The specification decides the number of the flameproof enclosure of the protection system.
*2 A stanchion or GCSMP can be mounted on the self-standing type.
External sampling systems can be connected as needed.
*3 Depending on the specifications.

Figure 1.3 Structure and components of Type 1



*1 The specification decides the number of the flameproof enclosure of the protection system.
*2 A GCSMP can be mounted on the self-standing type.
External sampling systems can be connected as needed.
*3 Depending on the specifications.

Figure 1.4 Structure and components of Type 2



*1 A stanchion is mounted on the self-standing type.
External sampling systems can be connected as needed.
*2 Depending on the specifications.

Figure 1.5 Structure and components of Type 3

1.10.2 Components and their Functions

(1)Protection System

The protection system is a flameproof enclosure and contains the protection circuit in the pressurized enclosure. The Y-purging specification (FM) does not use this system.

This device contains the power relay, pressure switch, timer, relay, illuminance sensor, and override switch.

The device monitors the internal pressures of the pressurized enclosures (the electronic section of the control unit and oven units 1 to 3, the large isothermal oven, the isothermal oven, or the programmed-temperature oven) while the power is on, and if any of them indicates lower than 392 ± 20 Pa, the protection system will automatically turn off the power.

This automatic power-off can be disabled by a function called “overriding.” To enable this function, open the cover of the protection system and press the override switch while the illuminance sensor is detecting light of 100 lx or more. When the illuminance becomes lower than 10 lx, the function becomes invalid, and the automatic power-off prevails. The override function allows operators to open the door of the protection system while the power is on. However, make sure the ambient atmosphere is not hazardous before opening the door for repairs or other purposes.

Refer to Chapter 2 for details of checking the status display of the protection system and override function.

* Guideline for illuminance and brightness
In an office with fluorescent lights: 400 to 500 lx
Under a street lamp: 50 to 100 lx
Candlelight (at a distance of 20 cm): 10 to 15 lx
Ordinance on Industrial Safety and Health, Article 604
For precision work: 300 lx or more
For ordinary work: 150 lx or more
For rough work: 70 lx or more

(2)Electronic Section

The electronic section of the control unit and the electronic section of oven units 1-3 (including the EPC box) connect with one another to form a single pressurized enclosure.

The electronic section of the control unit controls the electronic section of oven units 1 to 3, calculates, and communicates I/O data with external devices.

The GC-HMI (Human Machine Interface: a 12-inch color LCD touch panel) mounted on the front makes it easy to check analysis results, trend data, and parameters, and thus monitor the measurement condition of devices on the screen.

The electronic section of oven units 1 to 3 controls the large isothermal oven, the isothermal oven, or the programmed-temperature oven; detector, RV, LSV, hydrogen limiting unit, atmospheric-pressure balancing valve, 3-port valve for quickly cooling the programmed-temperature oven, and EPC, and sends the data to the electronic section of the control unit.

(3)Pressure and Flow Control Section

The pressure and flow control section controls the pressures and flow rate of protection gas (air), carrier gas, and utility gas, and displays their pressures. The connections for supplying carrier gas and utility gas or air output, the hydrogen limiting unit, and the vortex tube (cooling device for the programmed-temperature oven or FDD) are installed. The specification determines the number and types of parts installed.

This section is on the right side of the control unit and on the front and right side of oven units 1 to 3.

(a) The pressure control section of the control unit

The connection for air output for stream valves is equipped in the pressure control section on the right side of the control unit, and the pressure regulator is equipped under the cover.

There are up to eight air outputs for stream valves. The connection is a 6-mm or 1/4-inch tube. Air pressure is 350 kPa. They may be used in GCSMP or sampling units.

The manifold regulators adjust the following pressures, and display them. Each setting pressure is described in the operational manual, and can be checked on the operation condition configuration screen of the EtherLCD.

- Pressure for operating solenoid valves:

  Air pressure which is applied to the solenoid valves for operating RV, LSV, air-operated valves of the hydrogen limiting unit, quick-cooling valves for the programmed-temperature oven, atmospheric-pressure balancing valves (including air output to outside), and stream valves (including air output to outside). Setting pressure: 350 kPa.
- Air pressure for the electric chamber:

  Air pressure which is applied as protection gas to the pressurized enclosure, which consists of the electronic section of the control unit and the electronic section of oven units 1 to 3 (including the EPC box).

  The setting pressure is described in the operational manual.
- Air pressure for oven units 1 to 3:

  Air pressure which is applied as protection gas to the large isothermal oven, the isothermal oven, or the programmed-temperature oven. The setting pressure is described in the operational manual.

Refer to Figures 1.6 to 1.7.

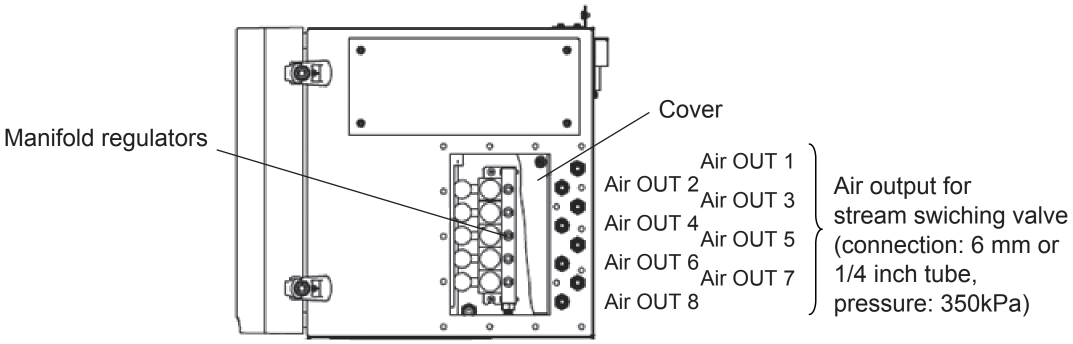


Figure 1.6 Pressure control section of the control unit

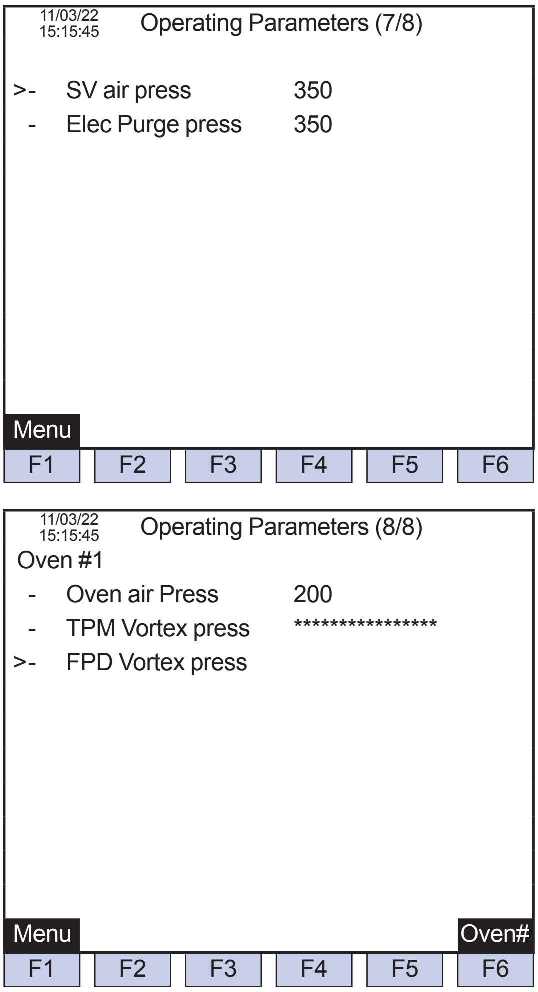


Figure 1.7 Example of the operation condition configuration screen of the GC-HMI (touch panel) EtherLCD

(b) Pressure and flow control section of the oven

In the case of the large isothermal oven or isothermal oven, the pressure and flow rate control section is equipped on the front and right side of the oven unit. In the case of the programmed-temperature oven, this section is equipped only on the right side of the oven unit.

The pressure regulators with a pressure gauge for utility gases 1 to 4 are equipped in sequence from right to left on the front of the oven unit, followed by the pressure gauges for carrier gases 1 to 2.

The connections for the following purposes are on the right side of the oven unit.

- Air for driving the solenoid valve and for purging/cooling the electric chamber and ovens 1 to 3: Rc1/4 or NPT1/4(F)
  (Use the pipe of 1/2 inch or more.)
- Inlet and outlet of sample gases 1 to 2 respectively: 6-mm or 1/4-inch tube
- Inlet of carrier gases 1 to 2 (except for H2): 6-mm or 1/4-inch tube
- Inlet of H2 for carrier gas, combustion gas, make-up gas: 6-mm or 1/4-inch tube
- Inlet of make-up gas (except for H2): 6-mm or 1/4-inch tube
- Inlet of combustion air: 6-mm or 1/4-inch tube
- Outlet of atmospheric-pressure balancing valves 1 to 2: 6-mm or 1/4-inch tube

The following parts are under the cover on the right side of the oven unit.

- Hydrogen limiting unit
- Pressure regulator for carrier gases 1 to 2 (in the large isothermal oven or isothermal oven)
- Restrictors 1 to 4 (in the large isothermal oven or isothermal oven)

The values of each setting pressure and flow rate are described in the operation manual. They also are checked on the operation condition configuration screen of the GC-HMI (touch panel) EtherLCD.

Refer to Figures 1.8 to 1.10.

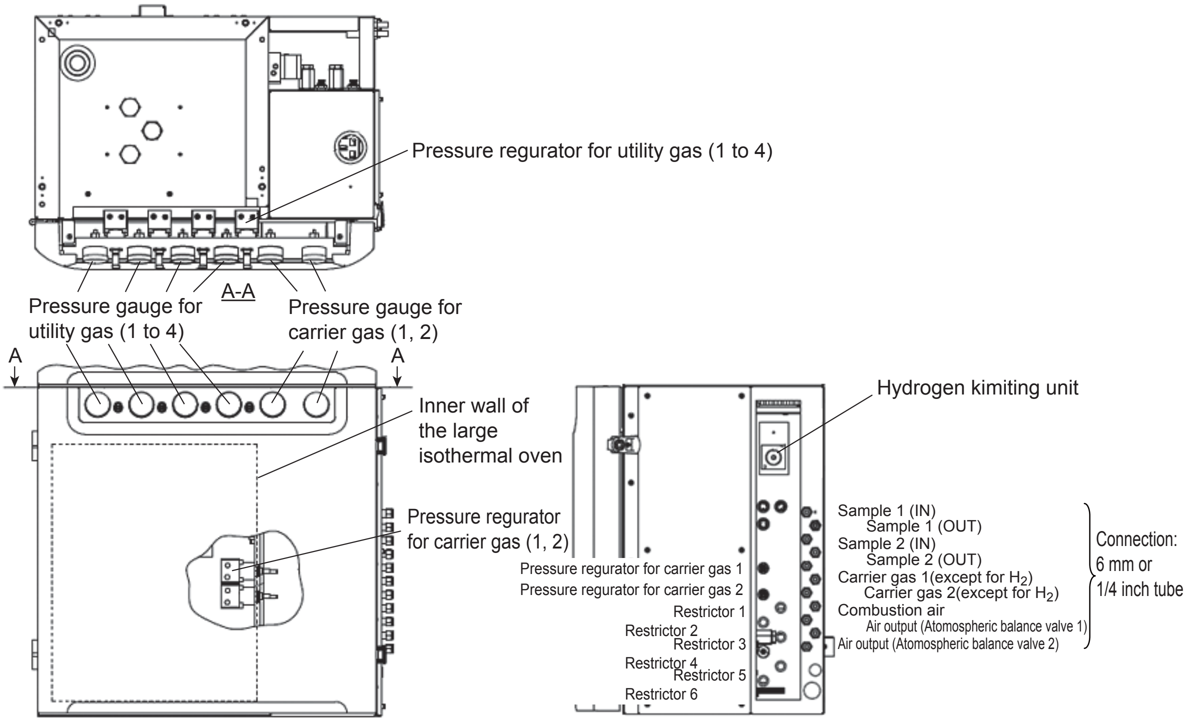


Figure 1.8 **Pressure and flow control section of the large isothermal oven**

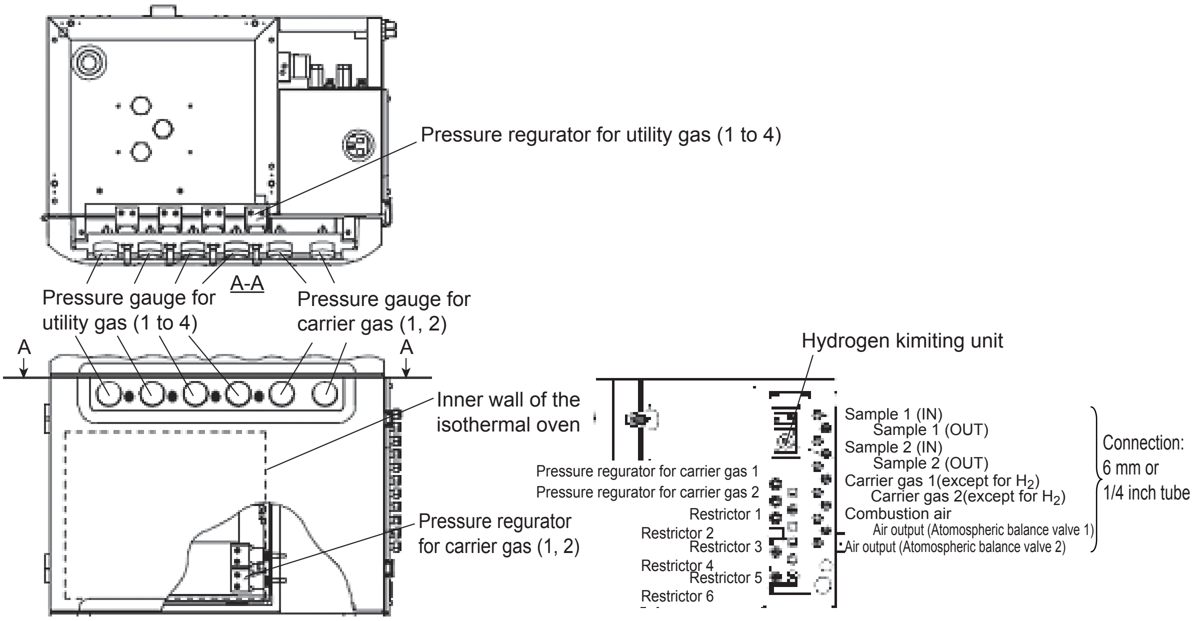
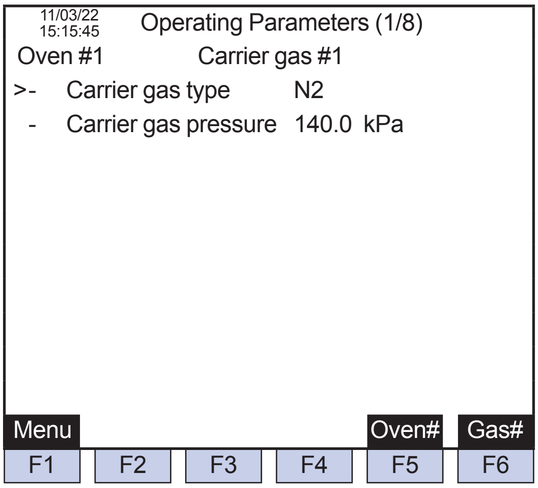
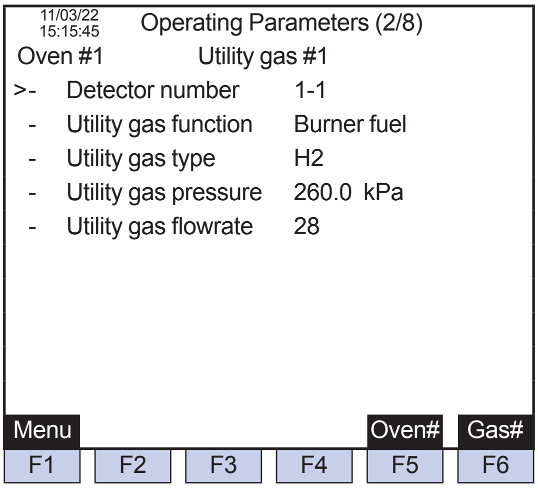
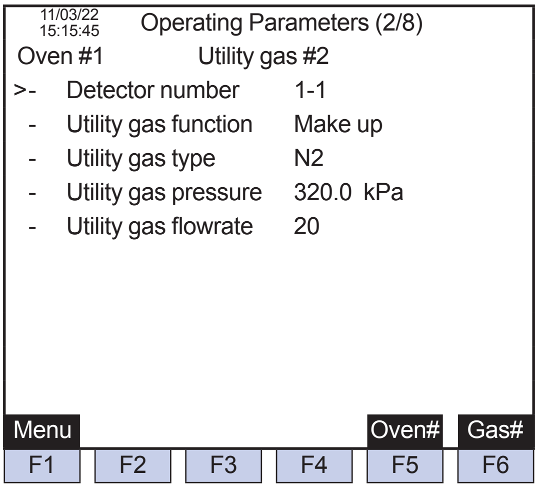
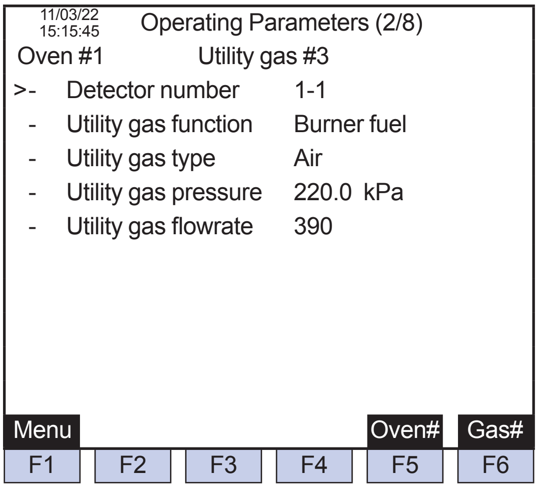


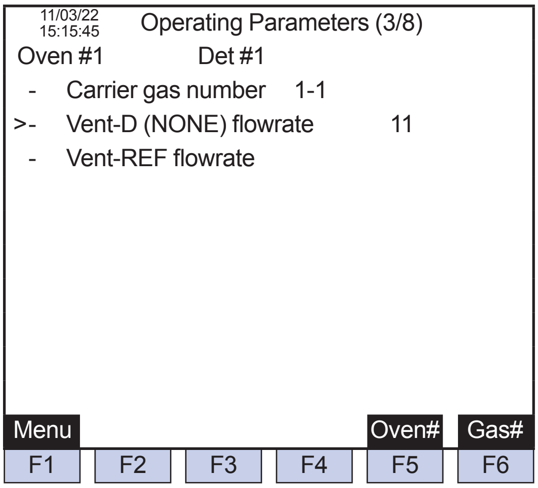
Figure 1.9 Pressure and flow control section of the isothermal oven






11/03/22
15:15:45
Operating Parameters (2/8)
Oven #1
Utility gas #2
>- Detector number 1-1
- Utility gas function Make up
- Utility gas type N2
- Utility gas pressure 320.0 kPa
- Utility gas flowrate 20
Menu
Oven#
Gas#
F1
F2
F3
F4
F5
F6


11/03/22
15:15:45
Operating Parameters (2/8)
Oven #1
Utility gas #3
>- Detector number 1-1
- Utility gas function Burner fuel
- Utility gas type Air
- Utility gas pressure 220.0 kPa
- Utility gas flowrate 390
Menu
Oven#
Gas#
F1
F2
F3
F4
F5
F6


11/03/22
15:15:45
Operating Parameters (3/8)
Oven #1
Det #1
- Carrier gas number 1-1
>- Vent-D (NONE) flowrate 11
- Vent-REF flowrate
Menu
Oven#
Gas#
F1
F2
F3
F4
F5
F6

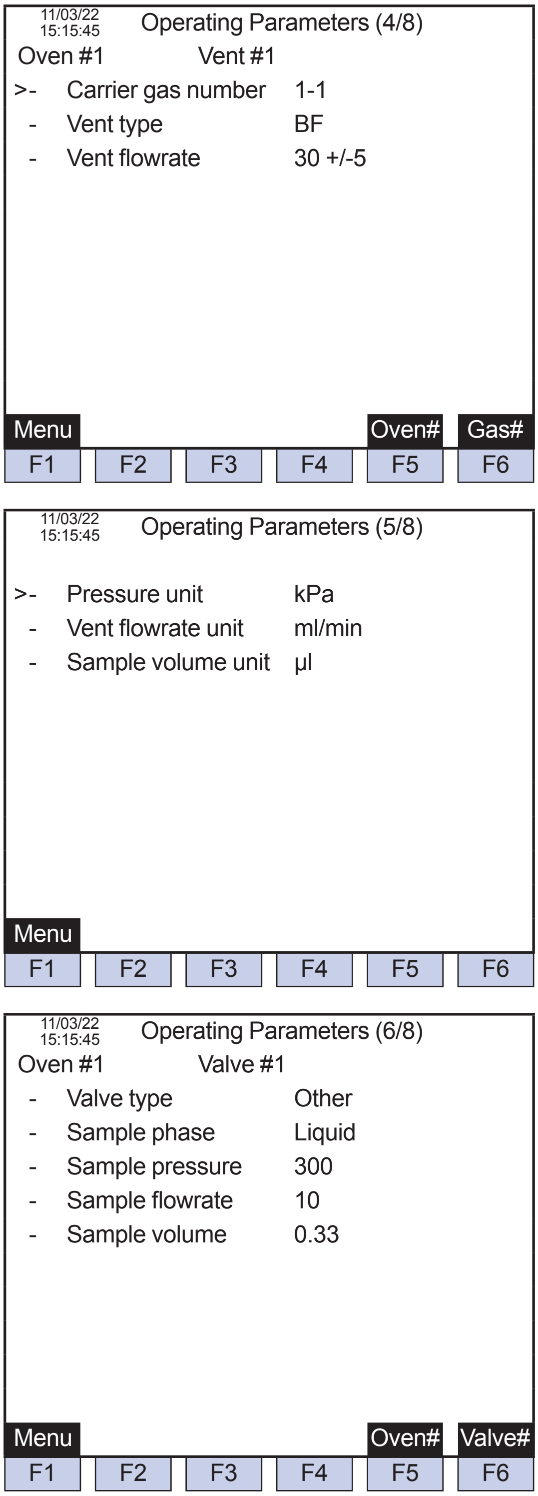


Figure 1.10 Example of the operation condition configuration screen of the GC-HMI (touch panel) EtherLCD

(4) Isothermal Oven

A large isothermal oven (volume: 40 L) and isothermal oven (31 L) are provided, each having a pressurized enclosure.

The temperature setting of both ovens is the fixed set point. The setting range is from 55 to 225°C (in 1°C units). When LSV is equipped, the temperature is set at a fixed value from 60 to 250°C (in 1°C units). When FPD is equipped as a detector (only for the large isothermal oven), the temperature is set at a fixed value from 0 to 60°C (in 1°C units).

The maximum temperature is limited in accordance with each explosion-proof standard and its allowable temperature level and type of detector installed. The values of the setting temperature are described in the operation manual, and can be checked on the operation condition configuration screen of the GC-HMI (touch panel) EtherLCD.

Refer to Figure 1.11.

The following parts are in the large isothermal oven and isothermal oven.

- Pressure regulator for carrier gas
- Restrictor
- RV
- LSV
- Column
- Detector
- Flame arrester
- Mesh arrester

The specification determines the number and types of parts. Refer to Table 3.1 for the maximum number of parts for each oven.

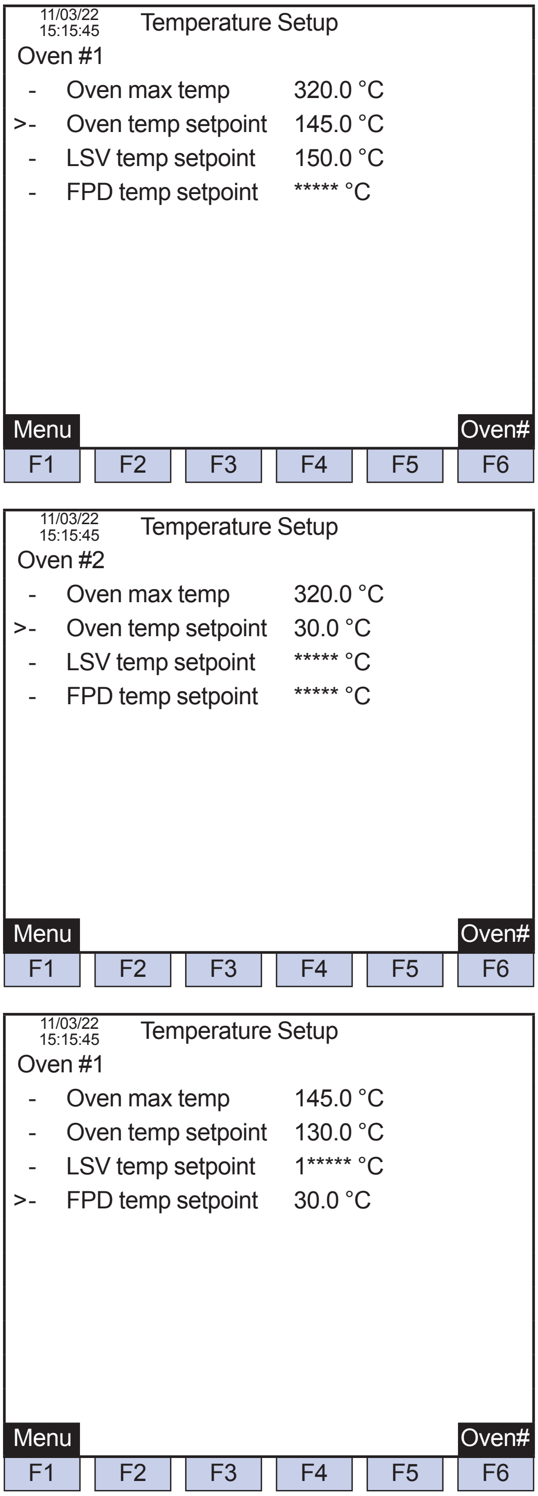


Figure 1.11 Example of the operation condition configuration screen of the GC-HMI (touch panel) EtherLCD

Table 1.1 The maximum number of parts for each oven

	Large isothermal oven	Isothermal oven
Pressure regulator for carrier gas	Max. 2	Max. 2
Restrictor	Max. 6	Max. 6 (4 recommended)
RV LSV Atmospheric-pressure balancing valve	Max. 8 in total Select from: 7 RVs, 1 LSV, 2 Atmospheric-pressure balancing valves Providing RV + LSV ≤ 7	Max. 7 in total Select from: 5 RVs (3 recommended), 1 LSV, 2 Atmospheric-pressure balancing valves Providing RV + LSV ≤ 5
Detector	Max. 2 in total Select from: 2 TCDs, 2 FIDs, 1 FID-MC, 1 FPD	Max. 2 in total Select from: 2 TCDs, 2 FIDs, 1 FID-MC *FPD is not mountable.
Mesh arrester	Max. 2 (used for FID and FPD)	
Flame arrester	Max. 5 (Connections for sample gas, carrier gas, utility gas, and I/O of the detector)	

(5) Analyzer Base Sampling Unit (GCSMP)

In order to ensure the process gas chromatograph operates stably over a long period of time, it is necessary to select the most appropriate sampling system corresponding to sample properties in addition to analyzer stability and reliability. The GCSMP can be equipped on the self-standing GC8000 Type 1 and 2, in which the analyzer and GCSMP can be operated and maintained integrally.

The GCSMP adjusts the pressure and flow rate of the measurement stream for measuring the process sample (gas and liquid) and the calibration and validation stream with standard gas (liquid). The GCSMP also has a humidifying and warming function (setting temperatures: 50°C or 75°C) and stream switching function by using air output from the analyzer. If the GCSMP is not equipped, the stream switching valve can be operated by sending the air output or contact output to an external sampling system.

● Limitation in Selecting a Sampling System

Sample properties that can be conditioned in the GCSMP are as follows. In addition, the specifications for the maximum number of air-operated valves are limited. The sample properties and specifications exceeding these limits necessitate preparing an external sampling system.

Table 1.2 Sample Properties

Sample	Sample valve	Temperature	Pressure	Dust	Mist	Boiling point
Gas	Rotary sampling valve	150°C or less	0.01 to 3 MPa	0.01 g/m^3 (stp) or less	None	—
Liquid	Rotary sampling valve	Normal temperature	0.2 to 3 MPa	None	—	270°C or less
	Liquid sampling valve with a vaporizer	150°C or less	0.2 to 3 MPa	None	—	450°C or less

Note: In the case of ATEX, the rotary sampling valve can not be used as the liquid sampling valve.

Refer to Table 1.3 for the limitations on specifications with the GCSMP.

Table 1.3 The limitations on specifications with the GCSMP

Purpose of air-operation valve	Number of Mountable Valves	
	Type 1	Type 2
Automatic stream switching valve	Max. 7 in total *1 Stream for measurement: 1 to 6 Stream for calibration and validation: 1 to 3	Max. 4 in total *1 Stream for measurement: 1 to 3 Stream for calibration and validation: 1 to 3
Atmospheric-pressure balancing valve	Max. 2	Max. 1
	*Max. 1 per 1 GCM	

*1 If the number of automatically switched streams exceeds the above limitation, use an external sampling system.
*2 The GCSMP is not mounted on Type 3.

Table 1.4 shows the limitation by the analyzer on specifications with an external sampling system

Table 1.4 The limitation by the analyzer on specifications with an external sampling system

	Type of Stream Valves	Number of Streams *1	Remarks
Automatic stream switching valve	One-to-one output (air) *2	1 to 8	
	One-to-one output (DO) *2	1 to 12	DIO card: 3 ch × 4 (Max. 12 ch)
		1 to 20	DO card: 5 ch × 4 (Max. 20 ch)
	Binary output (air) *2 *3	1 to 31	4 bits: 1 to 15
			5 bits: 16 to 31

Purpose of air-operation valve	Number of Mountable Valves	
	Type 1	Type 2
Atmospheric-pressure balancing valve	Max. 2	Max. 4
	*Max. 1 per 1 GCM	

*1 Stream for calibration and validation is included.
*2 Air output from the analyzer is 350 kPa.
*3 Only 1 GCM can be set up for an analyzer in the case of binary output (air). (Multiple GCMs are not possible.)

1.11 Human Machine Interface

1.11.1 Types of GC8000 Human Machine Interface

The GC8000 has the following three operation interfaces.

GC-HMI	GC human-machine interface Displays the status of the GC8000 analyzer, operates it, changes its settings, and displays analysis data. 12.1-inch color LCD touch panel on the GC8000
ASET	Analyzing server engineering terminal software PC software which displays status of analyzers and operates analyzers
PCAS	PC analyzer server software PC software which manages the network and automatically saves data

(1)GC-HMI (Touch panel)

Either the GC8000 analyzer with or without the GC-HMI can be specified.

The GC-HMI can display the status, perform operations, change settings, and display analysis data of the analyzer with the GC-HMI or one of the registered analyzers (up to 7 with/without the GC-HMI) via Ethernet. Only one analyzer (control CPU) can be connected to the GC-HMI at one time, and only one GC-HMI can be connected to the analyzer (control CPU) at one time.

Refer to Chapter 4 for details of the GC-HMI operation.

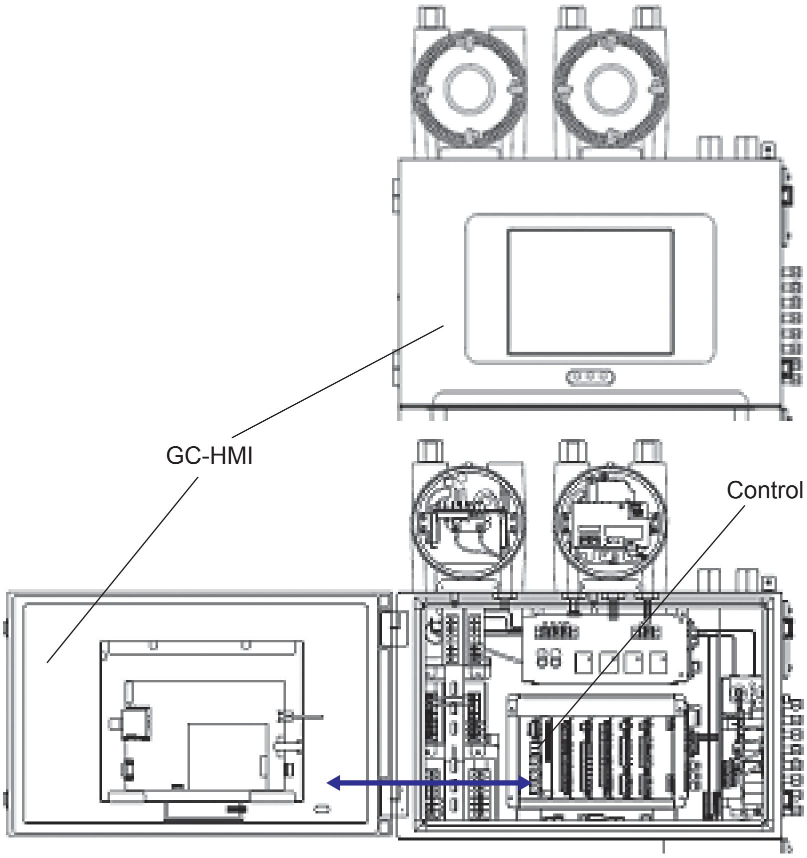
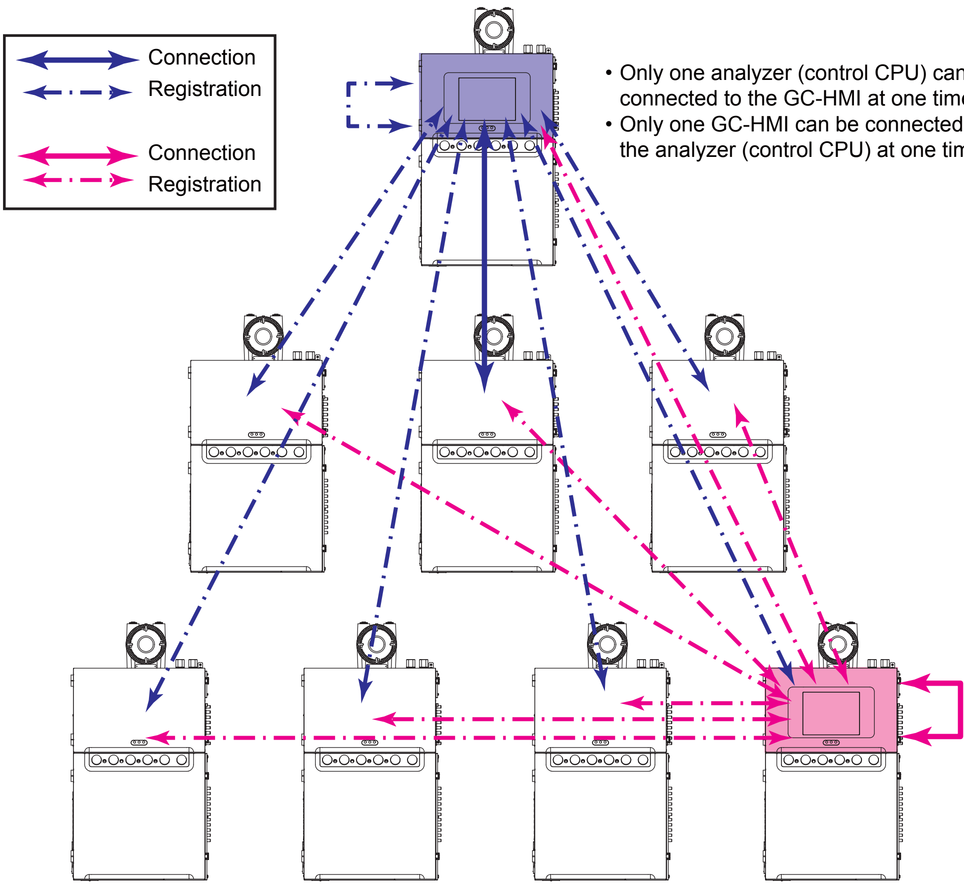
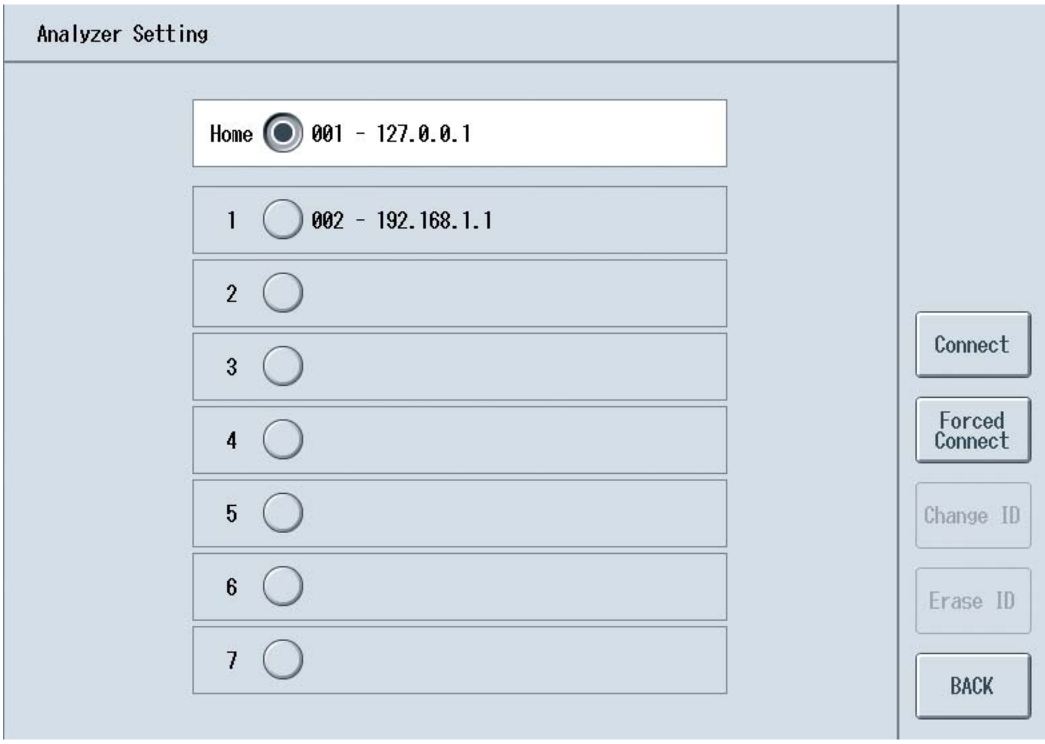


Figure 1.12 Position of the GC-HMI (touch panel) of the analyzer and control CPU



- Only one analyzer (control CPU) can be connected to the GC-HMI at one time.
- Only one GC-HMI can be connected to the analyzer (control CPU) at one time.

Figure 1.13 Example of registration and connection between the GC-HMI and analyzers



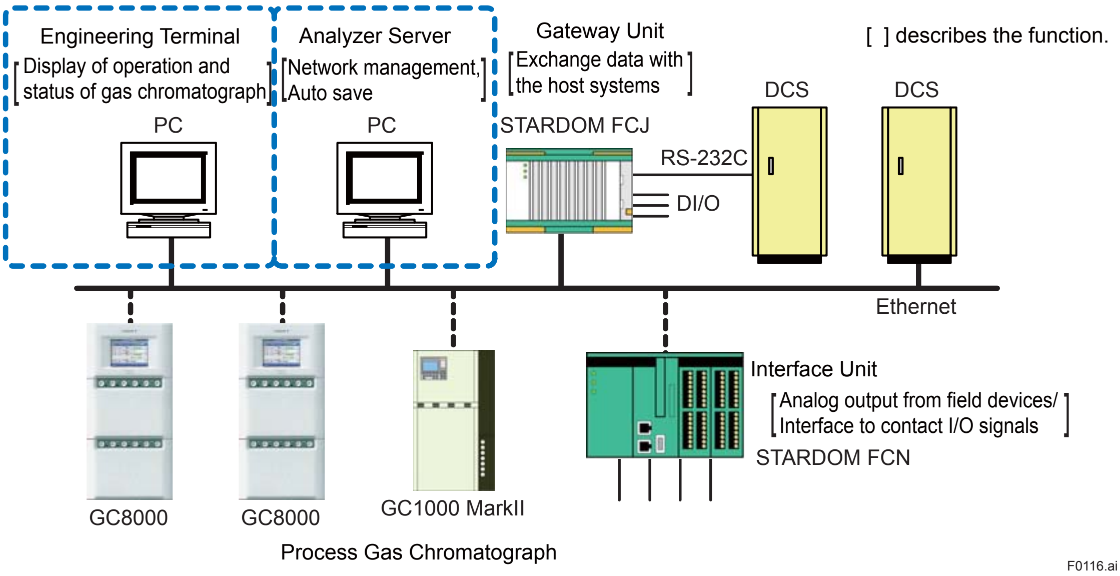
- Registration (including ID update/delete) of analyzers to be connected to the GC-HMI and the settings can be done on the Analyzer Selecting screen.
- Home: the analyzer on which the GC-HMI is mounted
- 1 to 7: analyzers other than the above analyzer

Figure 1.14 Analyzer Selecting screen of the GC-HMI (touch panel)

(2)PC Software and Network

In addition to the GC-HMI, the GC8000 analyzer can be connected to PC software (ASET and PCAS) which is provided as the GC8000 operation interface.

The GC8000 analyzer can be added to and connected with the existing network which GC1000 MarkIIs are connected via Ethernet or the analyzer bus.



GC8000	The analyzer installed on the site (Process gas chromatograph)
GC1000 MarkII	The analyzer installed on the site (Process gas chromatograph)
ASET	Analyzing server engineering terminal software Operates and displays the analyzers.
PCAS	PC analyzer server software Manages the network and automatically saves data.
DCS	Distributed control system The upper system of analyzers
ASGW	Analyzer server gateway software Exchanges data with the upper system by using the STARDOM FCJ.
ASIU	Analyzer server interface unit software Serves as an interface with the network for analog output signals of field devices except for process gas chromatographs or input/output of contact signals.

Figure 1.15 Example of the structure of Ethernet and analyzer bus system

1.11.2 User Level

The display of the status, operation, change of settings, and display of analysis data of the analyzer performed on the GC-HMI (touch panel) are limited depending on the user level.

EtherLCD is a function which consolidates the settings for display of I/O and Ethernet connection status of analyzers under connection; operation of I/O, user program, and detectors; and parameters of hardware configuration, analysis method, and I/O, which are mainly used for maintenance among general settings from the GC-HMI.

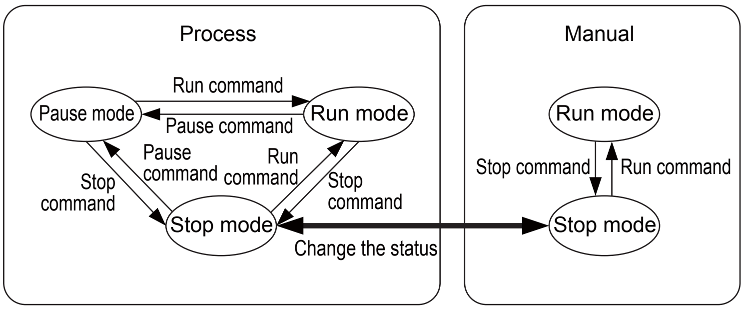
Since this is equivalent to the functions of EtherLCD (display and operation), which is the human-machine interface of the GC1000 Mark II, excluding operation and display of analysis data, the term “EtherLCD” is used in the GC8000.

User-level settings for EtherLCD are independent of other screens of the GC-HMI (analyzer overview, etc.), and so they must be set separately.

The operation of the PC software (ASET and PCAS) is also limited based on the user level.

For more information, refer to each chapter of GC-HMI, ASET, and PCAS.

1.11.3 Status and Operation Mode



The GC8000 has the following statuses. The change is possible only in the Stop mode.

Process	Normal measurement, calibration and validation	
Manual	Manual operation	

The GC8000 has the following operation modes and commands.

Run	Mode in which measurement is running. Starts the measurement in the Process mode. This operation can be made by operators with user level B or higher. Starts to display chromatograms in the Manual mode. (It does not detect peaks, calculate concentration, or save chromatograms.) This operation can be made by operators with user level C or higher.	
Pause	Mode in which measurement pauses. Operates until the pause time specified in the GCM method in the Process mode. This operation can be made by operators with user level B or higher.	
Stop	Mode in which measurement stops. Operates in the Process mode for the main cycle specified in the GCM method. This operation can be made by operators with user level B or higher. Stops the Run mode immediately in the Manual status. This operation can be made by operators with user level C or higher.	
Command cancellation	Cancels the operation mode command that is in the operation queue in the Process mode. This operation can be made by operators with user level B or higher.	
Forced stop	Stops the current operation mode forcibly in the Process mode. This operation can be made by operators with user level C+ or higher.	

Figure 1.16 shows the change of status and operation mode.

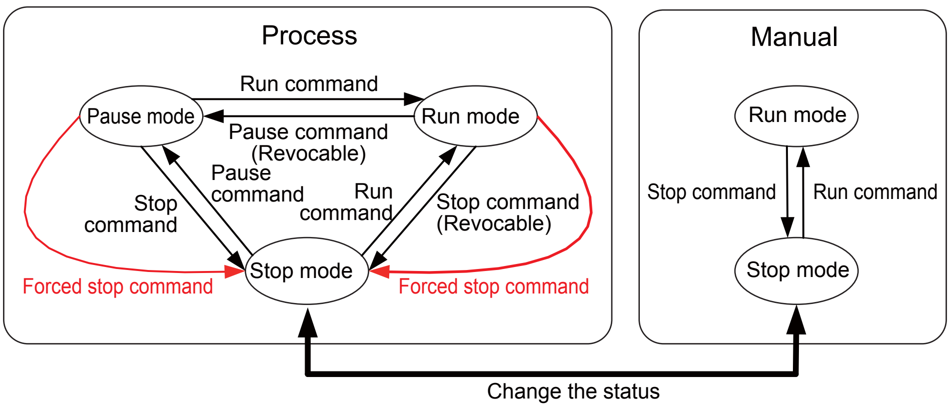


Figure 1.16 Diagram of Changing the Status and Operation Modes

The statuses and operation modes can be changed in the Analyzer Operation screen of the GC-HMI (touch panel) equipped on the GC8000 analyzer. The operation modes can be changed in the Analyzer Overview screen.

Figure 1.17 shows the Analyzer Operation screen of the GC-HMI (touch panel). Figure 1.18 shows the Analyzer Overview screen and the Operation Mode Changing screen. For detailed information of the GC-HMI operation, refer to Chapter 4.

Refer to “ASET: Analyzing Server Engineering Terminal software IM 11B06C01-01E” for details of changing the statuses and operation modes using the PC software (ASET) connected to the GC8000.

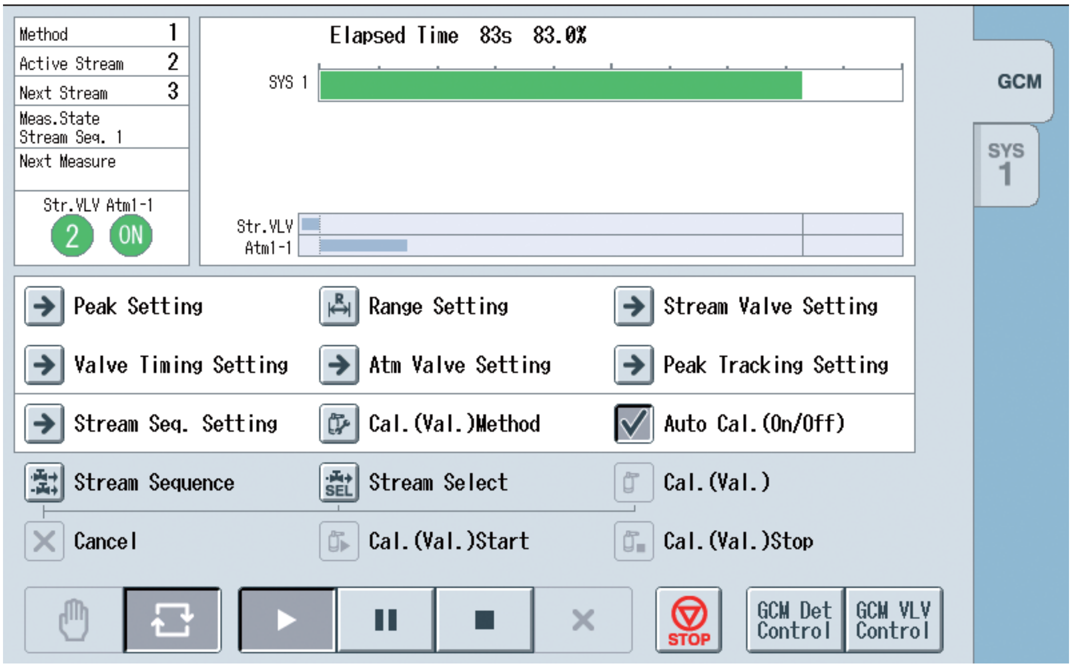


Figure 1.17 **Analyzer Operation screen of the GC-HMI (touch panel)**

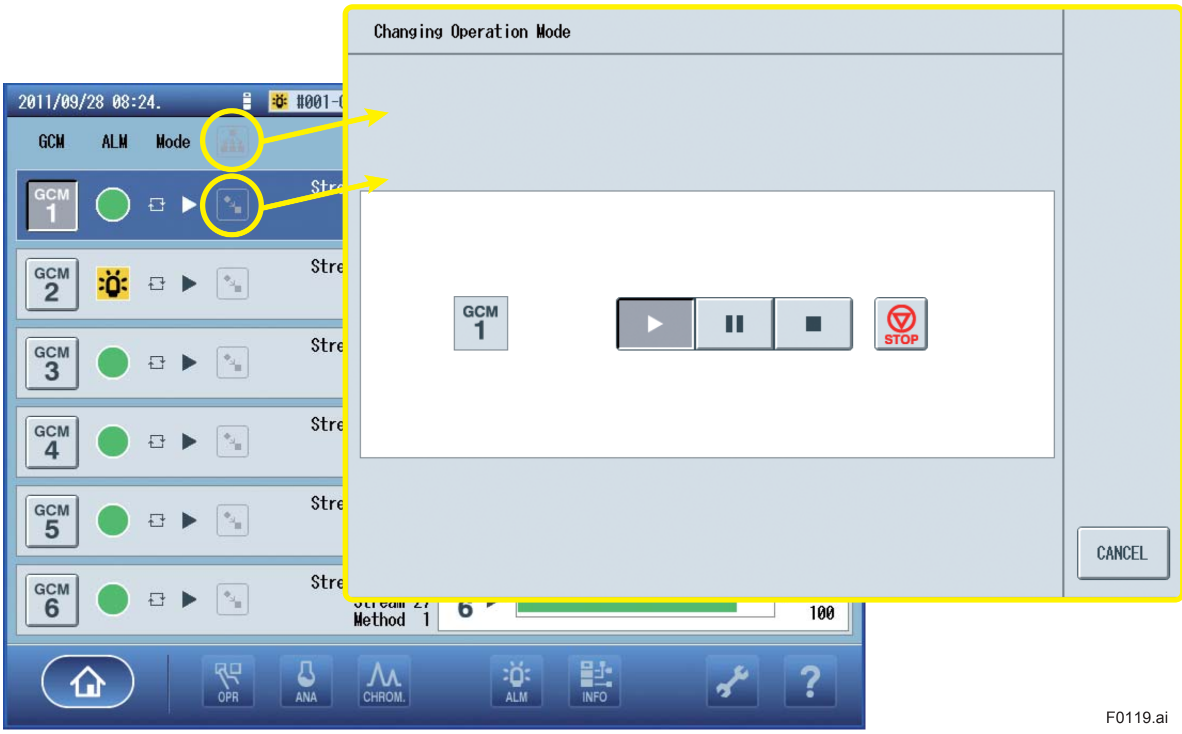


Figure 1.18 **Analyzer Overview screen of the GC-HMI (touch panel)**

1.12 Analyzer operation

The GC8000 operates in two operating statuses: the process status and the manual status. The operating statuses are changed to each other in the stop mode. The process status is set when the equipment is turned on.

1.12.1 Process status

Normal process measurement, calibration, and validation are performed in the process status. The following measurement statuses are available in the process status. The measurement status is set to “Stream sequence” when the equipment is turned on.

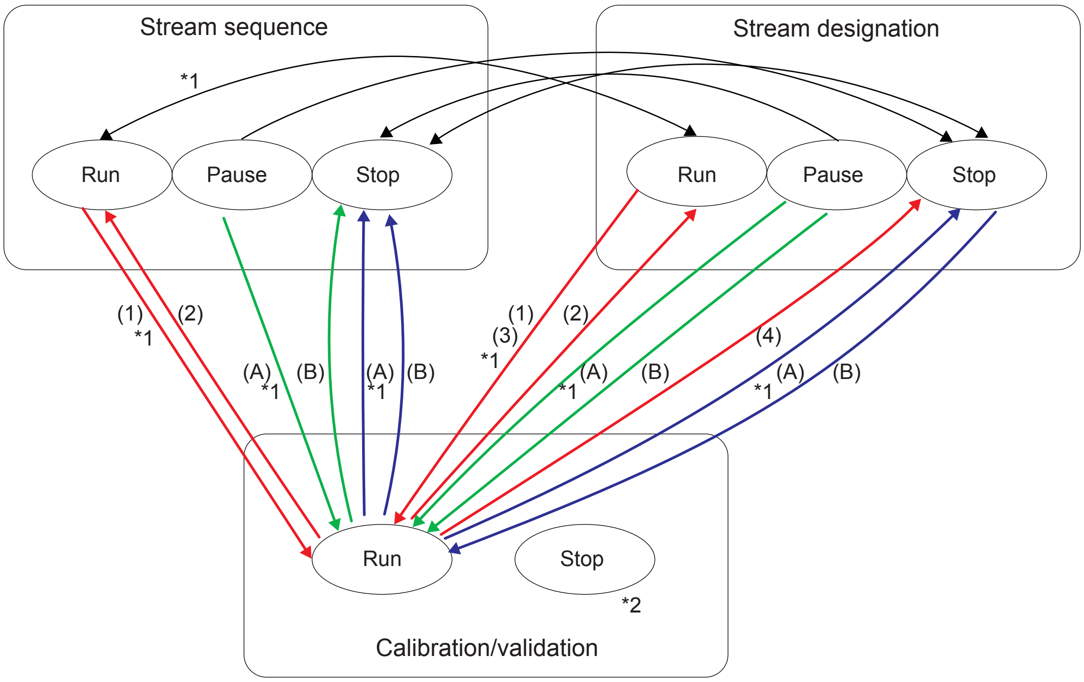
Measurement status	Function	User level	Operation button
Stream sequence	Measures streams in series in a preset sequence.	B or higher	
Stream designation	Measures the designated streams continuously or a specified number of times. Also stops operation after the specified number of times of measurement.	B or higher	
Calibration (Validation)	Gives a command to change the measurement setting to a preset pattern among Calibration 1 to 6 or Validation 1 to 6.	B or higher	
Command cancellation	Cancels a command to change the measurement status.	C or higher	
Start of calibration (or validation)	Gives a command to start calibration (or validation). This is used for manual calibration (or validation).	B or higher	
Termination of calibration (or validation)	Gives a command to terminate calibration (or validation). This is used for manual calibration (or validation).	B or higher	
Start/termination of automatic calibration	Gives a command to start or terminate automatic operation. This is not available when manual or semiautomatic calibration (or validation) is selected.	C or higher	

The following modes are available in the process status.

The process status and the manual status can be changed to each other in the stop mode.

Run	• A mode to perform measurement • Measurement is started in this mode. Users at Level B or higher are allowed to activate this mode.	
Pause	• A mode to suspend measurement • In the process status, measurement is suspended in this mode at the time preset by the GCM method. Users at Level B or higher are allowed to activate this mode.	
Stop	• A mode to stop measurement • In this mode, measurement is continued through the main cycle preset by the GCM method, and then stopped. Users at Level B or higher are allowed to activate this mode.	
Command cancellation	• Operation mode commands waiting for execution are canceled in this mode. Users at Level B or higher are allowed to activate this mode.	
Forced stop	• The current operation mode is forcibly terminated in this mode. Users at Level C+ or higher are allowed to activate this mode.	

Figure 1.19 shows the transition among measurement statuses and operation modes.



*1: Command can be canceled.
*2: Only for manual

- If a calibration/validation command is issued during the pause mode or the stop mode in the stream sequence or stream specification (N times or continuous (set to “0”)) status
  - (A) The measurement status and the operation mode innediately changes to the requested calibration/validation status and the run mode, respectively.
  - (B) The measurement status and the operation mode respectivily return to the stream sequenace status and the stop mode when calibration/validation is complete for all the spwcified streams.
- If a calibration/validation command is issued during the run mode in the stream sequence status
  - (1) The measurement status changes to the requested calibration/validation status when the measurement of the currently-measured stream is completed.
  - (2) The measurement status and the operation mode respectively return to the stream sequence status and the run mode when calibration/validation is completed for all the specified streams. The suspended measurement is (not reset but) resumed from the next stream.
- If a calibration/validation commands is issued during the run mode in the stream specification (N times) status
  - (3) The measurement status changes to the requested calibration/validation status when the Nth round of the spwcified measurement is completes.
  - (4) The measurement status and the operation mode respectively return to the stream specification (N times) status and the stop mode when calibration/validation is completed for all the specified streams.
- If a calibration/validation command is issued in the stream specification (Continuous (set to “0”))status
  - (3) The measurement status changes to the requested calibration/validation status when the measurement of the currently-measured stream is completed.
  - (4) The measurement status and the operation mode respectively return to the stream specification (Continuous) status and the run mode when calibration/validation is completed for all the specified streams.

Figure 1.19 Transition among measurement statuses and operation modes

(1)Operation description

For example, this section describes the operation where the stream sequence, calibration, and validation are set as shown in Table 1.5, 1.6, and 1.7, respectively.

Table 1.5

	1st stream	2nd stream	3rd stream
Stream sequence 1	Stream 1	Stream 2	Stream 3
Stream sequence 2	Stream 4	Stream 5	Stream 6

Table 1.6

	Calibration stream	Measurement frequency	Automatic calibration	Validation stream number before calibration	Measurement frequency	Validating stream number after calibration	Measurement frequency
Calibration 1	Stream 7	2	Valid	0	0	Stream 8	1

Table 1.7

	Validation stream	Measurement frequency	Automatic validation
Validation 1	Stream 8	2	Invalid

(2)Operation in the stream sequence status

- Streams are measured in series in a preset sequence.
- The measurement status is set to “Stream sequence” when the equipment is turned on.
- Eight patterns of stream sequence can be stored. To select a sequence, touch the “Stream sequence” button to open the selection window on the GCM operation status screen on the analyzer operation display (Figure 1.20).

  Users at Level B or higher are allowed to select stream sequences and change the measurement status.
- A sequence of up to 31 streams can be specified in sequence for each stream sequence.

  To define a sequence, touch the “Stream sequence setting” button to open the setting window on the GCM operation status screen on the analyzer operation display (Figure 5.3) or define it on the “Stream sequence setting” screen on the EtherLCD (Figure 1.21).

  Users at Level C or higher are allowed to define stream sequences.
- When a command is issued to change the measurement status to the stream sequence status during the pause mode in the stream sequence status or the stream specification status, the measurement status is changed to the requested status but the operation mode changes to the stop mode and valves are all turned off. Then change the operation mode (to the run mode or pause mode).
- If a run command is issued while a completely undefined stream sequence is selected, an “ALM#455: Failed to change measurement status, Level 3” alarm is activated and the measurement status is not changed.

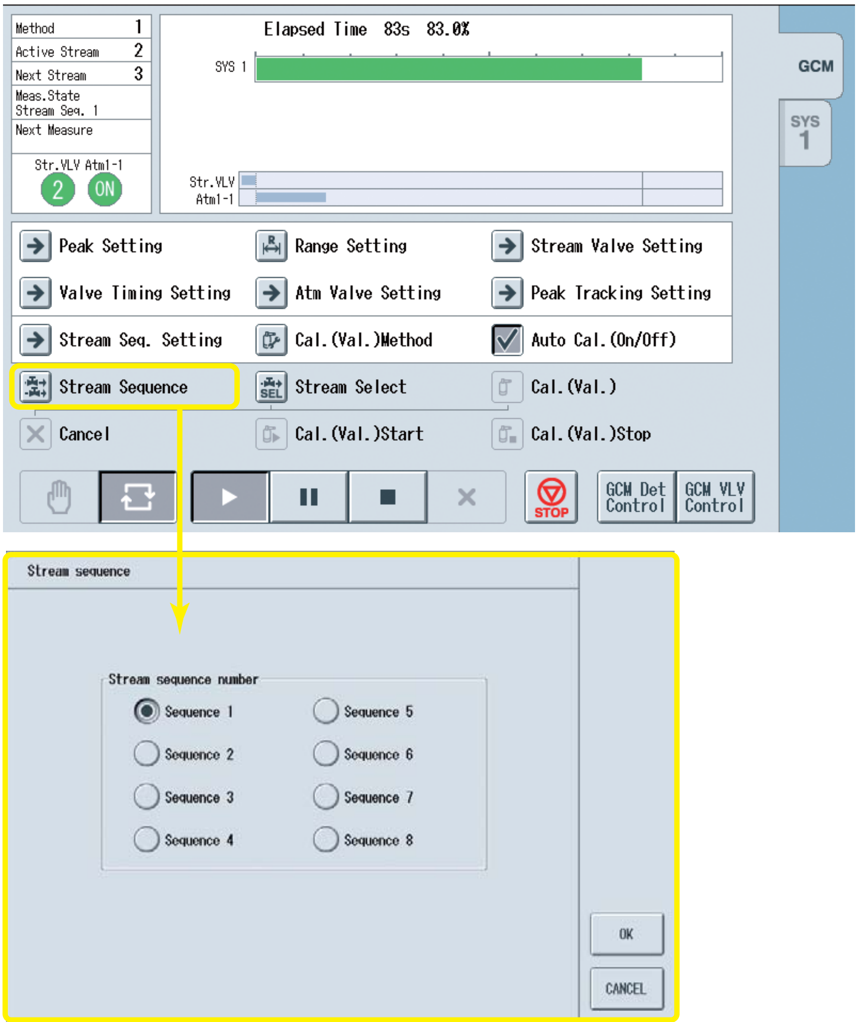


Figure 1.20 Stream sequence window on the GCM operation status screen on the GC-HMI analyzer operation display

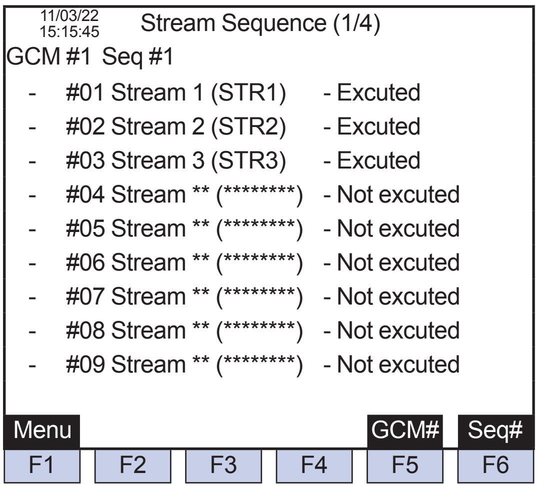


Figure 1.21 An example of the stream sequence setting screen on the GC-HMI EtherLCD

- In the case where a stream sequence change command is received during the stop mode in the stream sequence status [1A1]

  The measurement status is immediately changed to the requested stream sequence status.

  In this case, the operation mode remains unchanged from the stop mode.

  * Requests for changes to the same stream sequence number are invalid.

- In the case where a stream sequence change command is received during the run mode in the stream sequence status [1A2]

  The measurement status is changed to the requested stream sequence status when the measurement of the currently-measured stream is completed.

  In this case, the operation mode remains unchanged from the run mode.

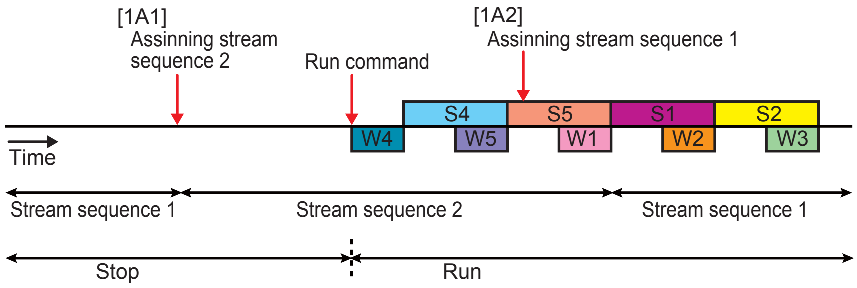
  * Requests for changes to the same stream sequence number are invalid.

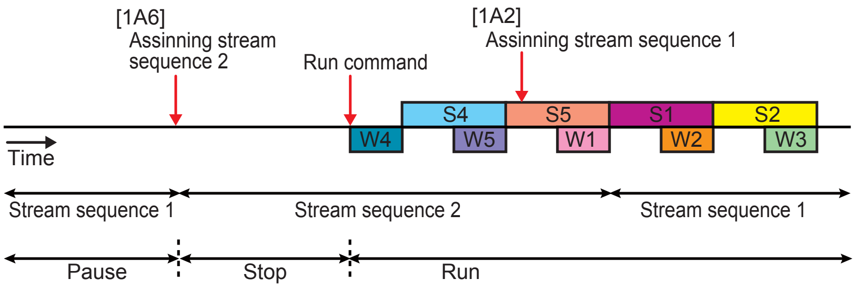
- In the case where a stream sequence change command is received during the pause mode in the stream sequence status [1A6]

  The measurement status is immediately changed to the requested stream sequence status.

  In this case, the operation mode changes to the stop mode and valves are all closed (turned off).

  * Requests for changes to the same stream sequence number are invalid.

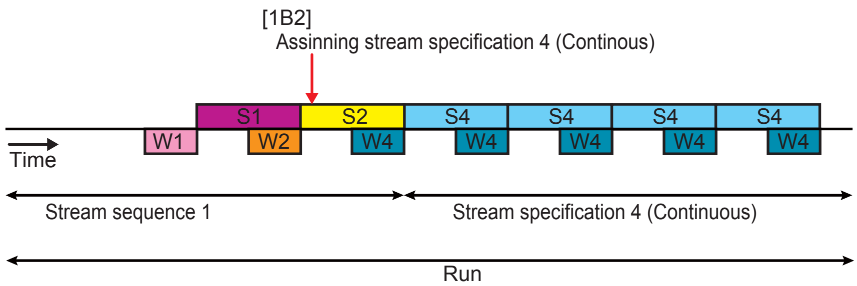




- In the case where a stream specification change command (for continuous measurement) is received during the run mode in the stream sequence status [1B2]

  The measurement status is changed to the requested stream specification status (for continuous measurement) when the measurement of the currently-measured stream is completed.

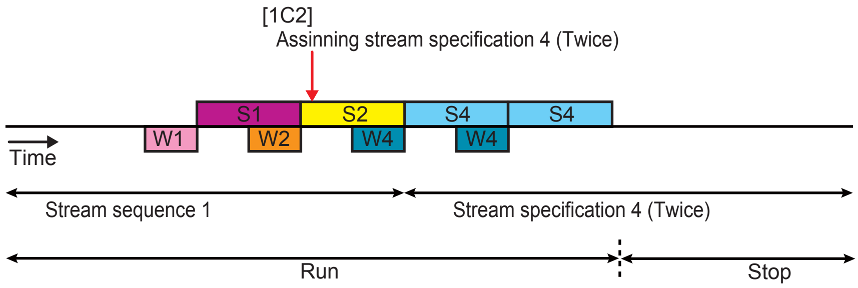
  In this case, the operation mode remains unchanged from the run mode.



- In the case where a stream specification change command (for N times of measurement) is received during the run mode in the stream sequence status [1C2]

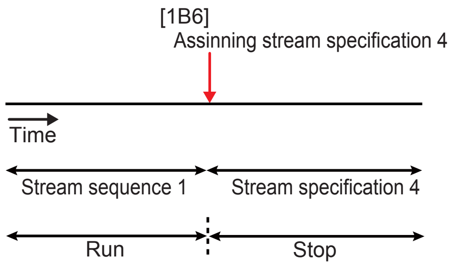
  The measurement status is changed to the requested stream specification status (for N times of measurement) when the measurement of the currently-measured stream is completed.

  In this case, the operation mode changes from the run mode to the stop mode when the Nth round of the specified measurement is completed.



- In the case where a stream specification change command is received during the pause mode in the stream sequence status [1B6]The measurement status is immediately changed to the requested stream specification status.

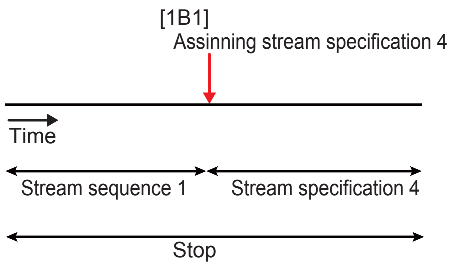
  In this case, the operation mode changes to the stop mode and valves are all closed (turned off).



- In the case where a stream specification change command is received during the stop mode in the stream sequence status [1B1]

  The measurement status is immediately changed to the requested stream specification status.

  In this case, the operation mode remains unchanged from the stop mode.

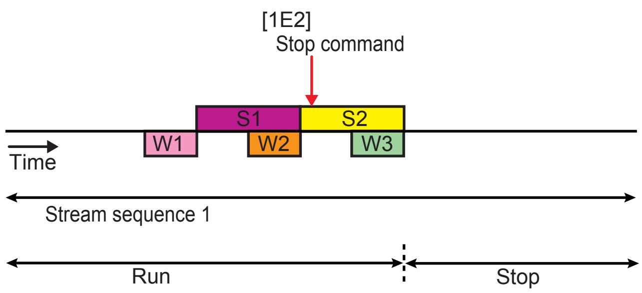


- In the case where a stop command is received during the run mode in the stream sequence status [1E2]

  The operation mode is immediately prepared to be changed to the stop mode.

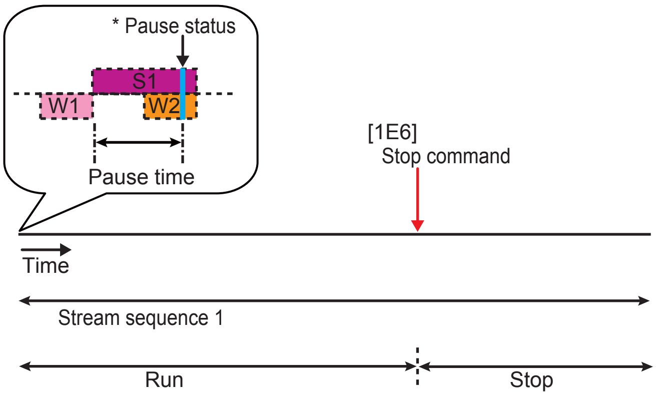
  The operation mode changes to the stop mode in the stream sequence status when the measurement of the currently-measured stream is completed.

  The stop command can be canceled with a cancel command until the operation mode changes to the stop mode.



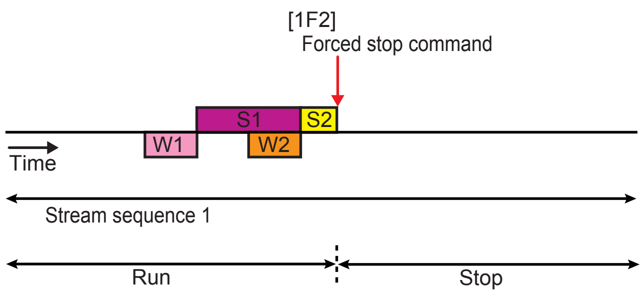
- In the case where a stop command is received during the pause mode in the stream sequence status [1E6]

  The operation mode is immediately changed to the stop mode in the stream sequence status.



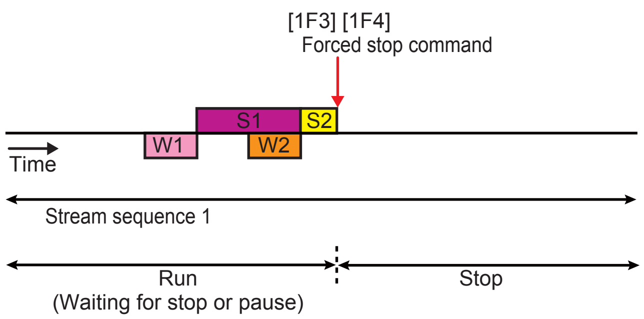
- In the case where a forced stop command is received during the run mode in the stream sequence status [1F2]

  The operation mode is immediately changed to the stop mode in the stream sequence status.



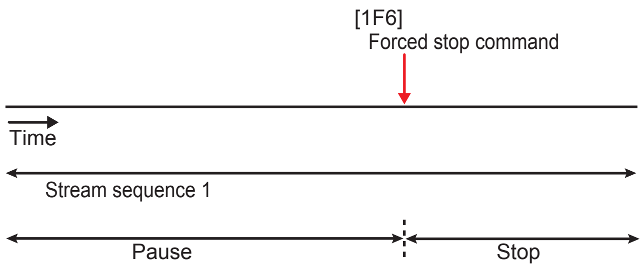
- In the case where a forced stop command is received while the operation mode is scheduled to be changed to the stop mode or pause mode in the stream sequence status [1F3], [1F4]

  The operation mode is immediately changed to the stop mode in the stream sequence status.



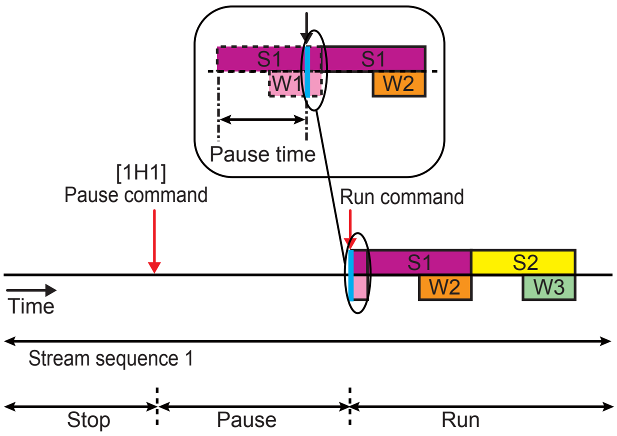
- In the case where a forced stop command is received during the pause mode in the stream sequence status [1F6]

  The operation mode is immediately changed to the stop mode in the stream sequence status.



- In the case where a pause command is received during the stop mode in the stream sequence status [1H1]

  The operation mode is immediately changed to the pause mode in the stream sequence status.



- In the case where a pause command is received during the run mode in the stream sequence status [1H2]

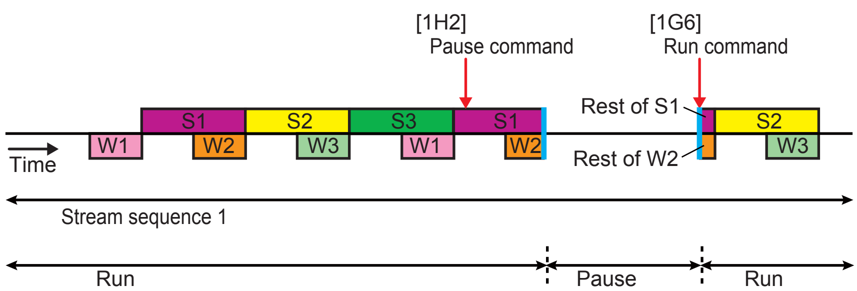
  The operation mode is immediately prepared to be changed to the pause mode in the stream sequence status.

  The operation mode changes to the pause mode in the stream sequence status at a preset time during the measurement of the currently-measured stream.

  The pause command can be canceled with a cancel command until the operation mode changes to the pause mode.

- In the case where a run command is received during the pause mode in the stream sequence status [1G6]

  The suspended measurement is resumed.



(3)Operation in the stream specification status

- In the stream specification status, a specified stream is measured continuously (when the preset number is 0) or a preset number of times (when the preset number is 1 to 9999). To specify a stream, touch the “Stream specification” button to open the specification window on the GCM operation status screen on the analyzer operation display (Figure 5.5).

  Users at Level B or higher are allowed to specify a stream and change the measurement status.
- In the stream specification status, operation stops after the preset number of times of measurement.
- When a command is issued to change the measurement status to the stream specification status during the pause mode in the stream sequence status or the stream specification status, the measurement status is changed to the requested status but the operation mode changes to the stop mode and valves are all turned off. Then change the operation mode (to the run mode or pause mode).
- If a command is issued to change the measurement status to a stream specification status of which GCM numbers or Method numbers have been inappropriately defined on the “Stream specification” screen on the EtherLCD, an “ALM#454: Failed to change operation mode, Level 3” alarm is activated and the operation mode is not changed. (When the operation mode changes from the stop mode to the pause mode or run mode, an alarm is immediately activated. In case where a command is issued to change the measurement status to an inappropriately defined stream specification status during the run mode in the stream sequence status or the stream specification status, an alarm is activated when the measurement of the currently-measured stream is completed and preparation starts for the measurement of the specified stream.)

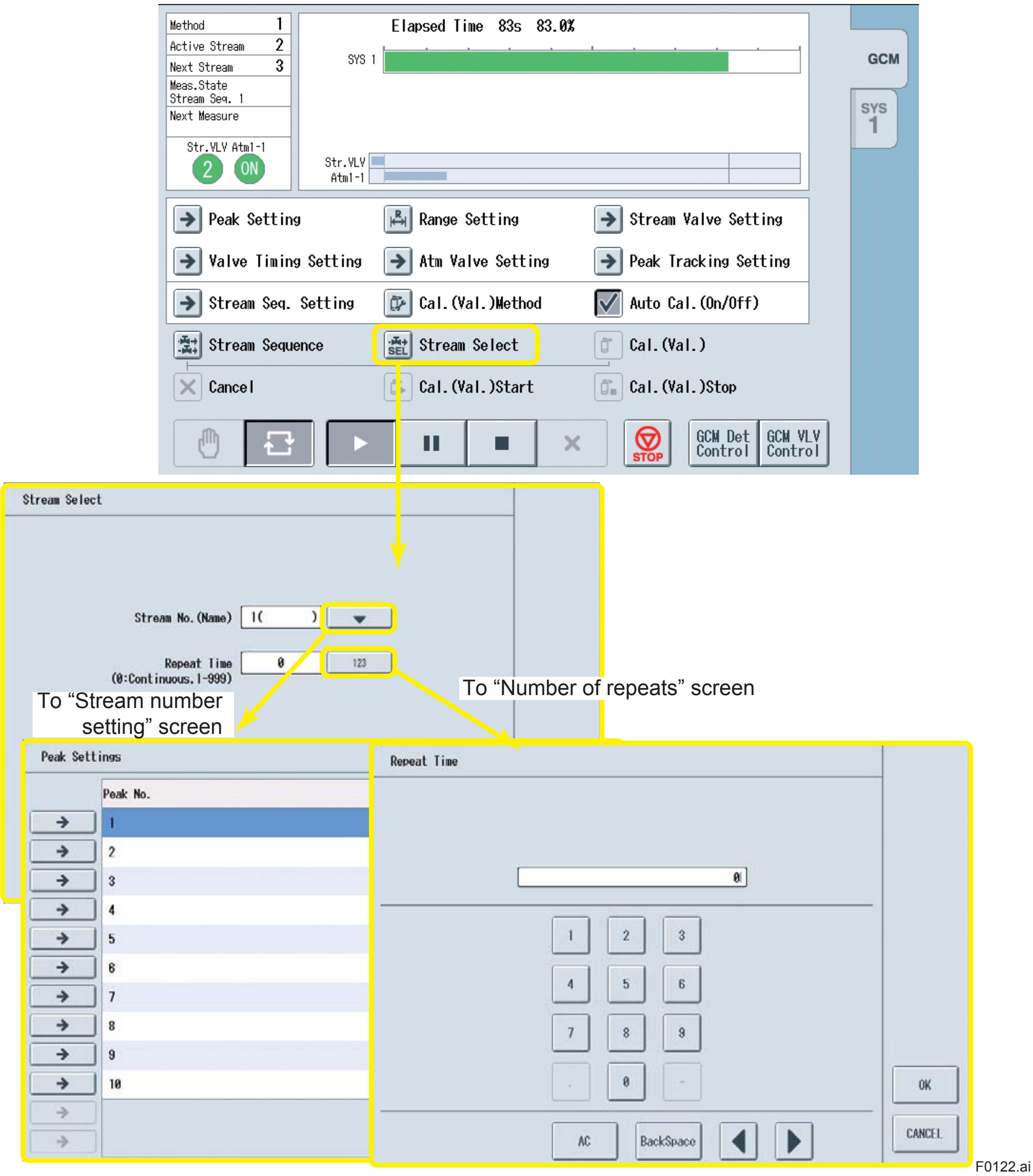
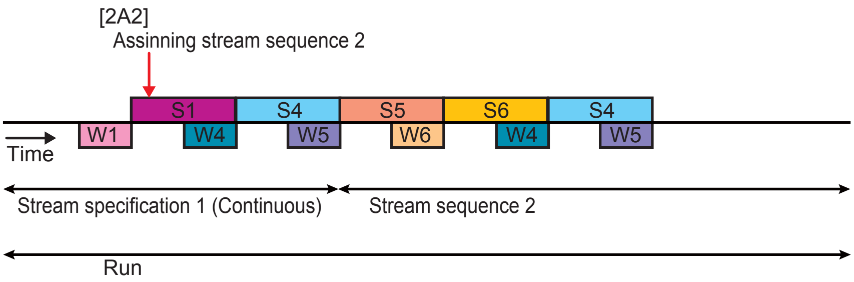


Figure 1.22 An example of the stream specification window on the GCM operation status screen on the GC-HMI analyzer operation display

- In the case where a stream sequence change command is received during the run mode in the stream specification status (for continuous measurement) [2A2]

  The measurement status is changed to the requested stream sequence status when the measurement of the currently-measured stream is completed.

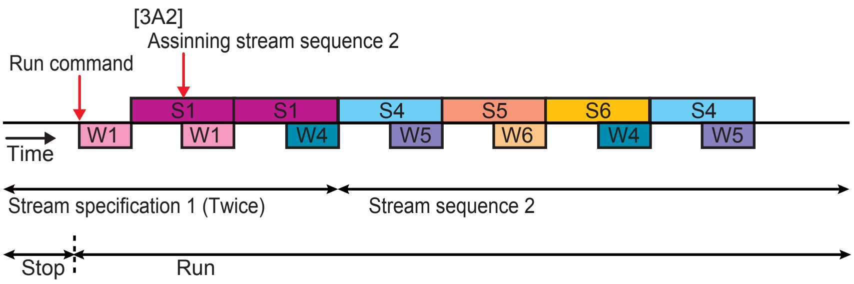
  In this case, the operation mode remains unchanged from the run mode.



- In the case where a stream sequence change command is received during the run mode in the stream specification status (for N times of measurement) [3A2]

  The measurement status is changed to the requested stream sequence status when the Nth round of the measurement of the currently-measured stream is completed.

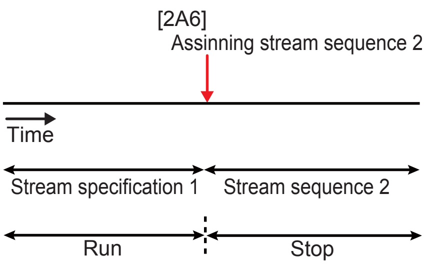
  In this case, the operation mode remains unchanged from the run mode.



- In the case where a stream sequence change command is received during the pause mode in the stream specification status [2A6]

  The measurement status is immediately changed to the requested stream sequence status.

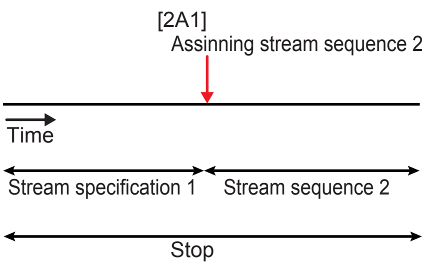
  In this case, the operation mode changes to the stop mode and valves are all closed (turned off).



- In the case where a stream sequence change command is received during the stop mode in the stream specification status [2A1]

  The measurement status is immediately changed to the requested stream sequence status.

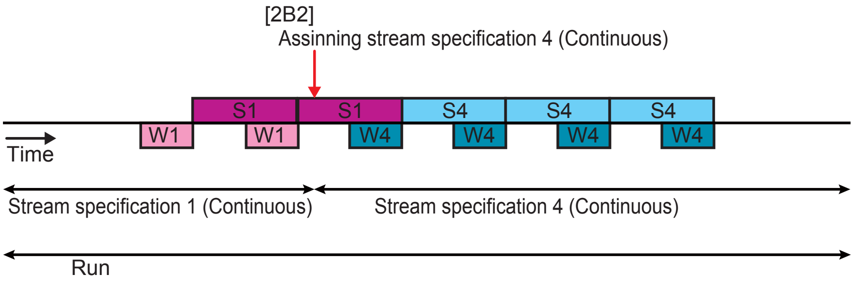
  In this case, the operation mode remains unchanged from the stop mode.



- In the case where a stream specification change command (for continuous measurement) is received during the run mode in the stream specification status (for continuous measurement) [2B2]

  The measurement status is changed to the requested stream specification status (for continuous measurement) when the measurement of the currently-measured stream is completed.

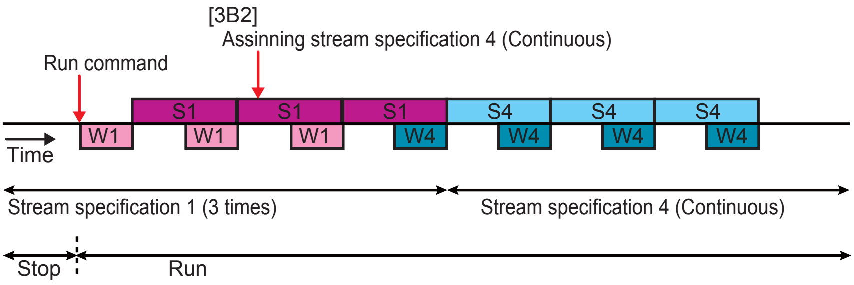
  In this case, the operation mode remains unchanged from the run mode.



- In the case where a stream specification change command (for continuous measurement) is received during the run mode in the stream specification status (for N times of measurement) [3B2]

  The measurement status is changed to the requested stream specification status (for continuous measurement) when the Nth round of the measurement of the currently-measured stream is completed.

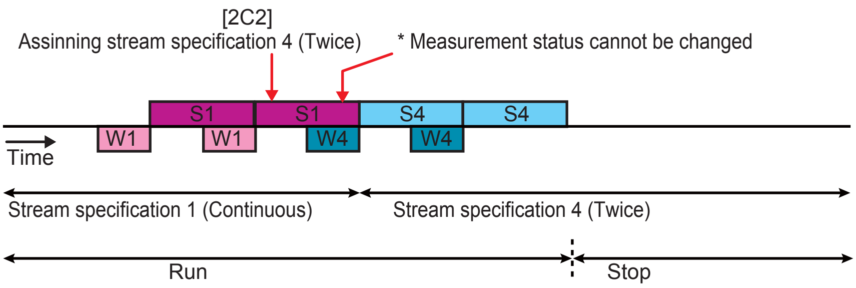
  In this case, the operation mode remains unchanged from the run mode.



- In the case where a stream specification change command (for N times of measurement) is received during the run mode in the stream specification status (for continuous measurement) [2C2]

  The measurement status is changed to the requested stream specification status (for N times of measurement) when the measurement of the currently-measured stream is completed.

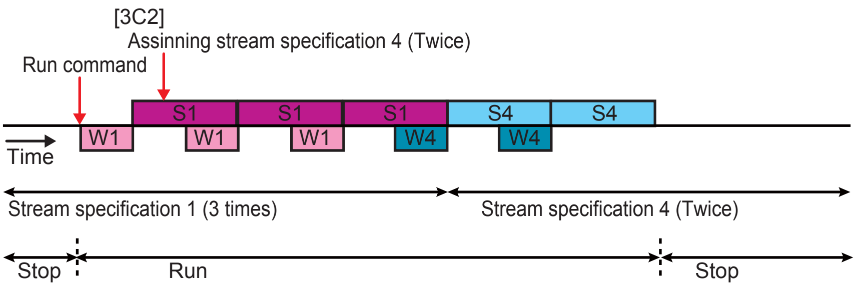
  In this case, the operation mode changes from the run mode to the stop mode when the Nth round of the specified measurement is completed.



- In the case where a stream specification change command (for N times of measurement) is received during the run mode in the stream specification status (for N times of measurement) [3C2]

  The measurement status is changed to the requested stream specification status (for N times of measurement) when the Nth round of the measurement of the currently-measured stream is completed.

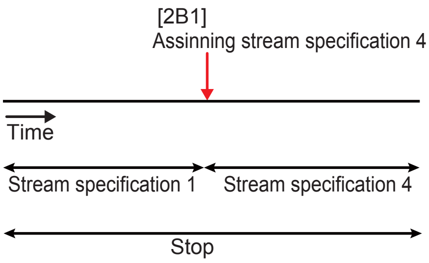
  In this case, the operation mode changes from the run mode to the stop mode when the Nth round of the specified measurement is completed.



- In the case where a stream specification change command is received during the stop mode in the stream specification status [2B1]

  The measurement status is immediately changed to the requested stream specification status.

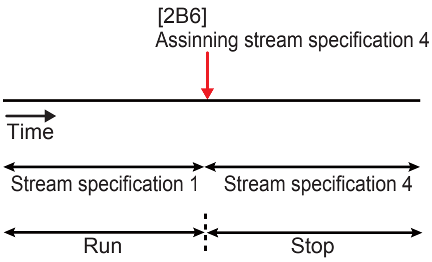
  In this case, the operation mode remains unchanged from the stop mode.



- In the case where a stream specification change command is received during the pause mode in the stream specification status [2B6]

  The measurement status is immediately changed to the requested stream specification status.

  In this case, the operation mode changes to the stop mode and valves are all closed (turned off).

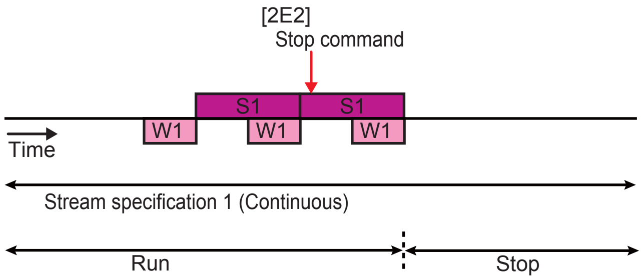


- In the case where a stop command is received during the run mode in the stream specification status (for continuous measurement) [2E2]

  The operation mode is immediately prepared to be changed to the stop mode.

  The operation mode changes to the stop mode in the stream specification status (for continuous measurement) when the measurement of the currently-measured stream is completed.

  The stop command can be canceled with a cancel command until the operation mode changes to the stop mode.



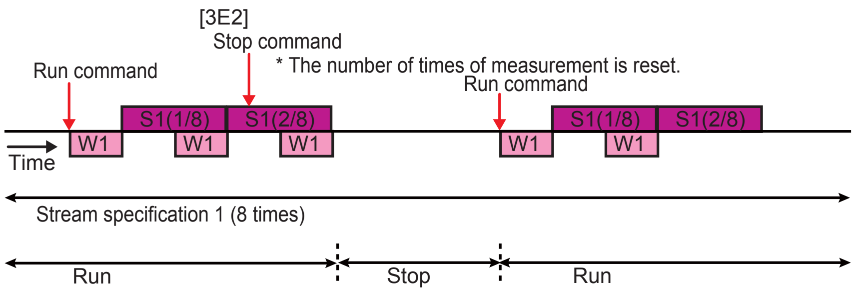
- In the case where a stop command is received during the run mode in the stream specification status (for N times of measurement) [3E2]

  The operation mode is immediately prepared to be changed to the stop mode.

  The operation mode changes to the stop mode in the stream specification status (for N times of measurement) when the measurement of the currently-measured stream is completed.

  In this case, the number of times of measurement is counted again from the beginning.

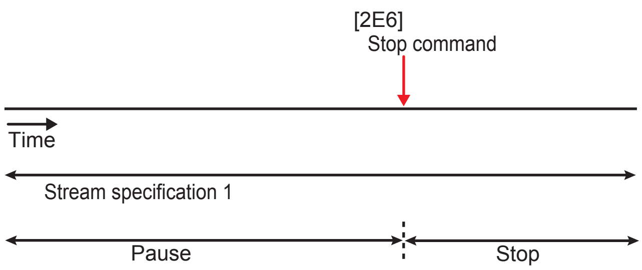
  The stop command can be canceled with a cancel command until the operation mode changes to the stop mode.



- In the case where a stop command is received during the pause mode in the stream specification status [2E6]

  The operation mode is immediately changed to the stop mode in the stream specification status.

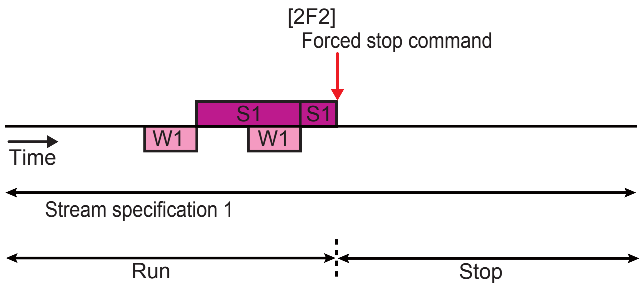
  In the stream specification status (for N times of measurement), the number of times of measurement is counted again from the beginning.



- In the case where a forced stop command is received during the run mode in the stream specification status [2F2]

  The operation mode is immediately changed to the stop mode in the stream specification status.

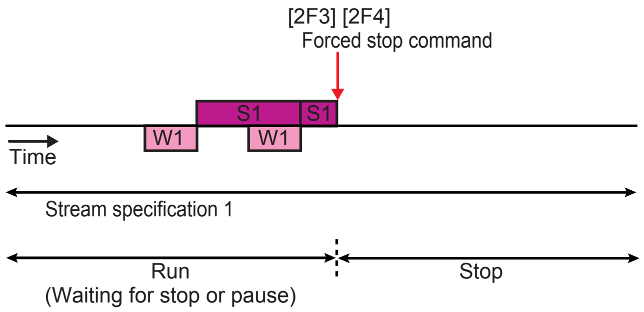
  In the stream specification status (for N times of measurement), the number of times of measurement is counted again from the beginning.



- In the case where a forced stop command is received while the operation mode is scheduled to be changed to the stop mode or pause mode in the stream specification status [2F3], [2F4]

  The operation mode is immediately changed to the stop mode in the stream specification status.

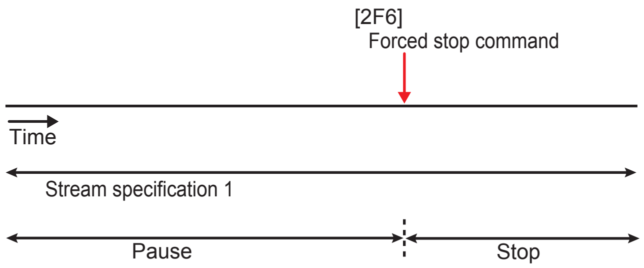
  In the stream specification status (for N times of measurement), the number of times of measurement is counted again from the beginning.



- In the case where a forced stop command is received during the pause mode in the stream specification status [2F6]

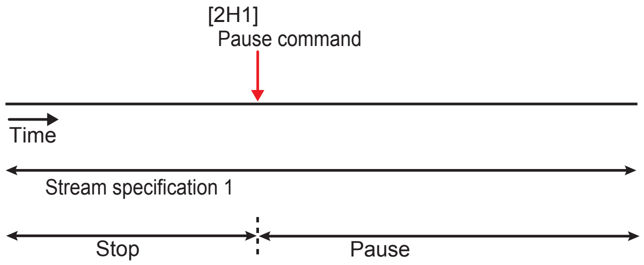
  The operation mode is immediately changed to the stop mode in the stream specification status.

  In the stream specification status (for N times of measurement), the number of times of measurement is counted again from the beginning.



- In the case where a pause command is received during the stop mode in the stream specification status [2H1]

  The operation mode is immediately changed to the pause mode in the stream specification status.



- In the case where a pause command is received during the run mode in the stream specification status [2H2]

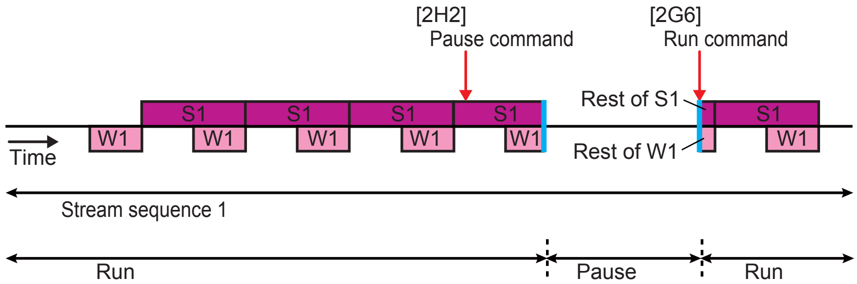
  The operation mode is immediately prepared to be changed to the pause mode in the stream specification status.

  The operation mode changes to the pause mode in the stream specification status at a preset time during the measurement of the currently-measured stream.

  The pause command can be canceled with a cancel command until the operation mode changes to the pause mode.

- In the case where a run command is received during the pause mode in the stream specification status [2G6]

  The suspended measurement is resumed.



(4)Calibration and validation

Three types of calibration and validation methods are available as follows.

Manual	Selection of a calibration (or validation) number, switching of stream valves to flow the standard sample, and issue of a calibration (or validation) start command are all performed manually.
Semiautomatic	Once a calibration (or validation) number is selected, stream valves are automatically switched to flow the standard sample, then calibration (or validation) starts automatically.
Automatic	Stream valves are automatically switched to flow the standard sample, then calibration (or validation) starts automatically at a preset date, time, and interval. The preset calibration (or validation) patterns of which automatic execution is enabled are automatically executed.

The details of these three types of calibration and validation are described below.

(a) Manual calibration

- To select the calibration (or validation) method, touch the “Calibration (validation) method” button to open the selection window on the GCM operation status screen on the GC-HMI analyzer operation display (Figure 1.23) or select it on the “Calibration/validation setting” screen on the EtherLCD (Figure 1.24). A set of stream numbers and the numbers of times of measurement is specified for each of Calibration 1 to 6 and Validation 1 to 6 on the “Calibration/validation setting” screen on the EtherLCD. Users at Level C or higher are allowed to select the calibration (or validation) method.
- Next, issue a command to change the measurement status to a preset status among Calibration 1 to 6 or Validation 1 to 6 on the calibration (validation) window on the GCM operation status screen. Calibration (or validation) numbers for which stream numbers are not specified are not in the options. If there is no calibration (or validation) numbers for which stream numbers are specified, the operation button is invalid and is displayed in gray.

  Select a calibration (or validation) number, and then touch the “OK” button. Then the waiting measurement status is changed to the selected calibration (or validation) number on the overall GCM information screen. Users at Level B or higher are allowed to select the calibration (or validation) number.

  Users at Level C or higher can cancel the command to change the measurement status to the specified calibration (or validation) status until the waiting measurement status is changed to the selected calibration (or validation) number and the measurement of the currently-measured stream is completed.

(Figure 1.25)

- The measurement status changes to “Replaceable” when the measurement of the currently-measured stream is completed.

  After the measurement status has changed to “Replaceable,” open the manual stream valve on the calibration stream (or validated) to flow the standard calibration (or validation) sample. After the flow in the line has been completely replaced with the standard sample, touch the “Calibration (validation) start” button. Users at Level B or higher are allowed to start calibration (or validation).

  (Figure 1.26)

- When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the measurement status returns to “Replaceable.” Then stop flowing the standard sample and press the “Calibration (validation) stop” button to return to the stop mode in the measurement status before the calibration (or validation) (the stream sequence status or the stream specification status).

  Users at Level B or higher are allowed to stop calibration (or validation).

  (Figure 1.27)

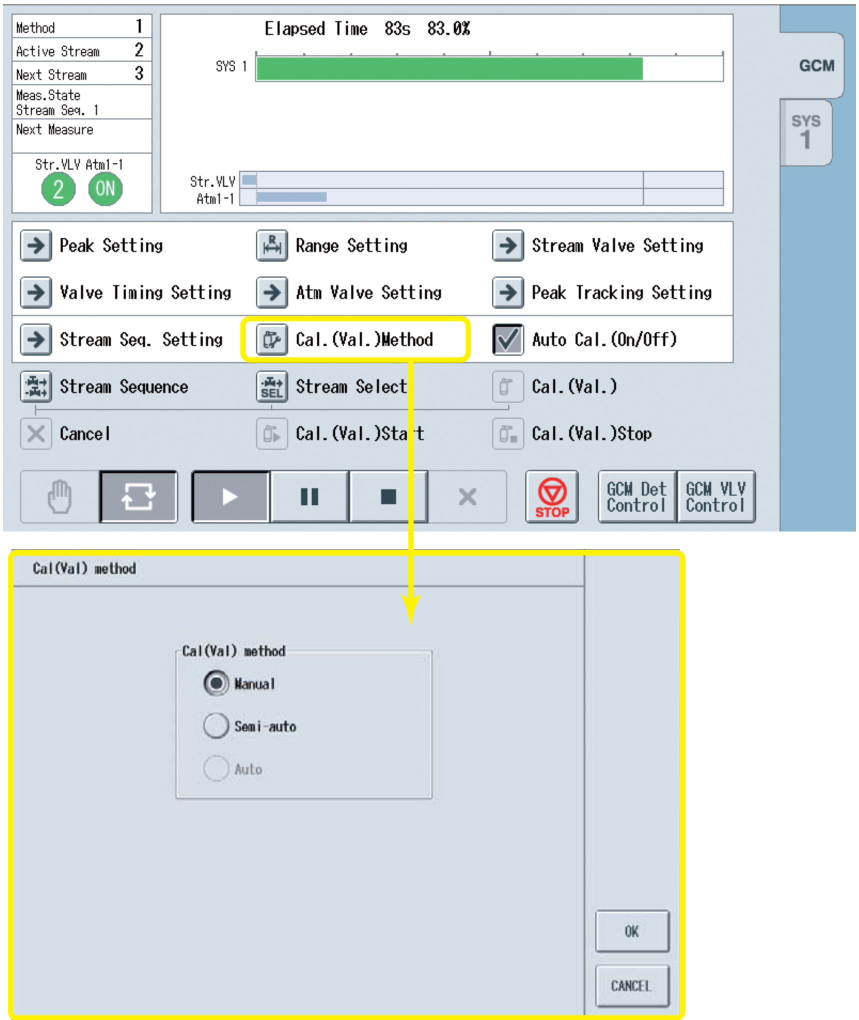


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Figure 1.23 An example of the calibration (validation) method window on the GCM operation status screen on the GC-HMI analyzer operation display

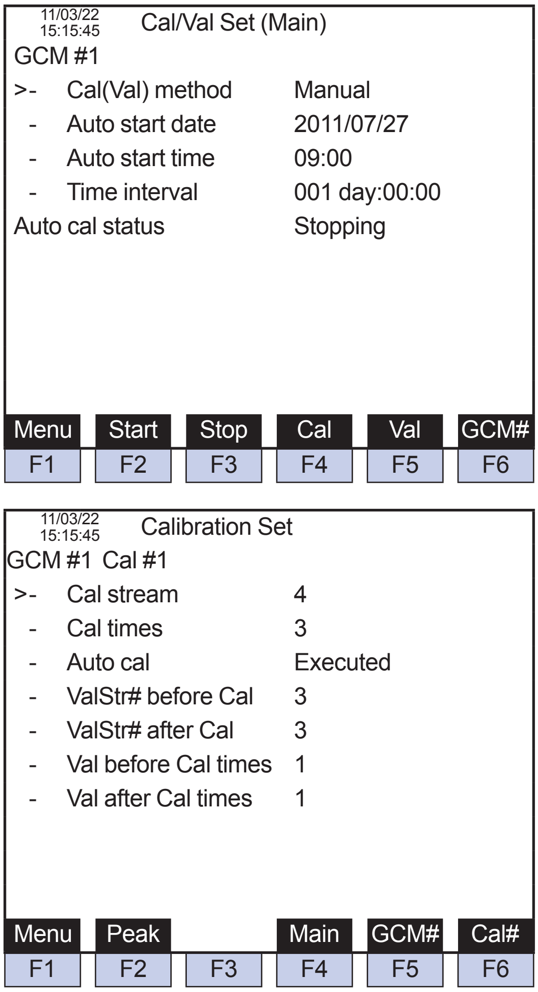


Figure 1.24 **An example of the calibration/validation setting screen on the GC-HMI EtherLCD**

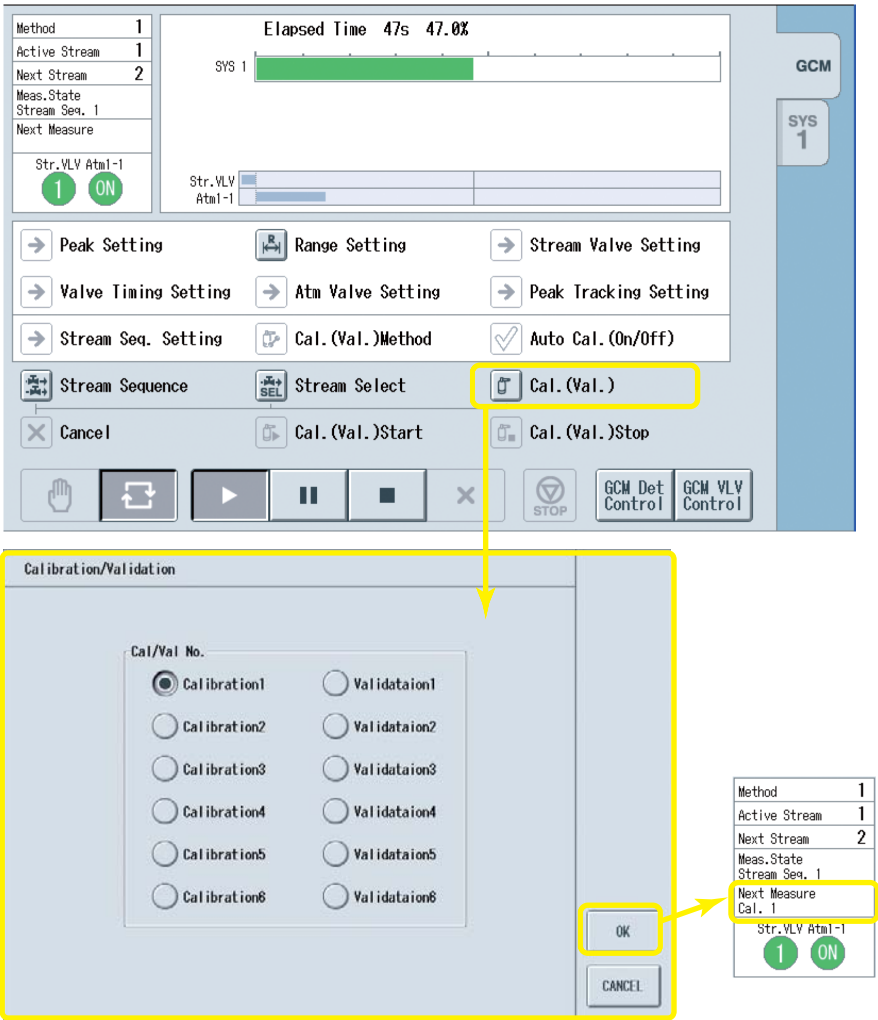


Figure 1.25 An operation example of the calibration (validation) window on the GCM operation status screen on the GC-HMI analyzer operation display

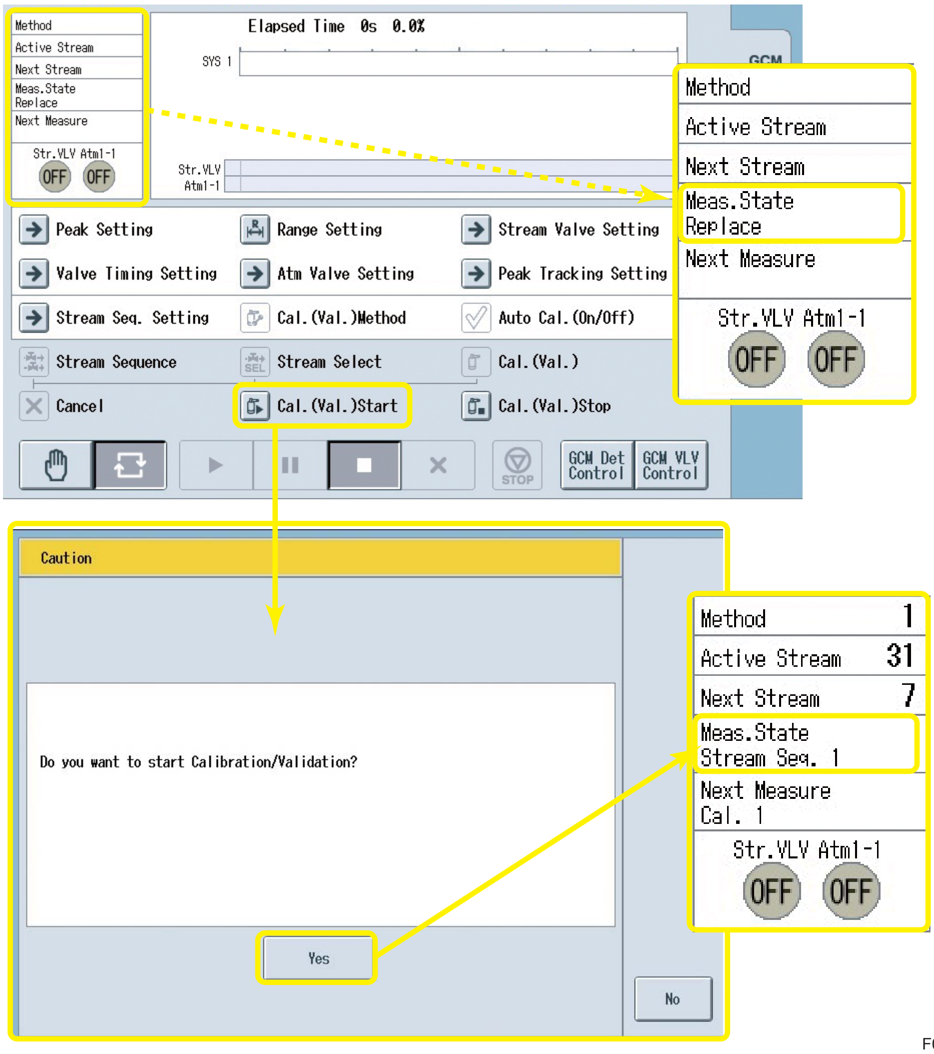
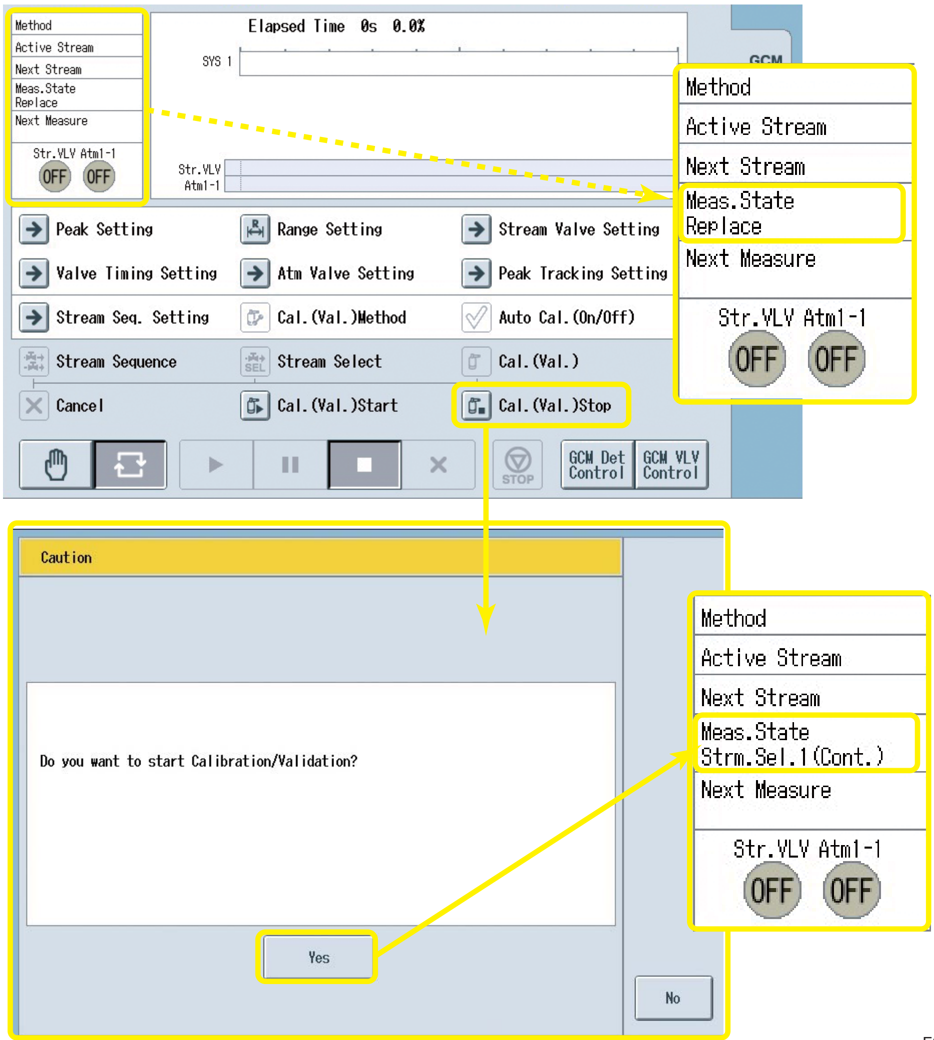


Figure 1.26 An operation example of the calibration (validation) start window on the GCM operation status screen on the GC-HMI analyzer operation display



F0127.ai

Figure 1.27 An operation example of the calibration (validation) stop window on the GCM operation status screen on the GC-HMI analyzer operation display

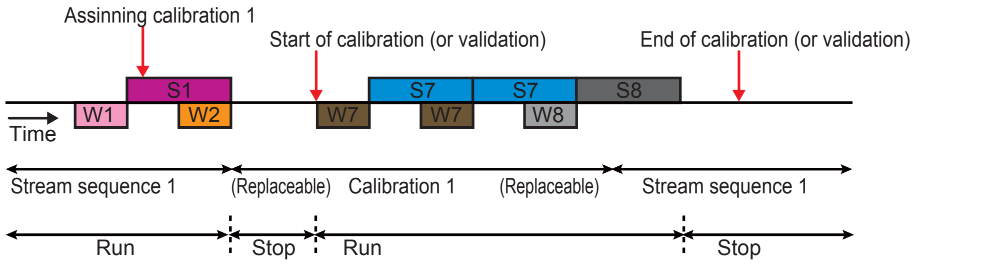
- In the case where a (manual) calibration/validation command is received during the run mode in the stream sequence status

  The measurement status is immediately prepared to be changed to the calibration (or validation) status.

  The measurement status changes to “Replaceable” in the stop mode in the calibration (or validation) status when the measurement of the currently-measured stream is completed.

  Users at Level C or higher can cancel the calibration/validation command until the operation mode changes to the stop mode.

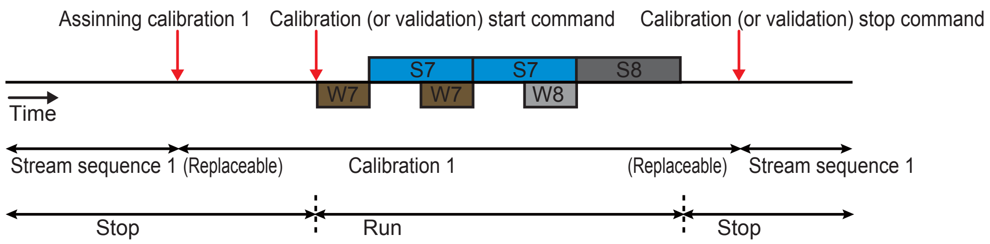
  Issue a command to start calibration (or validation) after confirming that manual replacement of the flow with the sample has been completed. When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode returns to the stop mode in the stream sequence status.



- In the case where a (manual) calibration/validation command is received during the stop mode in the stream sequence status

  The measurement status immediately changes to “Replaceable” in the stop mode in the requested calibration (or validation) status.

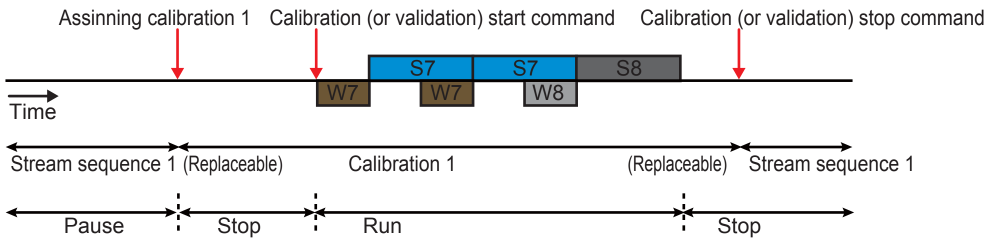
  Issue a command to start calibration (or validation) after confirming that manual replacement of the flow with the sample has been completed. When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode returns to the stop mode in the stream sequence status.



- In the case where a (manual) calibration/validation command is received during the pause mode in the stream sequence status

  The measurement status immediately changes to “Replaceable” in the stop mode in the requested calibration (or validation) status.

  Issue a command to start calibration (or validation) after confirming that manual replacement of the flow with the sample has been completed. When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode changes to the stop mode in the stream sequence status.



- In the case where a (manual) calibration/validation command is received during the run mode in the stream specification status

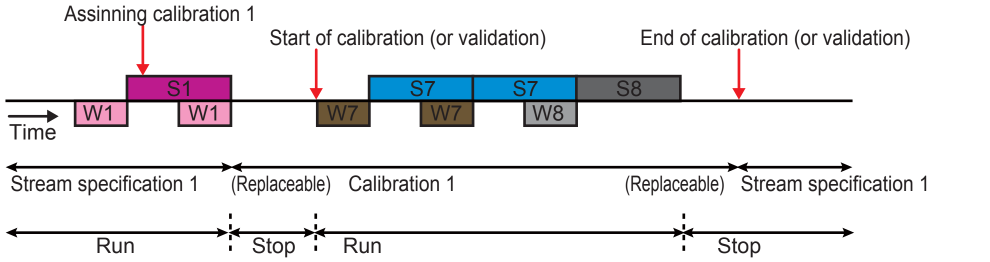
  The measurement status is immediately prepared to be changed to the calibration (or validation) status.

  In the case of the stream specification status (for continuous measurement), the measurement status immediately changes to “Replaceable” in the stop mode in the requested calibration (or validation) status.

  In the case of the stream specification status (for N times of measurement), the measurement status changes to “Replaceable” in the stop mode in the requested calibration (or validation) status when the Nth round of the measurement of the currently-measured stream is completed.

Users at Level C or higher can cancel the calibration/validation command until the operation mode changes to the stop mode.

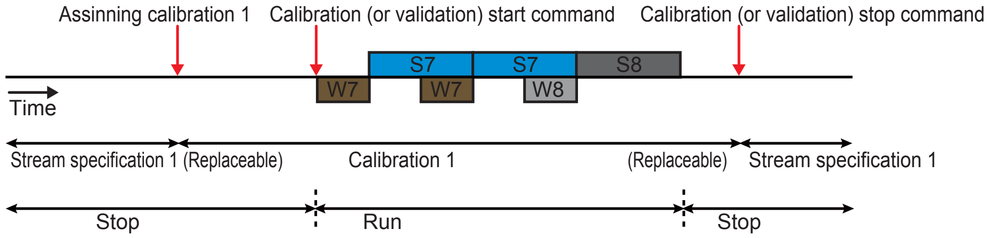
Issue a command to start calibration (or validation) after confirming that manual replacement of the flow with the sample has been completed. When calibration (or validation) is completed for all the specified streams, the operation mode returns to the stop mode in the stream specification status.



- In the case where a (manual) calibration/validation command is received during the stop mode in the stream specification status

  The measurement status immediately changes to “Replaceable” in the stop mode in the requested calibration (or validation) status.

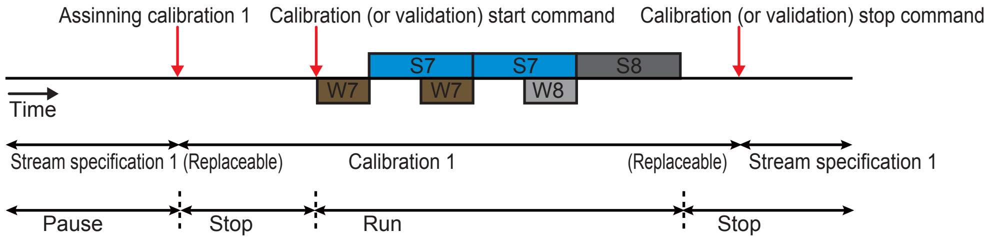
  Issue a command to start calibration (or validation) after confirming that manual replacement of the flow with the sample has been completed. When calibration (or validation) is completed for all the specified streams, the operation mode returns to the stop mode in the stream specification status.



- In the case where a (manual) calibration/validation command is received during the pause mode in the stream specification status

  The measurement status immediately changes to “Replaceable” in the stop mode in the requested calibration (or validation) status.

  Issue a command to start calibration (or validation) after confirming that manual replacement of the flow with the sample has been completed. When calibration (or validation) is completed for all the specified streams, the operation mode changes to the stop mode in the stream specification status.

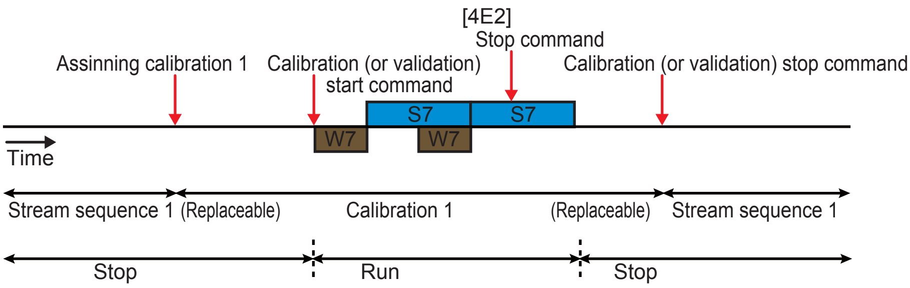


- In the case where a stop command is received during the run mode in the (manual) calibration/validation status [4E2]

  The operation mode is immediately prepared to be changed from the run mode to the stop mode in the calibration (or validation) status.

  The measurement status changes to “Replaceable” in the stop mode in the calibration (or validation) status when the current measurement is completed.

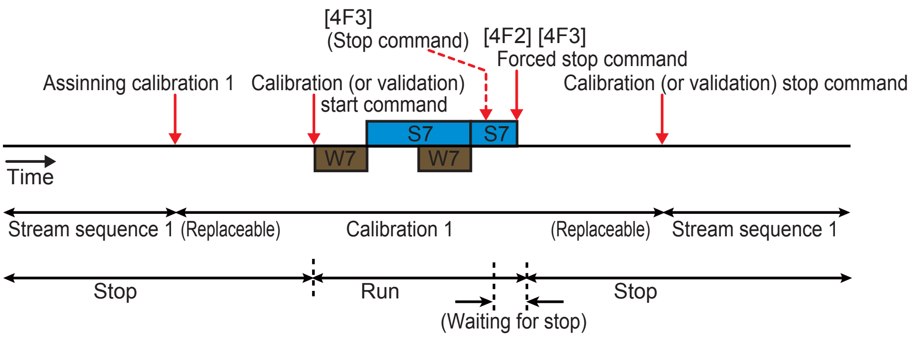
  The stop command can be canceled with a cancel command until the operation mode changes to the stop mode.



- In the case where a forced stop command is received during the run mode in the (manual) calibration/validation status [4F2]

  The measurement status immediately changes to “Replaceable” in the stop mode in the calibration (or validation) status.
- In the case where a forced stop command is received when the operation mode is prepared to be changed from the run mode to the stop mode in the (manual) calibration/validation status [4F3]

  The measurement status immediately changes to “Replaceable” in the stop mode in the calibration (or validation) status.



(b) Semiautomatic calibration

- To select the calibration (or validation) method, touch the “Calibration (validation) method” button to open the selection window on the GCM operation status screen on the GC-HMI analyzer operation display (Figure 1.28) or select it on the “Calibration/validation setting” screen on the EtherLCD (Figure 1.29). A set of stream numbers and the numbers of times of measurement is specified for each of Calibration 1 to 6 and Validation 1 to 6 on the “Calibration/validation setting” screen on the EtherLCD. Users at Level C or higher are allowed to select the calibration (or validation) method.
- Next, issue a command to change the measurement status to a preset status among Calibration 1 to 6 or Validation 1 to 6 on the calibration (validation) window on the GCM operation status screen. Calibration (or validation) numbers for which stream numbers are not specified are not in the options. If there is no calibration (or validation) numbers for which stream numbers are specified, the operation button is invalid and is displayed in gray.

  Select a calibration (or validation) number, and then touch the “OK” button. Then the waiting measurement status is changed to the selected calibration (or validation) number on the overall GCM information screen. Users at Level B or higher are allowed to select the calibration (or validation) number.

  Users at Level C or higher can cancel the command to change the measurement status to the specified calibration (or validation) status until the waiting measurement status is changed to the selected calibration (or validation) number and the measurement of the currently-measured stream is completed.

  (Figure 1.30)

- When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the measurement status returns to the status before the calibration (or validation). The operation mode after calibration (or validation) is determined as follows depending on the measurement status and the operation mode before the calibration (or validation).

Measurement status and operation mode before calibration (or validation)	Operation mode after calibration (or validation)
Stream sequence/Stream specification (for continuous measurement), Run	Run
Stream specification (for N times of measurement), Run	Stop
Stream sequence/Stream specification (for continuous measurement)/ Stream specification (for N times of measurement), Stop	Stop
Stream sequence/Stream specification (for continuous measurement)/ Stream specification (for N times of measurement), Pause	Stop

Users at Level B or higher are allowed to stop calibration (or validation).

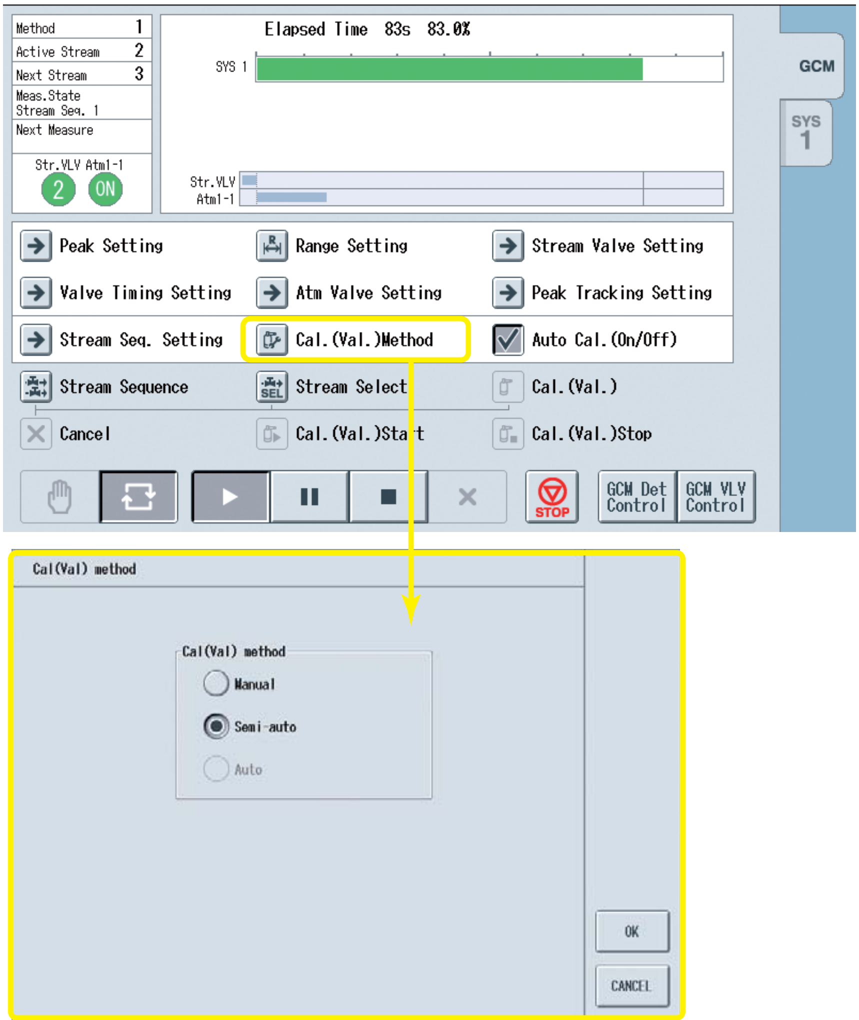


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Figure 1.28 An example of the calibration (validation) method window on the GCM operation status screen on the GC-HMI analyzer operation display

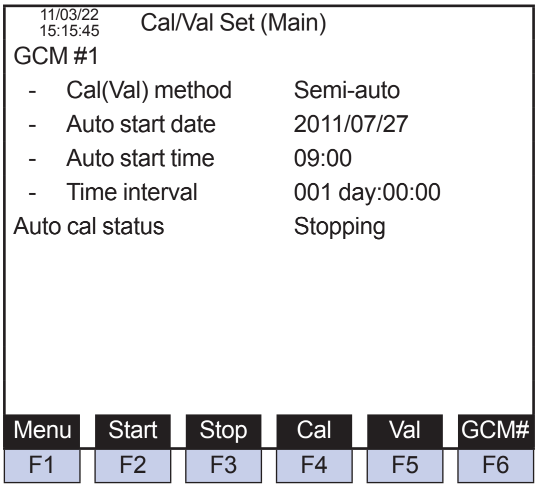


Figure 1.29 An example of the calibration/validation setting screen on the GC-HMI EtherLCD.

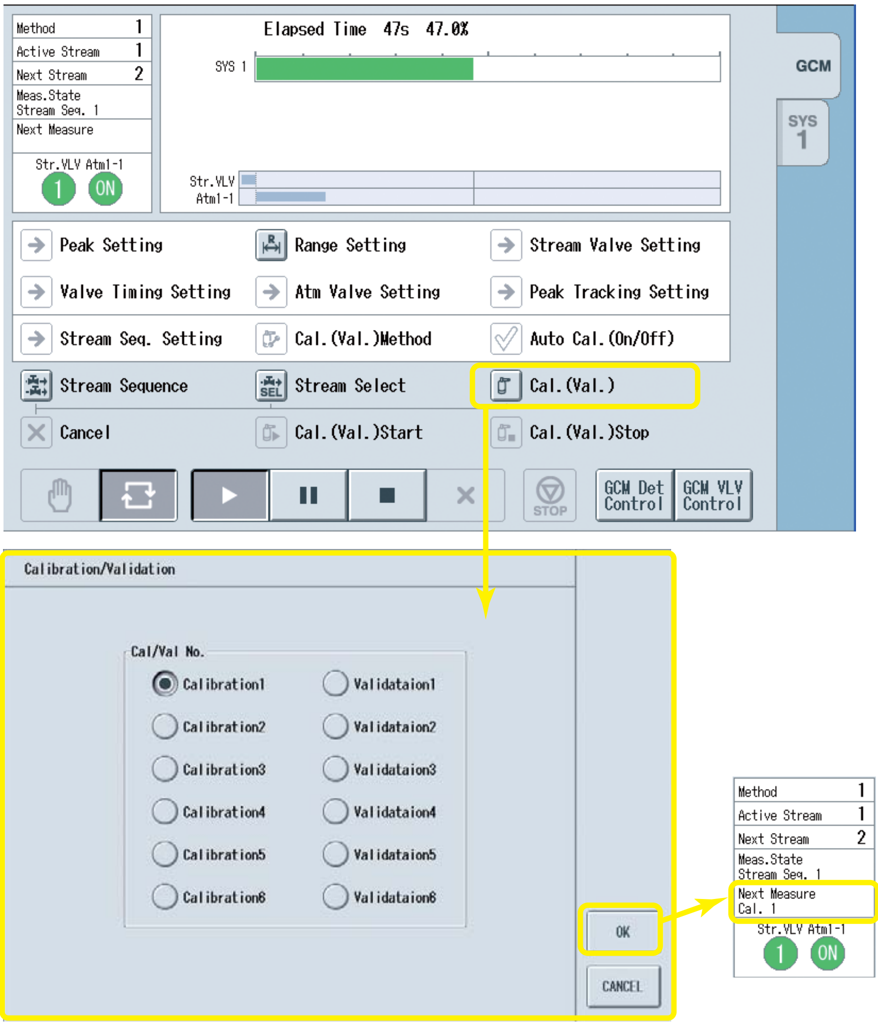


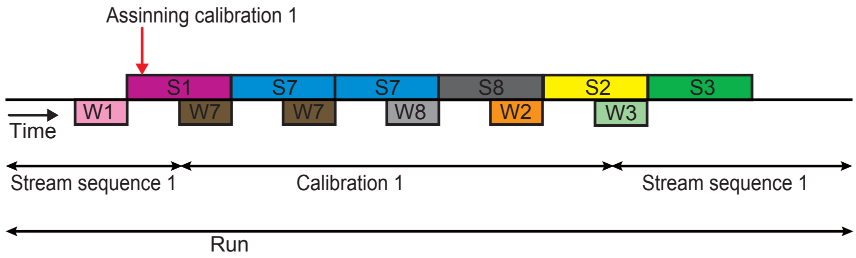
Figure 1.30 An operation example of the calibration (validation) window on the GCM operation status screen on the GC-HMI analyzer operation display

- In the case where a (semiautomatic) calibration/validation command is received during the run mode in the stream sequence status

  Calibration (or validation) is started when the measurement of the currently-measured stream is completed.

Users at Level C or higher can cancel the calibration/validation command until the measurement of the currently-measured stream is completed.

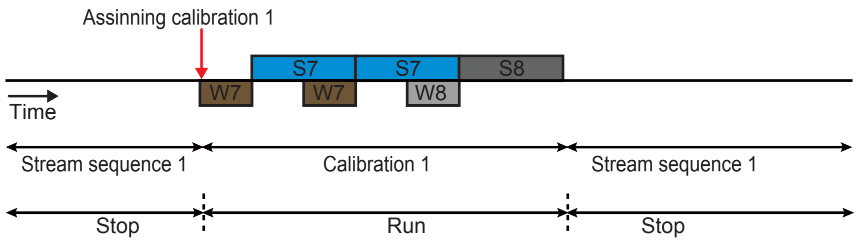
When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, measurement is resumed from the next stream in the run mode in the stream sequence status.



- In the case where a (semiautomatic) calibration/validation command is received during the stop mode in the stream sequence status

  Calibration (or validation) is immediately started.

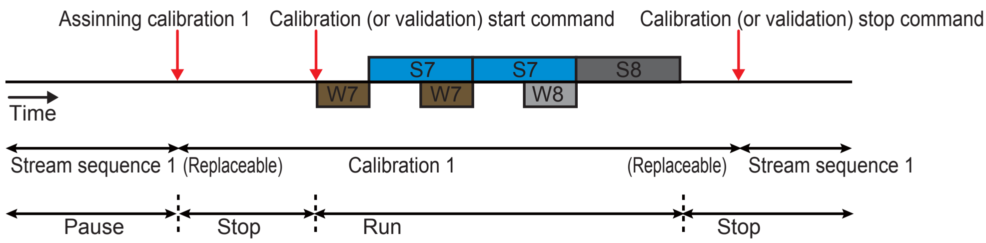
  When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode returns to the stop mode in the stream sequence status.



- In the case where a (semiautomatic) calibration/validation command is received during the pause mode in the stream sequence status

  Calibration (or validation) is immediately started.

  When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode changes to the stop mode in the stream sequence status.

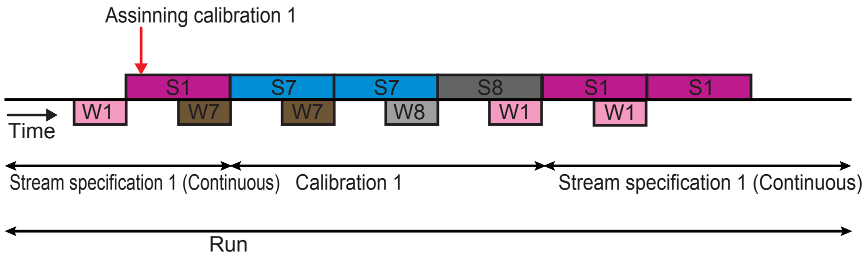


- In the case where a (semiautomatic) calibration/validation command is received during the run mode in the stream specification status (for continuous measurement)

  Calibration (or validation) is started when the measurement of the currently-measured stream is completed.

  Users at Level C or higher can cancel the calibration/validation command until the measurement of the currently-measured stream is completed.

  When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode returns to the run mode in the stream specification status (for continuous measurement).

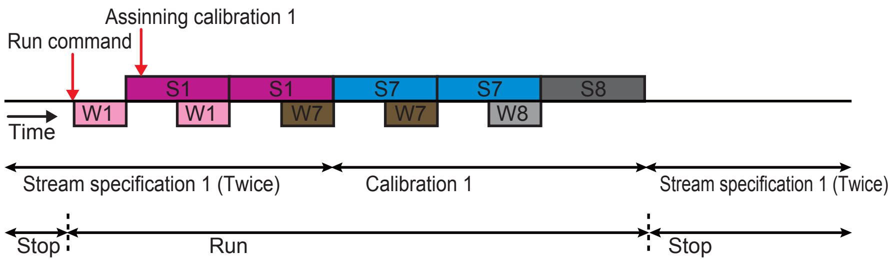


- In the case where a (semiautomatic) calibration/validation command is received during the run mode in the stream specification status (for N times of measurement)

  Calibration (or validation) is started when the Nth round of the measurement of the currently-measured stream is completed.

  Users at Level C or higher can cancel the calibration/validation command until the measurement of the currently-measured stream is completed.

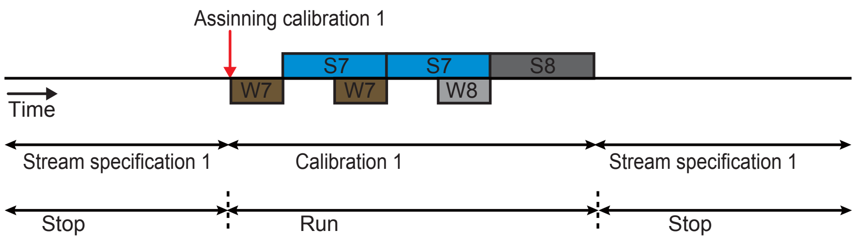
  When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode changes to the stop mode in the stream specification status (for N times of measurement).



- In the case where a (semiautomatic) calibration/validation command is received during the stop mode in the stream specification status

  Calibration (or validation) is immediately started.

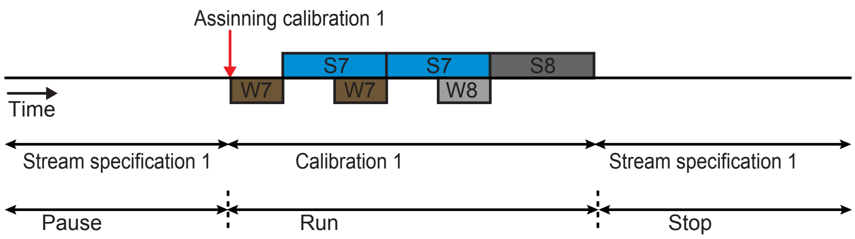
  When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode returns to the stop mode in the stream specification status.



- In the case where a (semiautomatic) calibration/validation command is received during the pause mode in the stream specification status

  Calibration (or validation) is immediately started.

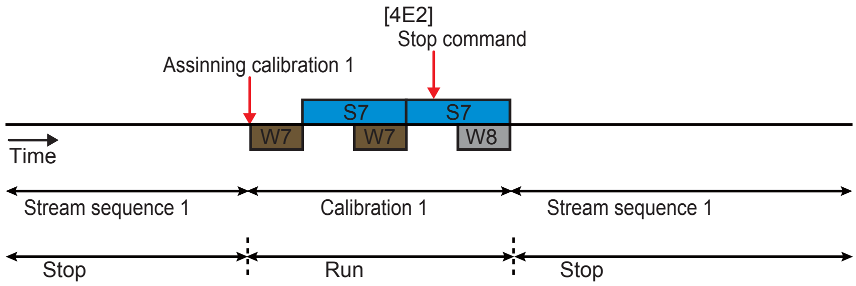
  When calibration (or validation) is completed for all the streams specified for the selected calibration (or validation) number, the operation mode changes to the stop mode in the stream sequence status.



- In the case where a stop command is received during the run mode in the (semiautomatic) calibration/validation status [4E2]

  The operation mode is immediately prepared to be changed to the stop mode in the calibration (or validation) status.

  The operation mode changes to the stop mode in the previous measurement status when the current measurement is completed.

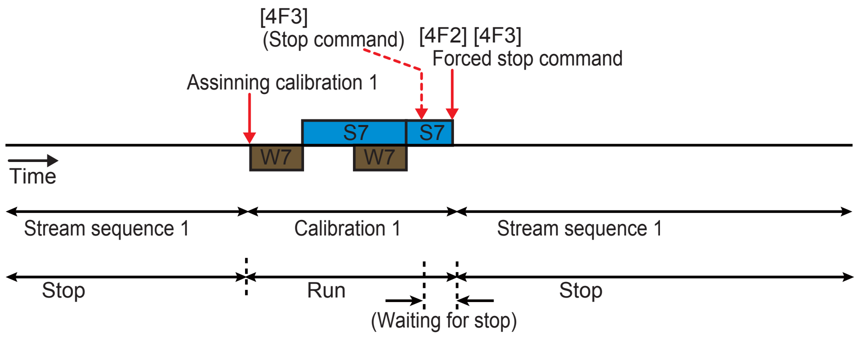


- In the case where a forced stop command is received during the run mode in the (manual) calibration/validation status [4F2]

  The operation mode is immediately changed to the stop mode in the previous measurement status.

- In the case where a forced stop command is received when the operation mode is prepared to be changed from the run mode to the stop mode in the (manual) calibration/validation status [4F3]

  The operation mode is immediately changed to the stop mode in the previous measurement status.



(c) Automatic calibration

- Stream valves are automatically switched to flow the standard sample, then calibration (or validation) starts automatically at a preset date, time, and interval. The preset calibration (or validation) patterns of which automatic execution is enabled are automatically executed.
- To select the calibration (or validation) method, touch the “Calibration (validation) method” button to open the selection window on the GCM operation status screen on the GC-HMI analyzer operation display (Figure 1.31).

  To issue a command to start/stop automatic calibration, touch the “Automatic calibration start/stop” button to open the confirmation window on the GCM operation status screen on the GC-HMI analyzer operation display (Figure 1.32).

  On the “Calibration/validation setting” screen on the EtherLCD (Figure 1.33), a set of stream numbers and the numbers of times of measurement is specified for each of Calibration 1 to 6 and Validation 1 to 6, while the date, time, and interval of automatic start as well as the validity of automatic calibration are specified.

  Users at Level C or higher can cancel the command to change the measurement status to the specified calibration (or validation) status until the waiting measurement status is changed to the selected calibration (or validation) number and the measurement of the currently-measured stream is completed.

When the measurement status is set to the calibration (or validation) status, commands to start/stop automatic calibration are invalid.

Users at Level C or higher are allowed to specify the setting and issue commands.

- When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the measurement status returns to the status before the calibration (or validation). The operation mode after calibration (or validation) is determined as follows depending on the measurement status and the operation mode before the calibration (or validation).

Measurement status and operation mode before calibration (or validation)	Operation mode after calibration (or validation)
Stream sequence/Stream specification (for continuous measurement), Run	Run
Stream specification (for N times of measurement), Run	Stop
Stream sequence/Stream specification (for continuous measurement)/ Stream specification (for N times of measurement), Stop	Stop
Stream sequence/Stream specification (for continuous measurement)/ Stream specification (for N times of measurement), Pause	Stop

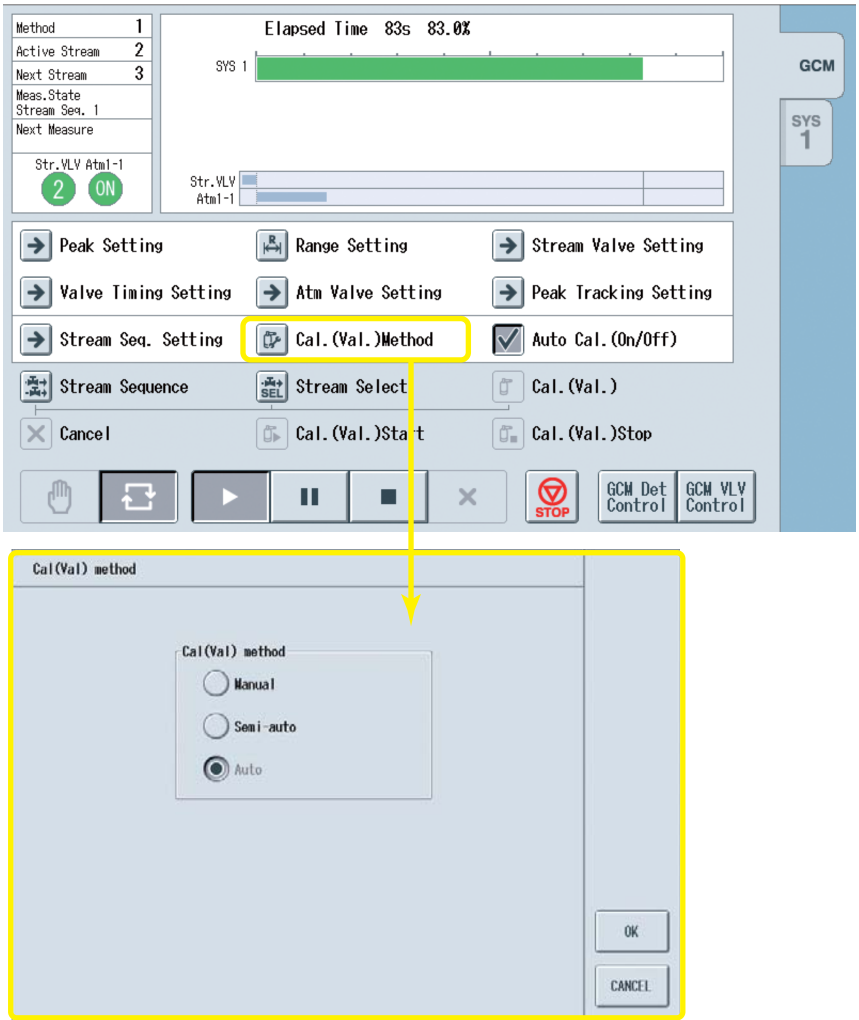


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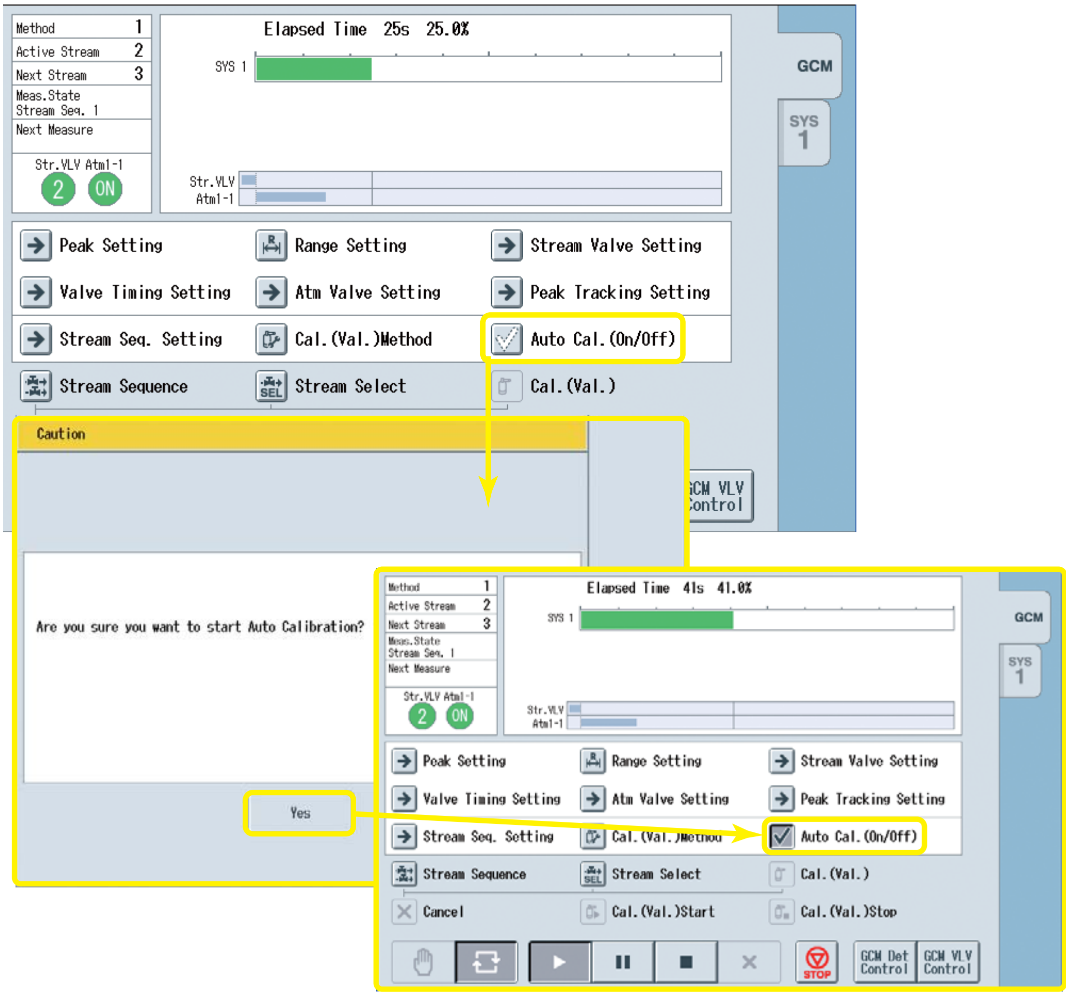
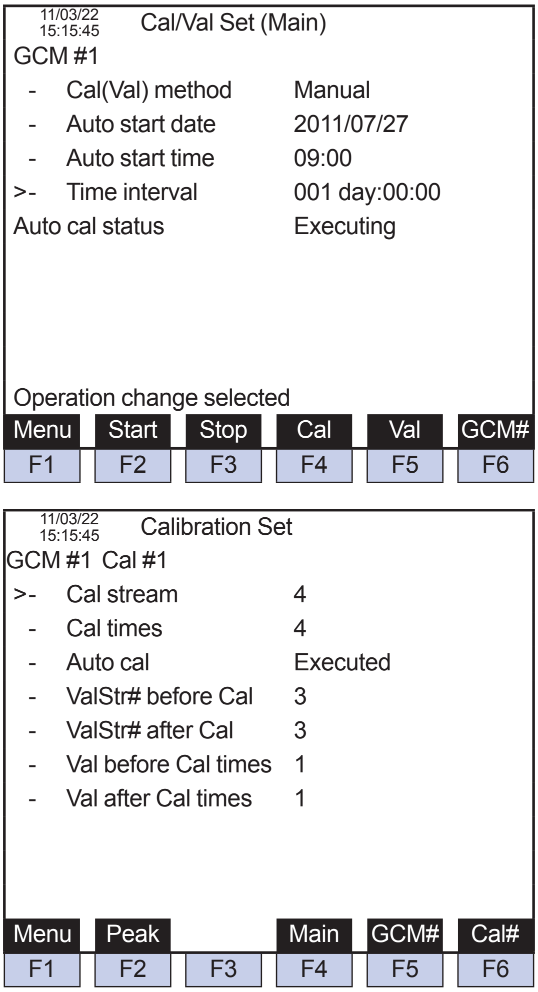
Figure 1.31 An example of the calibration (validation) method window on the overall GCM information screen on the GC-HMI analyzer operation display



F0132.ai

Figure 1.32 An operation example of the automatic calibration start/stop window on the overall GCM information screen on the GC-HMI analyzer operation display



Enable/disable automatic calibration with function keys.

Start (F2): Automatic calibration start command

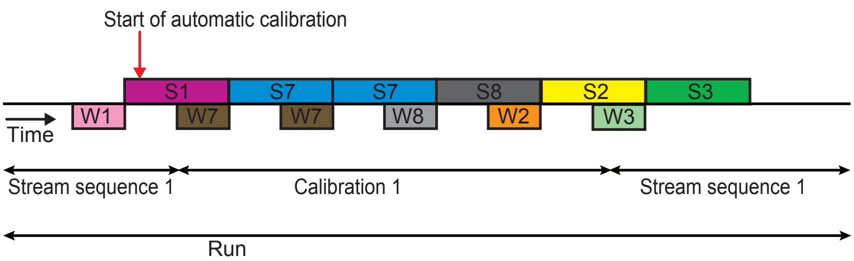
Stop (F3): Automatic calibration stop command

Figure 1.33 An example of the calibration/validation setting screen on the GC-HMI EtherLCD.

- In the case where automatic calibration starts during the run mode in the stream sequence status

  Calibration (or validation) is started when the measurement of the currently-measured stream is completed.

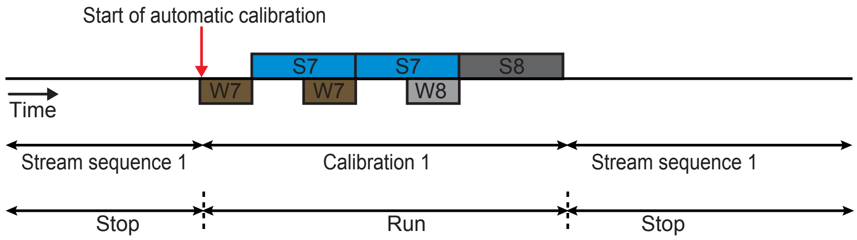
  When all the calibration (or validation) patterns of which automatic execution is enabled are completed, measurement is resumed from the next stream in the run mode in the stream sequence status.



- In the case where automatic calibration starts during the stop mode in the stream sequence status

  Calibration (or validation) is immediately started.

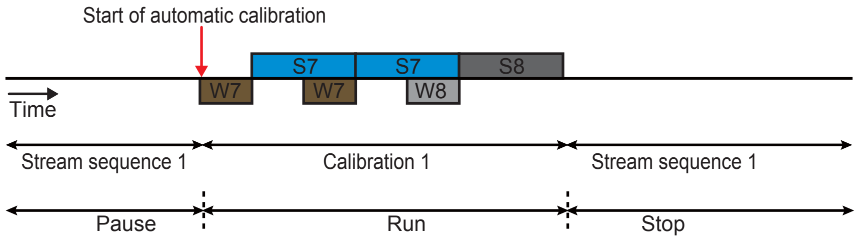
  When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the operation mode returns to the stop mode in the stream sequence status.



- In the case where automatic calibration starts during the pause mode in the stream sequence status

  Calibration (or validation) is immediately started.

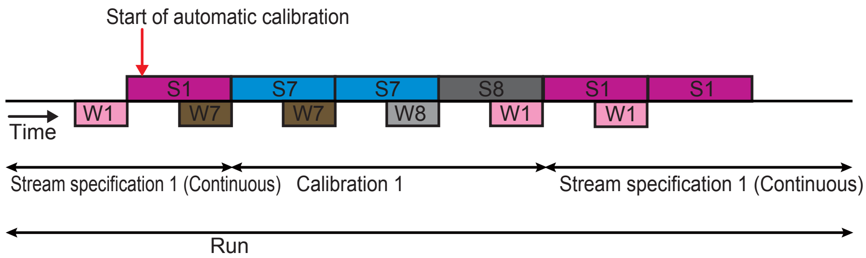
  When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the operation mode changes to the stop mode in the stream sequence status.



- In the case where automatic calibration starts during the run mode in the stream specification status (for continuous measurement)

  Calibration (or validation) is started when the measurement of the currently-measured stream is completed.

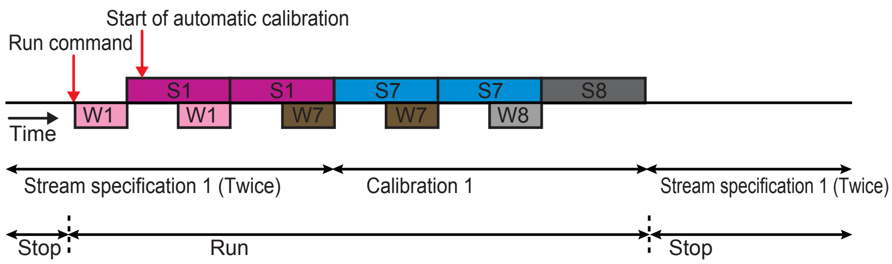
  When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the operation mode returns to the run mode in the stream specification status (for continuous measurement).



- In the case where automatic calibration starts during the run mode in the stream specification status (for N times of measurement)

  Calibration (or validation) is started when the Nth round of the measurement of the currently-measured stream is completed.

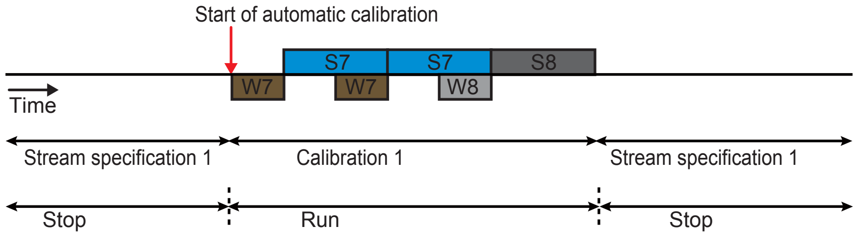
  When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the operation mode changes to the stop mode in the stream specification status (for N times of measurement).



- In the case where automatic calibration starts during the stop mode in the stream specification status

  Calibration (or validation) is immediately started.

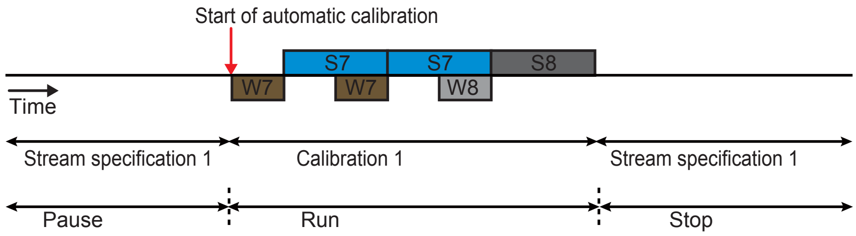
When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the operation mode returns to the stop mode in the stream specification status.



- In the case where automatic calibration starts during the pause mode in the stream specification status

  Calibration (or validation) is immediately started.

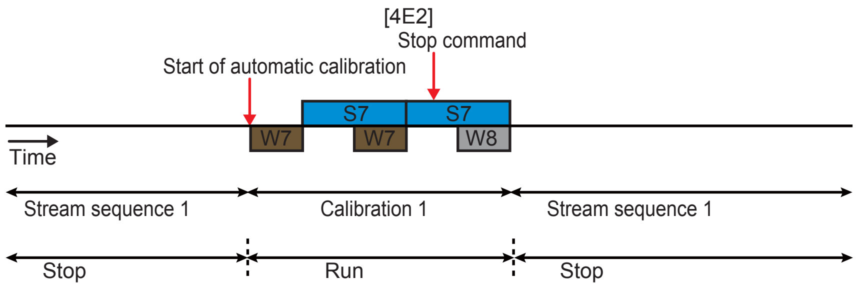
  When all the calibration (or validation) patterns of which automatic execution is enabled are completed, the operation mode changes to the stop mode in the stream specification status.



- In the case where a stop command is received during the run mode in the (automatic) calibration/validation status [4E2]

  The operation mode is immediately prepared to be changed from the run mode to the stop mode in the calibration (or validation) status.

  The operation mode changes to the stop mode in the previous measurement status when the current measurement is completed.

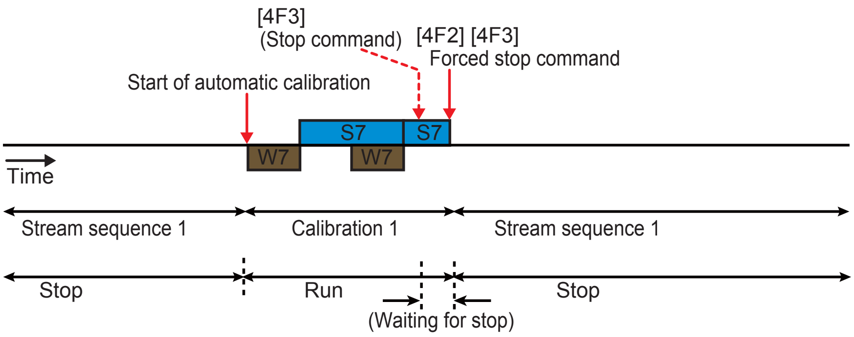


- In the case where a forced stop command is received during the run mode in the (manual) calibration/validation status [4F2]

  The operation mode is immediately changed to the stop mode in the previous measurement status.

- In the case where a forced stop command is received when the operation mode is prepared to be changed from the run mode to the stop mode in the (manual) calibration/validation status [4F3]

  The operation mode is immediately changed to the stop mode in the previous measurement status.



1.12.2 Manual status

Manual operation is performed and chromatograms are displayed in the manual status.

The operations available in the manual status are as follows.

Oven heater ON/OFF	When the oven belongs to two GCMs, set both the GCMs in the manual status, then click the SYS tab and open the “Temperature regulator control” window to turn on and off the heater.	
LSV heater ON/OFF	Set the GCM to which the LSV belongs to the manual status, then click the SYS tab and open the “Temperature regulator control” window to turn on and off the heater.	
FPD detector heater ON/OFF	Set the GCM to which the FPD belongs to the manual status, then click the SYS tab and open the “Temperature regulator control” window to turn on and off the heater.	
Hydrogen limiter ON/OFF	When the hydrogen limiter belongs to two GCMs, set both the GCMs in the manual status, then turn on and off the limiter in the “GCM Det Control” window or the “SYS Det Control” window.	 
Detector ON/OFF	Set the GCM to which the detector belongs to the manual status, then turn on and off the detector in the “GCM Det Control” window or the “SYS Det Control” window.	
Stream valve ON/OFF	Set the GCM to which the stream valve belongs to the manual status, then turn on and off the valve in the “GCM VLV Control” window.	
Atmospheric pressure balancing valve ON/OFF	Set the GCM to which the atmospheric pressure balancing valve belongs to the manual status, then turn on and off the valve in the “GCM VLV Control” window.	
Built-in oven valves (RV, LSV) ON/OFF	Set the GCM to which the built-in oven valves (RV, LSV) belong to the manual status, then turn on and off the valves in the “GCM VLV Control” window or the “SYS VLV Control” window.	

The following operation modes are available in the manual status.

The process status and the manual status can be changed to each other in the stop mode.

When the equipment is switched from the process mode to the manual mode, valves and stream valves are all turned off.

Run	• A mode to perform measurement • Activate this mode in the manual status to start to display a chromatogram. (Peak detection or concentration calculation is not performed. Chromatograms are not saved.) Users at Level C or higher are allowed to activate this mode.	
Stop	• A mode to stop measurement • Activate this mode to immediately stop the run mode in the manual status. Users at Level C or higher are allowed to activate this mode.	

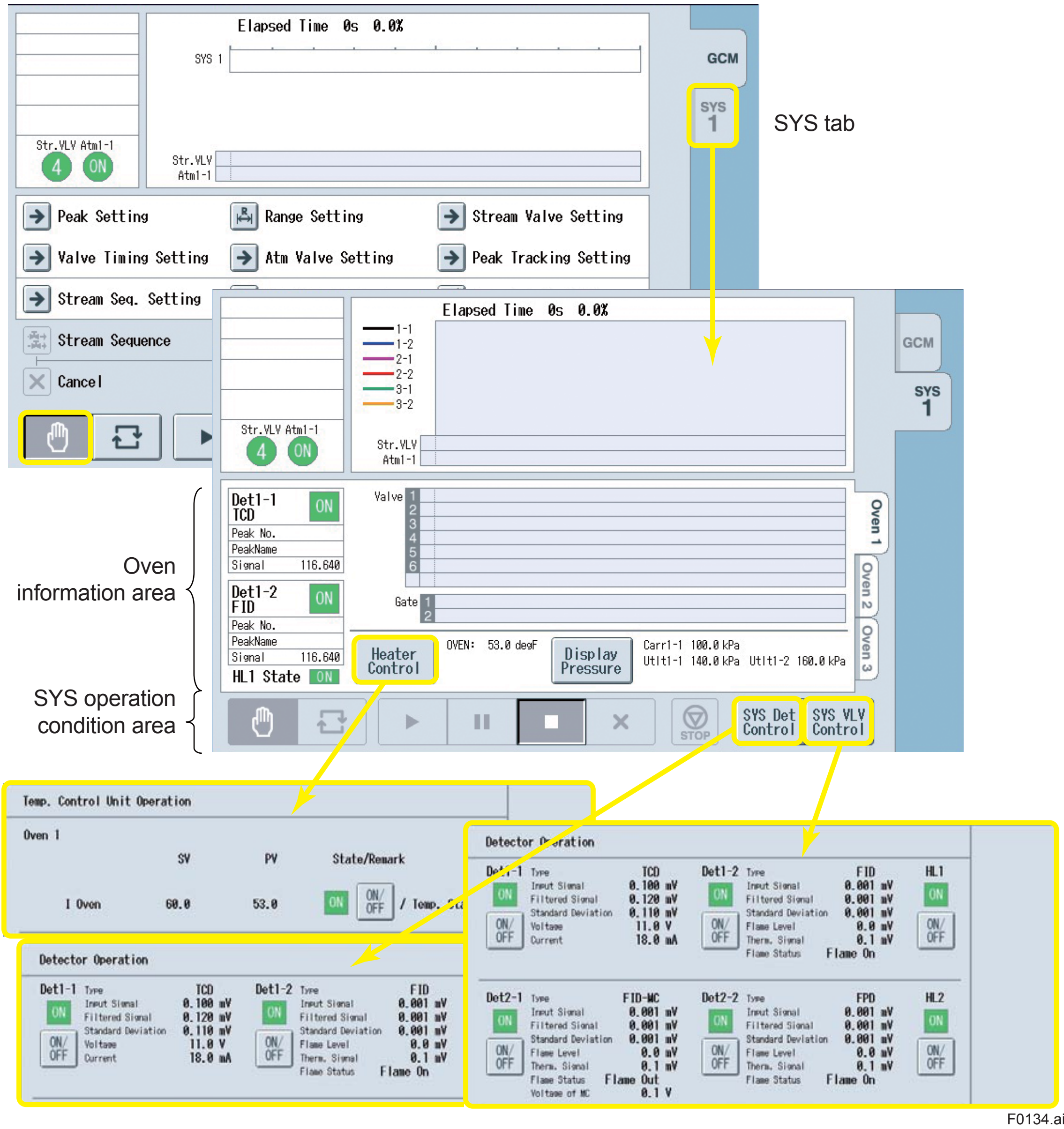


Figure 1.34 Operation examples of the temperature regulator control window and others on the GC-HMI analyzer operation display

1.12.3 Stream

The GC8000 can handle 31 streams.

The following items are defined for each stream.

● Stream name

● Stream valve number

A stream valve number from 1 to 31 is defined for each stream. The stream valve number "0" means that the stream has no stream valves. Stream valve numbers can be defined only for the valves that belong to the GCM.

(It is required to input the total number of stream valves used by GC8000 in the "Number of stream valves" in the "Basic system setting" window and to define the stream valve numbers that belong to the GCM with the "Initial stream valve number" and "Number of stream valves" in the "GCM setting" window.

When the stream valves are automatic valves, the valves specified among them are turned on and off. When the stream valves are manual valves, these settings do not affect the operation of the valves.

The same stream valve number can be specified for different streams. Specify the same stream valve number when a single stream is used for several measurements. Also define the standard sample stream as one of the streams.

● Stream type

- Measurement stream

  This is used for the measurement of the process sample.
- Validation stream

  This is used for the measurement of the standard sample in order to compare the measurement results between before and after calibration or to validate whether the GC8000 operates normally.
- Calibration stream

  This is used for the measurement of the standard sample for the purpose of calibration.

  This is also used as a validation stream in some cases.

● Sum calibration (Valid/Invalid) and sum total

When the “Concentration calculation” is set to “Standard” in the “Peak common setting” of the relevant GCM and the relevant stream is a measurement stream or a validation stream, sum calibration is enabled. However, sum calibration is disabled when the GCM of the relevant stream is composed of several systems.

The sum total can be arbitrary defined within the range from 0.1 to 100.0%.

● Baseline calibration (Valid/Invalid)

The previously-stored detector signal of the baseline-calibrating chromatogram is subtracted from the detector signal that measures the relevant stream for the purpose of calibration of the increase in the chromatogram baseline due to column bleed or something. Several detectors are used to measure the relevant stream depending on the configuration of the equipment. If it can be handled with individual peak setting integral treatment: the perpendicular method, it is recommended.

Baseline calibration shall be enabled or disabled for each stream. Obtain the chromatogram to be used for the baseline calibration by running the method specified not to operate sample valves, then touch the “Save baseline chromatogram” button while displaying the chromatogram to save it in the main unit of the GC8000 (Figure 5.21). Users at Level C or higher are allowed to save the baseline chromatogram.

● GCM number and Method number

Assign a number from 1 to 6 to GCM number and Method number, respectively that are used for the relevant stream.

Methods are classified into GCM methods and SYS methods. For example, if the GCM number and the Method number are both set to 1, Method#1 of GCM#1 and Method#1 of SYS#11 are used for the measurement of the relevant stream.

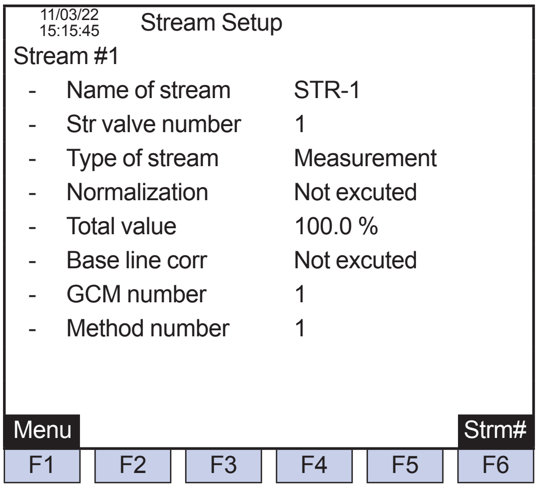


Figure 1.35 An example of the stream setting screen on the GC-HMI EtherLCD

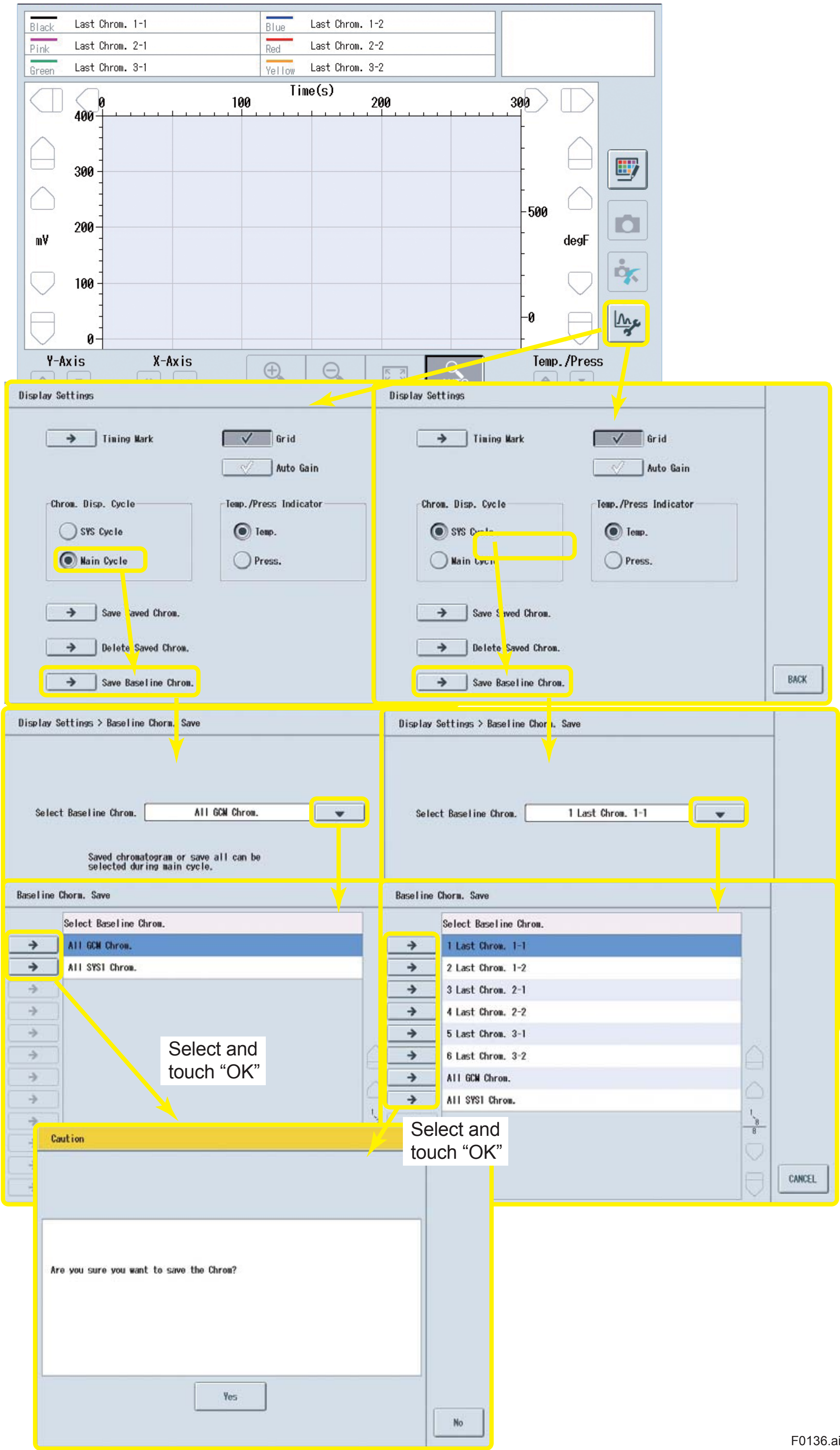


Figure 1.36 An operation example of the baseline chromatogram saving window on the GC-HMI chromatogram screen

1.12.4 Method

(1)GCM and SYS

GC module concept has achieved parallel chromatography to perform simultaneous analysis of multiple streams and has enabled optimal analysis condition by breaking the complicated applications into simple column systems. This shortens the analysis time and achieves flexible equipment configuration to meet customer needs.

Roles of GCM and SYS

GCM	Gas Chromatograph Module One GCM is equivalent to one virtual GC and assumes GC function of multiple units by setting multiple GCMs to GC8000. Two GCMs can be set at a maximum per isothermal oven. Up to two GCMs can be set in one isothermal oven. Up to four GCMs can be set in two isothermal ovens. Up to six GCMs can be set in three isothermal ovens. Setting for atmospheric pressure balancing valve number, stream valve number, stream identification output, and use of distillation point analyzer, and peak common setting are performed for each GCM. Operation setting of stream valves is performed by GCM method setting.
SYS	System SYS is the minimum analysis unit, and multiple SYSs can be set within GCM. This shortens the analysis time for the important control elements among the element group which is analyzed by GCM. The time obtained by dividing the main cycle of GCM method by an integer of 1 to 8 can be set to the analysis cycle of SYS method. [SYS method analysis cycle] = [GCM method main cycle] / n n: Integers of 1 to 8, division ratio of SYS analysis cycle and GCM main cycle Each SYS in the same GCM performs synchronous analysis. Each SYS in different GCMs performs asynchronous analysis. Two SYSs can be set at a maximum per isothermal oven. Up to two SYSs can be set in one isothermal oven. Up to four SYSs can be set in two isothermal ovens. Up to six SYSs can be set in three isothermal ovens. Perform setting of valve (RV or LSV), detector, and EPC for each SYS, and use SYS method for each operation setting. Although the atmospheric pressure balancing valve belongs to GCM, perform operation setting with SYS method. Perform the operation setting of timing signal using DO, by means of SYS method.

(2)GCM method

Method setting of 1 to 6 for each GCM is possible with users at Level C or higher.

The items to be set for GCM method are described below. Refer to Chapter 5.4.20 to find the setting method.

● Main cycle

The time required from the start to the end of analysis.

The settable lower limit values depending on the sample rate and the number of ovens are shown in the following table.

Sample rate (ms)	Number of ovens	Main cycle lower limit (s)
40, 80, 160	1	60
	2	120
	3	180

The settable upper limit values depending on the sample rate are shown in the following table.

Sample rate (ms)	Main cycle upper limit (s)
40	5400 s
80	10800 s
160	21600 s

● Warming up time

Warming up time is time for displacement in sample streams.

The warming up time at shipment is shown in the following table.

When there is one SYS within GCM	Half the time of the GCM method main cycle
When there are multiple SYSs within GCM	Half the time of the shortest SYS method analysis cycle among multiple SYSs

The settable lower limit values depending on the sample rate and the number of ovens are shown in the following table.

Sample rate (ms)	The number of ovens	Warming up time (s)
40, 80, 160	1	30
	2	60
	3	120

The settable upper limit values depending on the sample rate are shown in the following table.

Sample rate (ms)	Warming up time (s)
40	5400 s
80	10800 s
160	21600 s

● Stream valve ON/OFF time

Sample stream valve ON/OFF time.

Normally, turn on the stream valve one second after the warming up time. Therefore, set a negative time for stream valve ON time.

Please note that when multiple SYSs are set for GCM and the time obtained by dividing GCM main cycle by an integer of 2 to 8 is set for SYS analysis time, it is necessary to turn on the stream valve until the sample valve ON/OFF operation for all SYSs, which were set for the GCM, is performed.

The setting range is shown in the following table.

Stream valve ON time	–(Warming up time – 1) to 0 s
Stream valve OFF time	0 to main cycle – 2 s

● Pause time

The time when the measurement is suspended in Pause mode.

Set a time to suspend each valve, and EPC program, which does not cause harmful effect on the column system.

Normally, set a time between [SYS method peak detection stop time] × n and the main cycle – 2 s. (n: Integers of 1 to 8, division ratio of SYS analysis cycle and GCM main cycle)

The setting range is shown in the following table.

Pause time	5 to main cycle – 2 s

(3)SYS method

Method setting of 1 to 6 for each SYS is possible with users at Level C or higher.

SYS method number and GCM method number are in pairs.

The items to be set for SYS method are described below. Refer to Chapter 5.4.21 to find the setting method.

● Analysis cycle

The time required from the start to the end of SYS analysis.

[SYS method analysis cycle] = [GCM method main cycle] /n

n: Integers of 1 to 8, division ratio of SYS analysis cycle and GCM main cycle

● Peak detection stop time

The time when peak detection of chromatogram is completed. Set a time after all the peaks to be analyzed in SYS have been eluted.

The setting range is shown in the following table.

Peak detection stop time	5 s to analysis cycle

● Tracking specification and automatic renewal of tracking factors

Perform setting for whether to execute tracking (correction) of gate time setting to be used for peak detection and whether to automatically update tracking factors.

● Valve ON/OFF time

Set the ON/OFF time of the valve, which is set for SYS in advance, by using “SYS setting” (RV or LSV for sample valve, backflushing valve, and column switching valve). ON time and OFF time can be set three times per cycle of SYS method, respectively.

The setting range is shown in the following table.

Valve ON time	0 to analysis cycle – 2 s
Valve OFF time	ON time + 1 s to analysis cycle – 2 s

* Make sure to set the 2nd time after 1st time, 3rd time after 2nd time.
* Set ON time and OFF time for each cycle in pairs with an interval of 1 s or more.

● Atmospheric pressure balancing valve ON/OFF time

Set the ON/OFF time of the atmospheric pressure balancing valve for the gas sample.

There is a case when the atmospheric pressure balancing valve is used for collecting gas sample depending on the specification. Because the compressibility of the gas sample changes along with the change in flow rate, sample collection quantity changes. To prevent this change, use the atmospheric pressure balancing valve.

Specifically, stop the flow of gas sample by turning on the atmospheric pressure balancing valve, which was set before the sample valve measuring pipe, and turn on the sample valve. Collect the sample by turning on the sample valve when the pressure within the sample valve measuring pipe is in equilibrium with the outlet atmospheric pressure. These operations are executed by setting each valve at SYS method setting.

Perform setting for whether to install atmospheric pressure balancing valve per Oven# at “Atmospheric pressure balancing valve setting” and set atmospheric pressure balancing valve number to be used on each GCM at “GCM setting.” In this way, set the ON/OFF time of the atmospheric pressure balancing valve, which was set to GCM to which the SYS belongs, in advance with “SYS method.” ON time and OFF time can be set three times per cycle of SYS method, respectively.

Please note that when multiple SYSs are set to GCM, perform setting of ON/OFF operation of atmospheric pressure balancing valve that was set to GCM (mechanically one for one GCM) from the SYS method of each SYS which was set to the GCM.

The setting range is shown in the following table.

Atmospheric pressure balancing valve ON time	–(Warming up time or analysis cycle, whichever shorter) to analysis cycle – 2 s
Atmospheric pressure balancing valve OFF time	–(Warming up time or analysis cycle, whichever shorter) to analysis cycle – 2 s

* Make sure to set the 2nd time after 1st time, 3rd time after 2nd time.
* Set ON time and OFF time for each cycle in pairs with an interval of 1 s or more.

DO operation time

This time is set to inform the timing of analysis completion by contact output to the upper level calculator, etc. Set the processing designation to “Timing” per DO number with “DO setting” and set SYS number and SYS method number. ON time and OFF time can be set three times per cycle of SYS method, respectively, and whether to perform contact output to the upper level calculator, etc. or not is also set. In this way, set the ON/OFF time of the DO timing signal, which was set for the SYS in advance, with “SYS method.”

The setting range is shown in the following table.

DO ON time	0 to Analysis cycle – 2 s
DO OFF time	0 to Analysis cycle – 2 s

* Make sure to set the 2nd time after 1st time, 3rd time after 2nd time.
* Set ON time and OFF time for each cycle in pairs with an interval of 1 s or more.

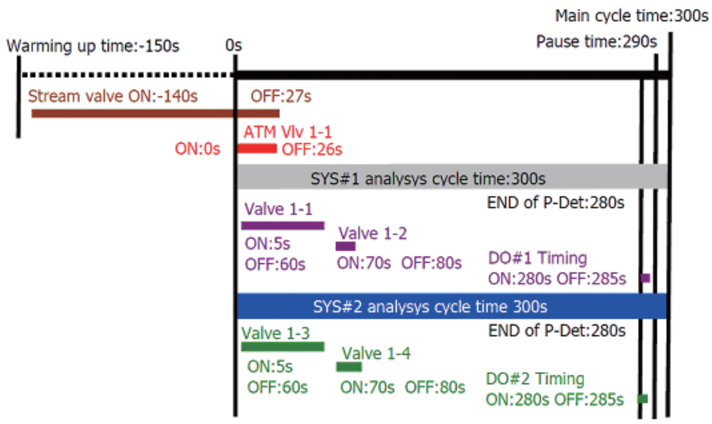


Figure 1.37 GCM method and SYS method setting example 1
SYS1 and SYS2 analysis cycle are the same as GCM main cycle

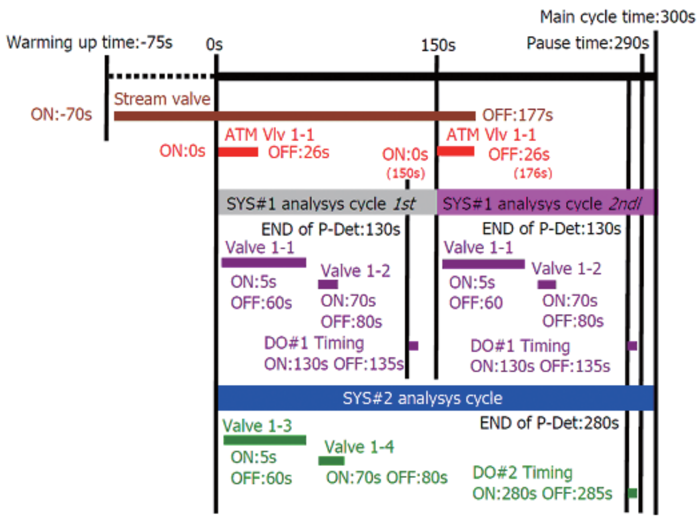


Figure 1.38 GCM method and SYS method setting example 2
SYS1 analysis cycle is the same as GCM main cycle, and SYS2 analysis cycle is 1/2 of GCM main cycle

● EPC program setting

When pressure adjustor for career gas complies with EPC specification of program control, three-staged heating program can be set.

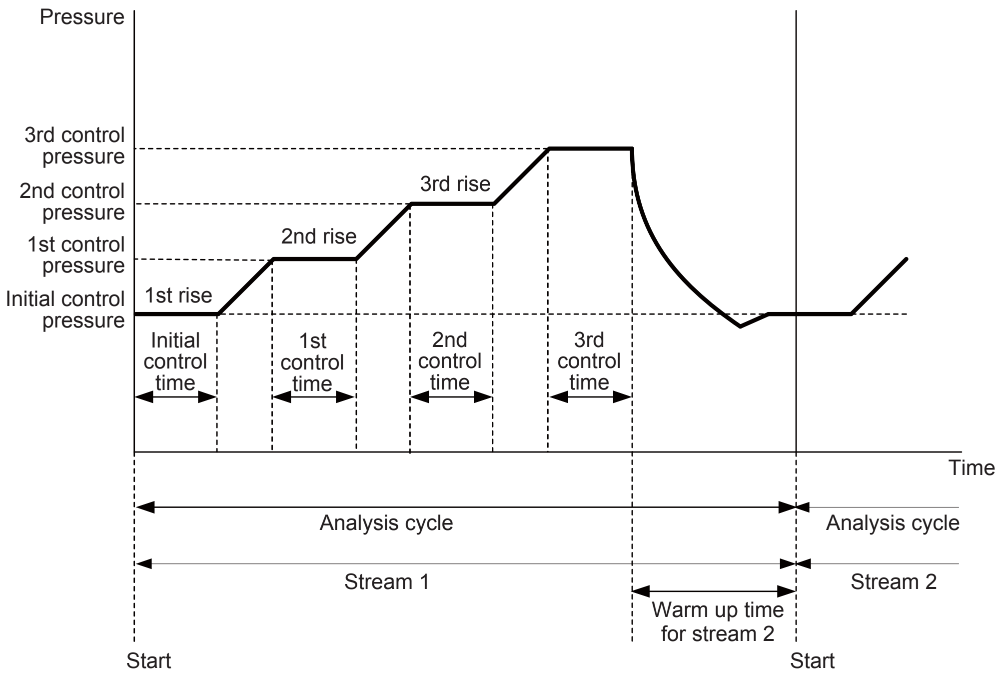


Figure 1.39 EPC program operations

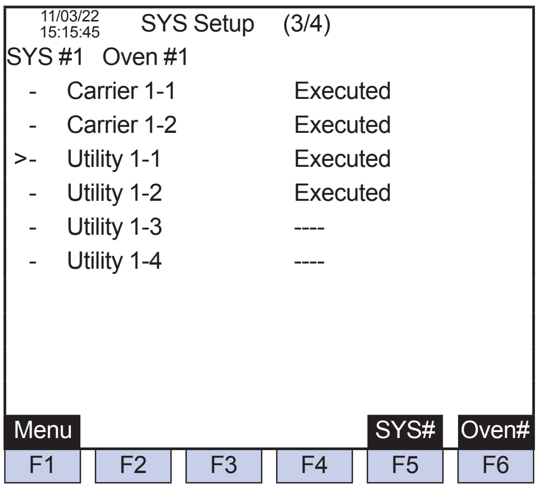
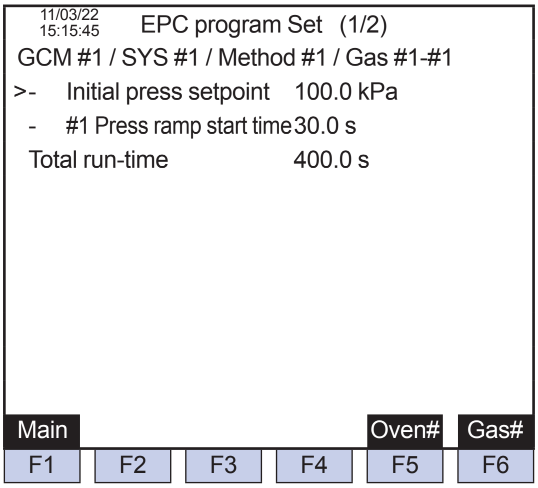


Figure 1.40 Setting example of SYS (GC-HMI EtherLCD)



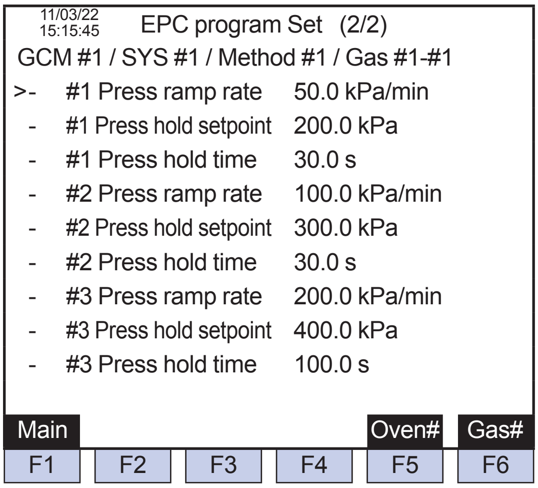


Figure 1.41 Setting example of SYS method EPC program (GC-HMI EtherLCD)

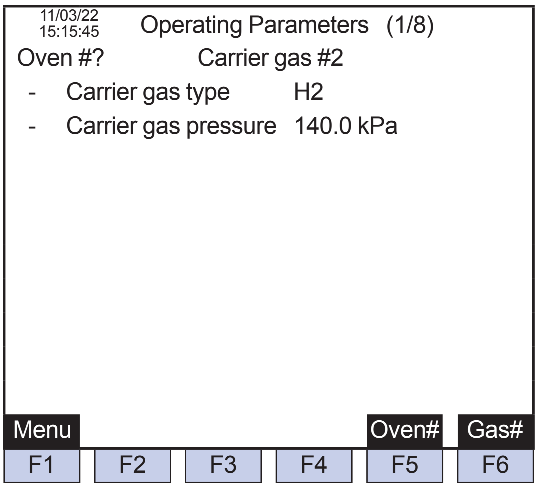


Figure 1.42 Operation conditions setting (GC-HMI EtherLCD)

(3)Auto-operation starting function

Auto-operation starting function operates the analyzer at process status Run mode without manual operation. When the auto-operation is started, consecutive measurement of the streams, which were set to the stream sequence 1, is performed in order.

It is required to supply power, protection gas, carrier gas, and utility gas sample to the analyzer in the same manner as when starting up the device manually.

It is not recommended to use the auto-operation starting function for FPD detector because it is necessary to operate pneumatic pressure for fuel two times as the value written in “operation condition setting” in the Operation Material.

If FPD is lit up with the pneumatic pressure for fuel at the operation condition setting value as is, a peak may not appear in the chromatogram and only the base line may be output.

The operation of the analyzer when “Auto-operation setting” is set to “Yes” is described below.

(1) Following the power supply for the electronic section of the control unit, immediately after power is supplied to the oven unit circuit section, the hydrogen limiting unit is turned on automatically.

For the model in which H2 is not used for carrier gas and utility gas, the hydrogen limiting unit is not equipped. If there is no hydrogen limiting unit, move to 2) operation after power is supplied to the electronic section of control unit and oven unit.

(2) After a lapse of “the 1st auto-start time,” automatically turn on the oven, LSV, and FPD heater.

(3) After a lapse of “the 2nd auto-start time,” automatically turn on the detector.

(4) After a lapse of “the 3rd auto-start time,” automatically perform the Run command of the stream sequence 1 at process status. When the mode is switched from Stop mode to run mode, start “warming up time” to substitute the sample stream according to the method, which was set at the first stream sequence 1. When the “warming up time” lapsed, measurement starts.

When the measurement start condition is not met at the starting of Run mode due to the reasons such as SV value of each types of heater temperature is not PV value, or detector is not at ON status, the level 3 alarm “#434 operation mode change failure” occurs, and auto-operation will not be started.

In addition, if the level 1 alarm is generated during the Run mode after the auto-operation is started, the mode is switched to Stop mode after a lapse of the main cycle time of the stream during measurement, when an alarm is generated.

The following table explains the setting for auto-operation starting functions.

The changed set values become effective by restarting the analyzer.

The analyzer has one setting overall, not for each GCM.

Auto-operation setting	Yes/No No initial value
1st auto-start time	Until the heater is turned on. Range: 0 to 50000 s Initial value: 0
	The purpose is to prevent deterioration of the column by turning the oven heater on while the column is not sufficiently substituted by the carrier gas. Set a time (s) when the carrier gas stream within the column system is sufficiently substituted by carrier gas. The rough indication is the time (s) obtained by dividing about 5 times the volume (ml) of the column total inner volume by the carrier gas DET flow rate (ml/s).
2nd auto-start time	Until the detector is turned on. Range: 0 to 50000 s Initial value: 0 s
	TCD detector: The purpose is to prevent filament from burning out as a result of turning on the air in the TCD without being sufficiently substituted by carrier gas. Set 600 s (10 min) or more.
	FID detector: Even if the heater is at ON status after a lapse of the 1st auto-start time, when the detector is turned on while the temperature within the isothermal oven is low, the vent may be clogged as a result of condensation or freezing (0°C or lower) of moisture generated by combustion of FID detector. To prevent this, set the required time. The rough indication is a time (s) when SV value of isothermal oven temperature exceeds 20°C and reaches PV value.
	FID-MC: The purpose is the same as the FID detection, and in addition to that, to prevent catalyst deterioration by turning the detector on while the air inside the MC (methane converter) is not sufficiently substituted by carrier gas. Set the time (s) in which SV value of the isothermal oven temperature exceeds 20°C and reaches PV value, or 600 s (10 min), whichever is longer.
3rd auto-start time	Time until Run mode command is executed Range: 0 to 50000 s Initial value: 0 s
	TCD detector: Even if the detector is turned on after a lapse of the 2nd auto-start time, the baseline drifts until the current value becomes stable. If such drifting becomes significant, an accurate analysis cannot be performed. To prevent this, set the required time. The rough indicator for the setting to start up the analyzer at room temperature is 12 hours or more in total of the 2nd and the 3rd auto-start time. Example: The 2nd auto-start time: 600 s (10 minutes) The 3rd auto-start time: 43200 s (12 hours)
	FID detector: Set at least “140 s” for generating detector anti-inflammation alarm as a result of decrease in pressure of utility gas, etc. The rough indication for configuring the analyzer to star up at room temperature is: When the isothermal oven temperature is set to 145°C or lower: 2 to 4 hours in total of the 2nd and the 3rd auto-start time. Example: The 2nd auto-start time: 3600 s (1 hour) The 3rd auto-start time: 7200 s (2 hours) When the isothermal oven temperature is set to 146°C or higher: 4 to 8 hours in total of the 2nd and the 3rd auto-start time. Example: The 2nd auto-start time: 3600 s (1 hour) The 3rd auto-start time: 18000 s (5 hours)
	FID-MC: Set at least “140 s” or more than the time required for generating detector anti-inflammation alarm as a result of decrease in pressure of utility gas, etc. In addition, there is a case when accurate analysis cannot be performed until the catalyst within the MC becomes activate, even if the detector is turned on after a lapse of the 2nd auto-start time. To prevent this, set the required time. The rough indicator for the setting to start up the analyzer at room temperature is 4 to 8 hours in total of the 2nd and the 3rd auto-start time. Example: The 2nd auto-start time: 3600 s (1 hour) The 3rd auto-start time: 18000 s (5 hours)

(4)Gate tracking function

This is a function to track (correct) the gate ON/OFF time to be used for peak detection and the operation time of base level processing by using tracking factor a/b, subsequent to fluctuation of retention time due to such changes as ambient temperature and atmospheric pressure, carrier gas supply pressure, and aged deterioration of column.

● Tracking specification

Set whether to execute tracking.

Perform this setting per SYS method. When multiple detections are set at SYS setting for the relevant SYS, they are treated as single setting.

● Automatic renewal of tracking factors

Set “Update” for automatic renewal of tracking factor a/b.

Set “No Update” to enter the set value of tracking factor a/b.

Perform this setting per SYS method. When multiple detections are set at SYS setting for the relevant SYS, they are treated as single setting.

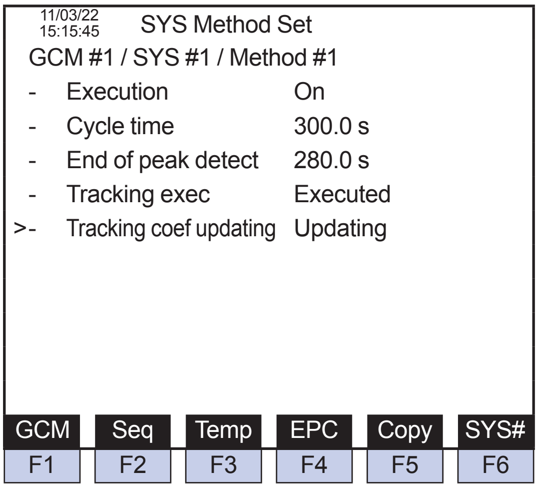


Figure 1.43 Tracking specification and automatic renewal of tracking factors in SYS method setting (GC-HMI EtherLCD)

● Timing and target for tracking

When “Execute” is set for “Tracking specification” in SYS method, perform correction of the gate ON/OFF time and the operation time of base level processing by using the latest tracking factor a/b after completion of peak detection of all the peaks of the relevant SYS method, and re-detect the peak and re-calculate the concentration.

Tracking (correction) is performed only for the peaks for which “Standard” or “Tracking” is set for “Automatic renewal of tracking factors” of the peak individual setting.

The following table shows processing designation of peak individual settings for the tracking (correction) target.

Processing designation		Tracking specification	Tracking (correction) items	Stream type	Concentration calculation
Type	Details				
Peak processing	External Tertiary	No tracking Tracking Standard*1	Gate ON time Gate OFF time	Calibration, Measurement, Validation	Standard
	External straight line			Calibration, Measurement, Validation	
	Indirect method			Calibration, Measurement, Validation	Standard, Correction area fraction
Calculation processing	Base level	No tracking Tracking	Operation time	Calibration, Measurement, Validation	

*1 "No tracking" or "Tracking" is settable for tracking specification when the gate processing method is "Zone gate." Only the setting for zone gate head peak becomes valid for tracking specification.

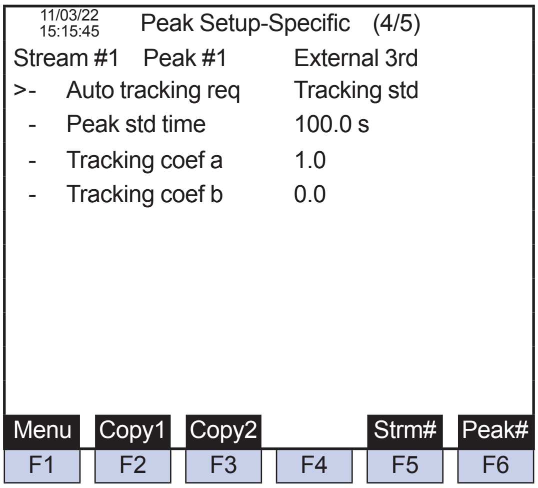


Figure 1.44 Tracking specification and tracking factor a/b in peak individual setting (GC-HMI EtherLCD)

● Tracking factor a/b

Tracking factor a/b is a factor to perform correction of gate ON/OFF time and operation time of base level processing by straight-line approximation. When the tracking factor b is 0, proportional correction by tracking factor a is performed.

Gate ON time after tracking = Gate ON time × Tracking factor a + Tracking factor b

Gate OFF time after tracking = Gate OFF time × Tracking factor a + Tracking factor b

Base level operation time after tracking = Base level operation time × Tracking factor a + Tracking factor b

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Tracking factor a/b can be obtained by auto-calculation or by entering a set value.

To obtain tracking factor a/b by auto-calculation, set "Update" for "Automatic renewal of tracking factors" of SYS method. Automatic renewal of tracking factor a/b is performed after completion of peak detection of all the peaks for the relevant SYS method but before correction of gate ON/OFF time and operation time of base level processing.

Refer to the following items to find the details of automatic renewal of tracking factor a/b.

The setting range is shown below.

Tracking factor a	0.500 to 2.000
Tracking factor b	-21600.000 to +21600.0

If auto-calculation result of tracking factor a/b does not fall within the above scope, the level 3 alarm, “#484 Peak tracking failure” occurs, and automatic renewal of tracking factor a/b and tracking of gate ON/OFF time and base level processing operation time are not performed.

● Tracking standard and tracking interval at automatic renewal of tracking factors

When “Update” is set for “Automatic renewal of tracking factors” of SYS method, calculation is performed by “Peak standard time“ of the peak for which “Standard” is set for “Tracking specification“ in peak individual setting, and “Retention time“ of the measurement result. When multiple detections are set in SYS setting, tracking factor a/b is calculated per detector.

Determine “Tracking interval” according to the number of peaks, which were set for “Standard,” and alignment, and automatic renewal the tracking factor a/b. Determine Tracking interval according to the number of peaks for which Standard is set for “Tracking specification” of peak individual setting, and alignment, and automatic renewal the tracking factor a/b. Calculation method is different when “Standard” is one and when it is more than one.

The rules of tracking standard and tracking interval are explained below. The peak which was set as “Tracking execution” and the peak which was set as “Standard” are called “Tracking peak” and “Standard peak,” respectively.

- The first tracking peak follows the subsequent standard peak.
- The first standard peak is calculated by a single standard peak (itself).
  a1 = y1 / x1
  b1 = 0
- The tracking peak that exists between the 1st standard peak and the 2nd standard peak follows the 2nd standard peak.
- The 2nd standard peak is calculated by two standard peaks of the 1st and the 2nd.
  a2 = (y1-y2) / (x1-x2)
  b2 = y1 - {(y1 - y2) / (x1 - x2)} × x1
- The tracking peak that exists between the 2nd standard peak and the 3rd standard peak follows the 3rd standard peak.
- The 3rd standard peak is calculated by two standard peaks of the 2nd and the 3rd.
  a3 = (y2-y3) / (x2-x3)
  b3 = y2 - {(y2 – y3) / (x2 – x3)} × x2
- The peak that exists behind the 3rd standard peak with no subsequent standard peak follows the 3rd standard peak.
- When multiple detections are set in SYS setting, tracking factor a/b is calculated per detector.
- “The 1st, 2nd, 3rd......” stands for the order from the earliest retention time, not the numerical order of the peak number.

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x: Peak standard time, which was set for tracking criteria

x: Peak retention time, which was set for tracking criteria

a: Tracking factor (Inclination)

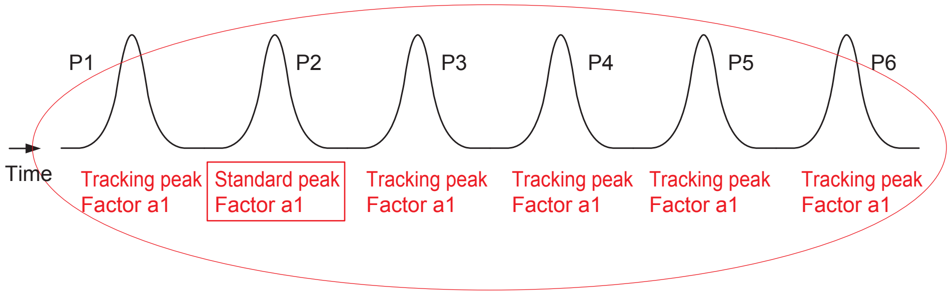
b: Tracking factor (Intercept)

The example of tracking standard and tracking interval are shown below.

(1) When there is zero (0) standard

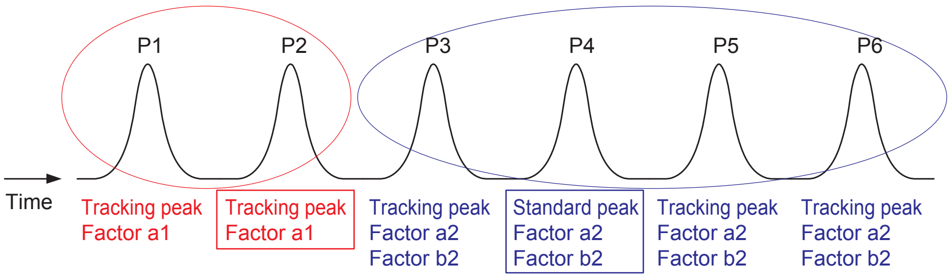
Because tracking factor cannot be calculated, tracking is not performed.

(2) When there is one standard



- P1: The first tracking peak follows the subsequent standard peak, therefore, tracking factor is a1.
- P2: This is the 1st standard peak. a1= y1 / x1 (b1=0)
- P3 to P6: Because there is no other standard peak after the 1st peak, follow the 1st standard peak, therefore, tracking factor is a1.

(3) When there is more than one tracking standard

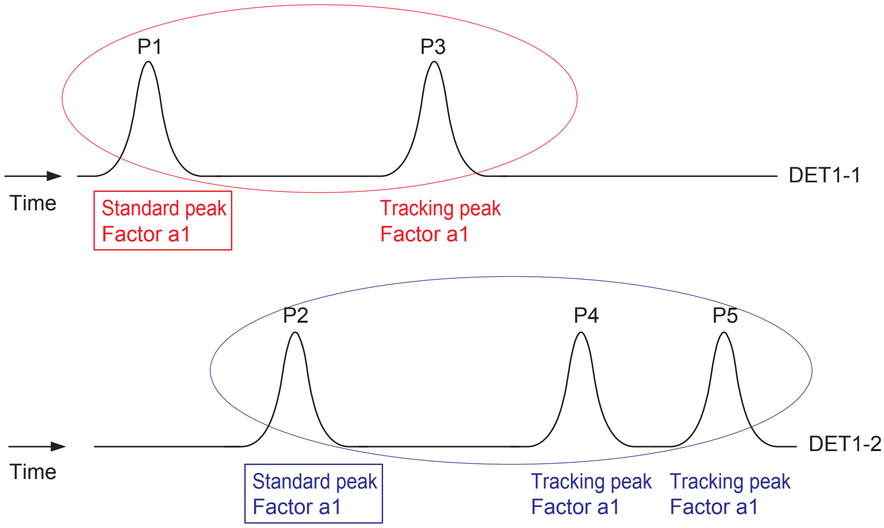


- P1: The first tracking peak follows the subsequent standard peak, therefore, tracking factor is a1.
- P2: This is the first standard peak. a1= y1 /x1 (b1=0)
- P3: Because the tracking peak that exists between the 1st and the 2nd standard peak follows the 2nd standard peak, the tracking factors are a2 and b2.
- P4: The 2nd standard peak is calculated by two standard peaks of the 1st and the 2nd.

  a2 = (y1-y2) / (x1-x2), b2 = y1 - {(y1 - y2) / (x1 - x2)}× x1
- P5 to 6: Because there is no standard peak after the 2nd peak, follow the 2nd standard peak, therefore, tracking factors are a2 and b2.

(4) When multiple detections are set to SYS

Tracking factor a/b is calculated for each detector.



2. Installation, Piping, and Wiring

If the process gas chromatograph is installed in a hazardous area, do the wiring according to the applicable explosionproof requirements.

2.1 Installation

Refer to "1.1 Wiring and Piping Diagram."

2.1.1 Installing the Analyzer

Two types of analyzer are available: self-standing and wall-mounted. Install the chromatograph according to the procedure for each type.

(1) Installation site

The following conditions must be met:

(a) Satisfying specified environmental conditions (atmospheric gases) even if it is a hazardous area.

(b) No vibration

(c) Not subject to rainfall or direct sunlight

(d) No corrosive gas and little dust

(e) Environmental temperature: –10 to 50°C, humidity: 95% RH or less

(f) Altitude of installation site: Max. 2000 m above sea level

(g) Installation category based on IEC 1010: II (See NOTE)

(h) Pollution level based on IEC 1010: 2 (See NOTE)

NOTE:

- The "Installation category" indicates the regulation for withstanding impulse voltage. It is also called the "Overvoltage category". "II" applies to electrical equipment.
- "Pollution level" describes the degree to which a solid, liquid or gas which degrades dielectric strength is adhering. "2" applies to a normal indoor atmosphere.

(2) Analyzer house

If the analyzer is installed outdoors, it should be constructed so as to protect it from rain and direct sunlight and to facilitate inspection and maintenance.

Figure 2.1 shows an example of an analyzer house.

The house should be designed to provide space for standard gas cylinders because the effects of the ambient temperature on standard gas can be better controlled indoors than outdoors.

It is also desirable for maintenance that the house accommodates an external sampling system if any, except when leakage of toxic or flammable standard gas is to be avoided indoors.

The floor area shown in Figure 2.1 is the minimum requirement for the house. Allow as much area as possible for the house taking into consideration the types of items to be accommodated and the space required for maintenance.

For the maintenance space, refer to "1.2 External Dimensions."

Provide ventilation openings in the upper portion (near the ceiling) and lower portion (near the floor) of a side wall of the house.

Also provide a window and electric lights.

Carrier gas cylinders, should be protected from exposure to direct sunlight and rainfall by placing them under the eaves of the house.

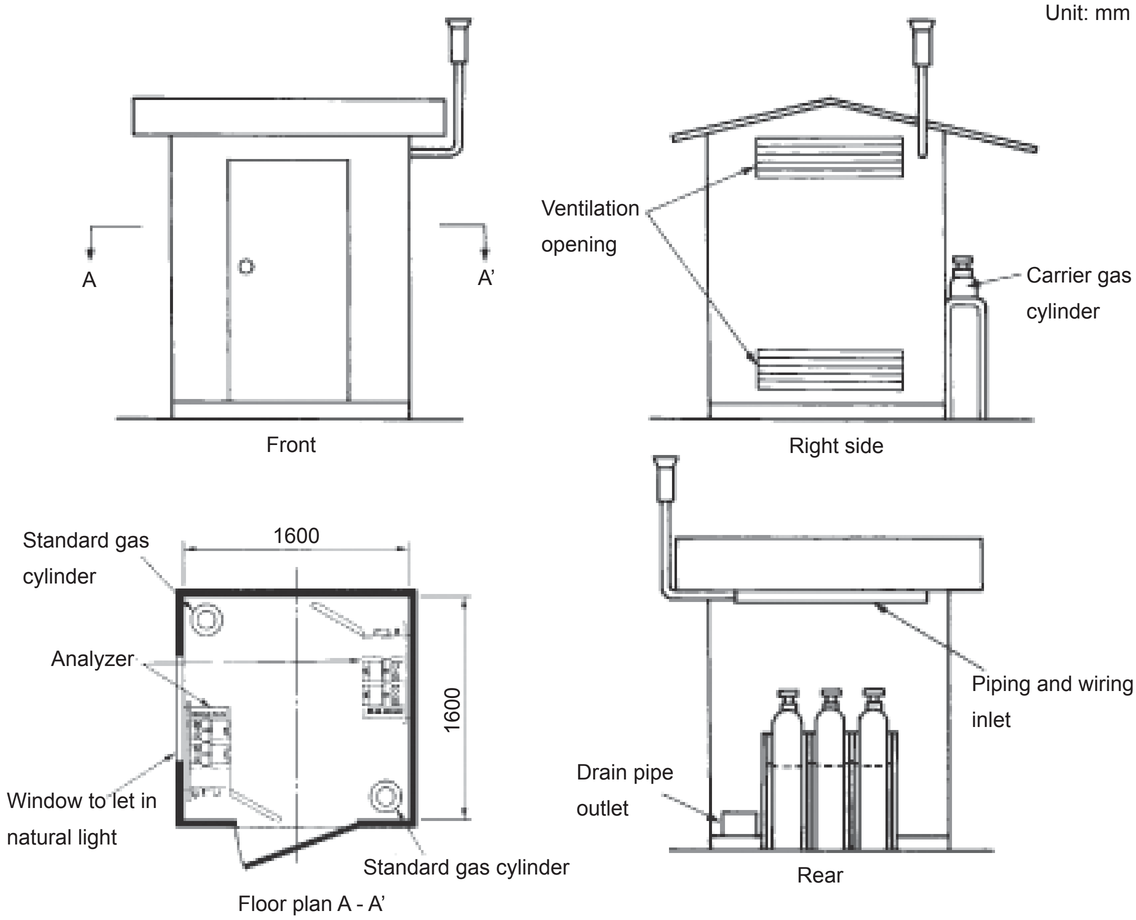


Figure 2.1 Example of analyzer house

(3) Unpacking

WARNING

- The GC8000 weighs about 100 to 220 kg. Unpack it near the installation site. Use a transportation machine to move it. Handle it carefully to prevent it from falling.
- Up to two protection system may be included, each of which weighs approximately 7 kg, are installed on top of the GC8000. Therefore, the center of gravity is higher than the center of the analyzer body.

(4) Checking equipment

Check that the equipment has not been damaged during transportation. Contact Yokogawa if any damage is found. Keep the packing such as crates.

● Model and Suffix Codes

Check that the model and suffix codes on the data plate on the left side of the GC8000 match those on the order sheet. Refer to “1.6 Data Plate.”

● Accessories

Check the accessories listed in Table 2.1 and Table 2.2.

Table 2.1 Accessory kit

			Accessory kit part number (K9800**)																		Remark
			EA	EB	EC	ED	HE	HF	HG	HH	EG	EH	EJ	EK	EE	EF	HA	HB	HC	HD	
			TIIS								FM-X		FM-Y		ATEX						
Type 1			○		○		○		○		○		○		○		○		○		
Type 2 (200V)			○		○		○		○		○		○		○		○		○		
Type 2 (100 V)				○		○		○		○		○		○		○		○		○	
Type 3				○		○		○		○		○		○		○		○		○	
			P	P	Q	Q	P	P	Q	Q					R	R	Q	Q	P	P	G, Q: 3/4NPT, P: G3/4, R: M25x1.5
Option ciode /KC							○	○	○	○											
No.	**Item**	**Parts No.**	**Quantity**																		**Remark**
1	Cable packing adapter	B1010EN	2	3	2	3	2	3	2	3											
2	Packing	—	2	3	2	3	2	3	2	3											For B1010EN
3	Manual	K9800FG	1	1	1	1	1	1	1	1											For B1010EN
4	Packing	—	6	6	6	6	6	6	6	6											For B1009EN
5	Manual	K9800GE	1	1	1	1	1	1	1	1											For B1009EN
6	Connector	K9402PU			8	9			8	9											3/4NPT
7	Connector	K9407PS															2	3			3/4NPT
		K9407PU																	2	3	G3/4
8	O-ring	Y9118XA															2	3	2	3	
9	Sealing fitting	L9811GQ	1	1	1	1	1	1	1	1											For sealing fitting
10	Nipple	K9194ZU	1	1	1	1	1	1	1	1											
11	Nut	K9194ZU	2	2	2	2	2	2	2	2											
12	Manual	K9800GF	1	1	1	1	1	1	1	1											
13	Hex wrench	L9827AT	2	2	2	2	2	2	2	2											
		L9827AC	2	2	2	2	2	2	2	2	2	2			2	2	2	2	2	2	
		L9827AS	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
14	Fuse	A1423EF	2	2	2	2	2	2	2	2	2	2			2	2	2	2	2	2	
		A1463EF	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
15	Fuse	A1598EF	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	UP300
16	Label	K9191NK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	For
17	Ferrite core	A1179MN					1	2	1	2					1	2	1	2	1	2	
18	Key	B1018HL	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	4 or 6	6 or 8	

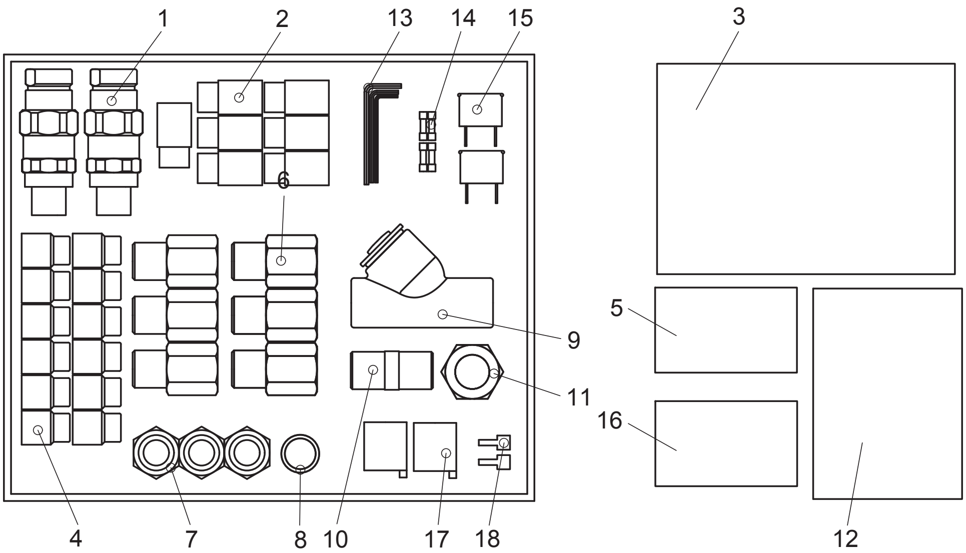


Figure 2.2 Accessory kit

Note:

Table 2.2

Item	Parts number	Quantity	Remark
Coil over wrench for LSV	L9827EA	1	
Seal kit for LSV	K9402VG	number of LSV	
Seal kit for LSV	K9402VH	number of LSV	
Ferrule	J9218VU	1 set	
Ferrule	J9218VT	1 set	
Cutter	J9218VV	1	
User's manual (CD)	—	1	IM 11B08A01-51E
Operation data	—	1	

(5) Installation

Use anchor bolts to secure the self-standing type analyzer on the floor.

Use nuts and bolts to secure the wall-mounted type analyzer on the wall. The wall construction has to be designed for four times the weight of the analyzer.

For the hole for installation, refer to "1.2 External Dimensions."

2.1.2 Installing Auxiliary Hardware

(1) Cylinders

The following conditions must be met:

(a) Located near the analyzer or the external sampling system.

(b) Not subject to rainfall or direct sunlight

(c) Ambient temperature: 0 to 40°C

(d) The place should be well-ventilated so that leaking gases, if any, do not accumulate.

Comply with regulations for high-pressure gases.

(2) Other items

(a) Dehumidifier

Provide a dehumidifier between the carrier gas cylinders and the analyzer (as near the analyzer as possible).

(b) Sample-gas pressure regulator

Provide sample-gas pressure regulators between the sampling point and the analyzer or the external sampling system (as near the sampling point as possible).

(c) Vent stack, Drain tank

Without Vent Stack

Provide a header with a diameter of about 5 cm near the analyzer to connect the venting lines. Extend the vent stack outside the house using a pipe with 1.5 cm diameter. Make provisions to prevent rain from getting in the top end of the vent stack. (See Figure 2.4.)

With Vent Stack

Connect the top end of the vent stack to the section for exhaust. Extend the vent stack outside the house using a pipe with 1.5 cm diameter. Make provisions to prevent rain from getting in the top end of the vent stack.

When using a TCD detector, plug the lower end of the vent stack. When using a FID or FPD detector, provide a drain tank with a diameter of about 5 cm near the analyzer to the venting lines.

For the details, see Figure 2.5.

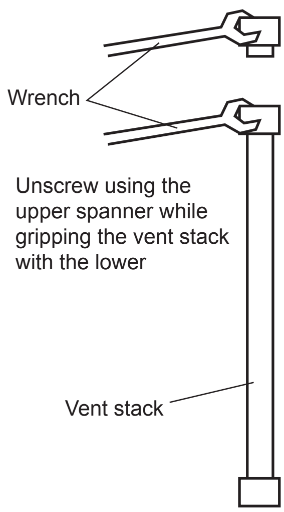


Figure 2.3 Unscrewing the vent stack

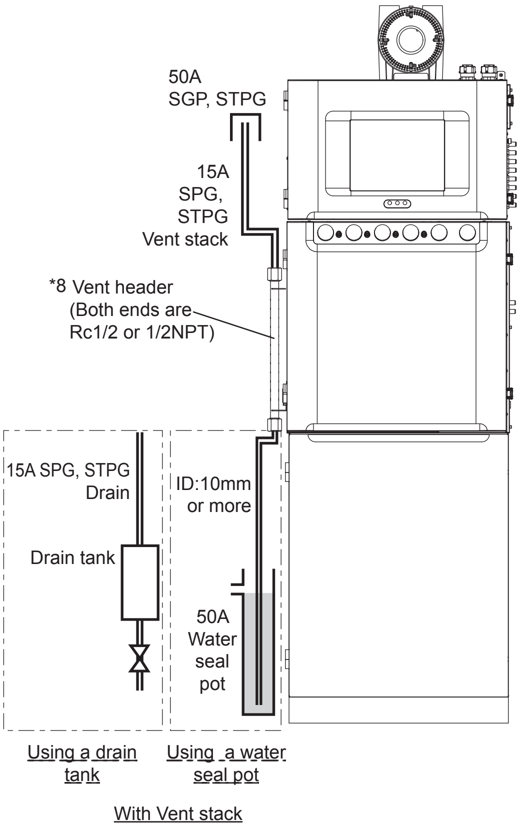
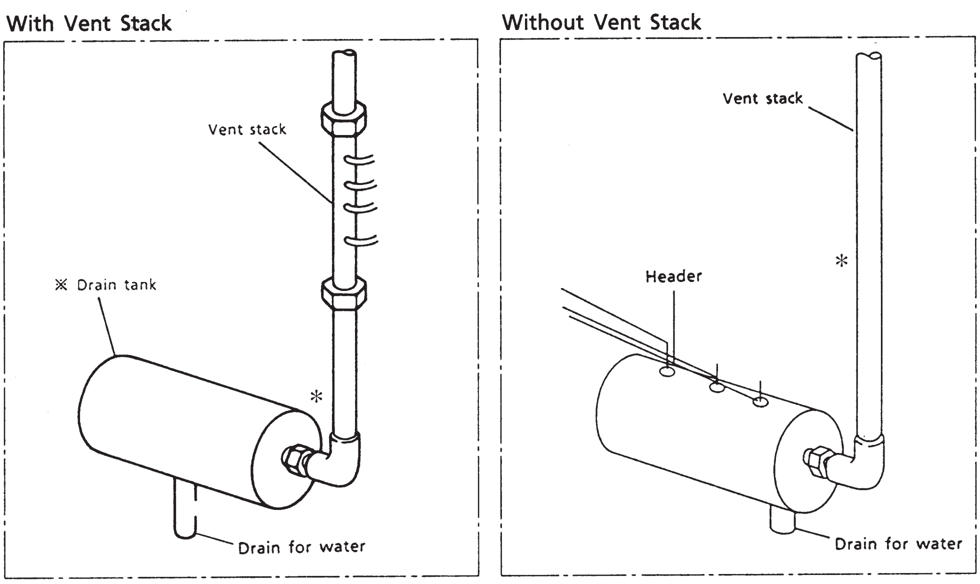


Figure 2.4 Example of vent stack installation



Note 1: The drain tank is used only for FID/FPD.
Note 2: For FID/FPD, incline the piping so that drain water will not accumulate in it.

Figure 2.5 Example of vent stack construction

2.2 Piping

IMPORTANT

- Do not remove the blind plugs at the analyzer piping connections until starting piping work to prevent deterioration of the columns. On the condition that carrier gas does not be supplied after the blind plugs taken out or during out of operation, the column has the risk of deterioration. In these condition, fix the the blind plugs at each vent with carrier gas enclosed.
- Use an anti-corrosion material for the pipes and pipe fittings.
- Never use pipes with too large a diameter for the sample inlet piping, for reducing dead time. However, use a little larger pipe for the exhaust line so as not to apply back pressure to the venting lines.
- Use pipes and pipe fittings free from interior contamination such as grease, oil or other substances. The contamination damage the analyzer. Before connecting the pipes, completely air-purge their interiors.
- Carefully connect the pipes so that there is no leakage from the pipe connections such as the joints.
- Use filters or other appropriate pipe fittings to prevent dust, moisture, or other foreign matter from getting into the analyzer.

2.2.1 Types of Piping and Installation

The types of piping are shown below.

Note that the types of piping and quantities of individual pipes required vary with the specifications such as the analyzer type and detector type (TCD, FID, or FPD).

See the flow sheets in the “Operation Data” for implementing piping.

Control unit

(A) Air output for stream valve 1 to 8 (AIR OUT 1 to AIR OUT 8)

Isothermal oven, large isothermal oven

(B) Purge air (PURGE AIR)
(C) Inlet/outlet of sample gas (SAMPLE 1 IN, SAMPLE 2 IN, SAMPLE 1 OUT, SAMPLE 2 OUT)
(D) Carrier gas (CARRIER 1, CARRIER 2)
(E) Hydrogen gas for combustion (H2)
(F) Make-up gas (MAKE UP)
(G) Air for combustion (BURNER AIR)
(H) Air output (ATM 1, ATM 2)
(J) FID vent (FID 1, FID 2)
(K) FPD vent (FPD 1)
(L) TCD vent (TCD1, REF.1, TCD2, REF.2)
(M) Vent (VENT 1 to VENT 10)

Analyzer base sampling system (GCSMP)

(1) Sample inlet (STREAM #1 to STREAM #12)
(2) Standard-gas inlet (STANDARD #1 to STANDARD #3)
(3) Sample bypass vent (STREAM #1 B/P VENT to STREAM #12 B/P VENT)
(4) Sample vent (SAMPLE VENT 1 to SAMPLE VENT 3)
(5) Condensate drain (CONDENSATE OUT)

(6) Steam (STEAM IN)

(7) Steam drain (STEAM OUT)

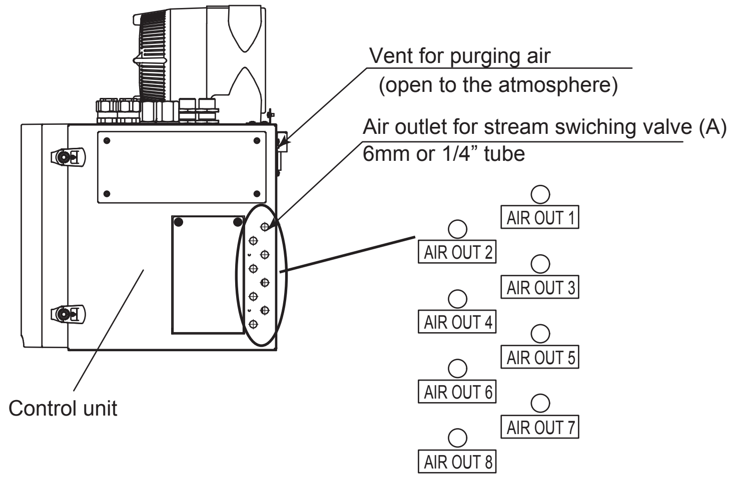


Figure 2.6 Right side of control unit

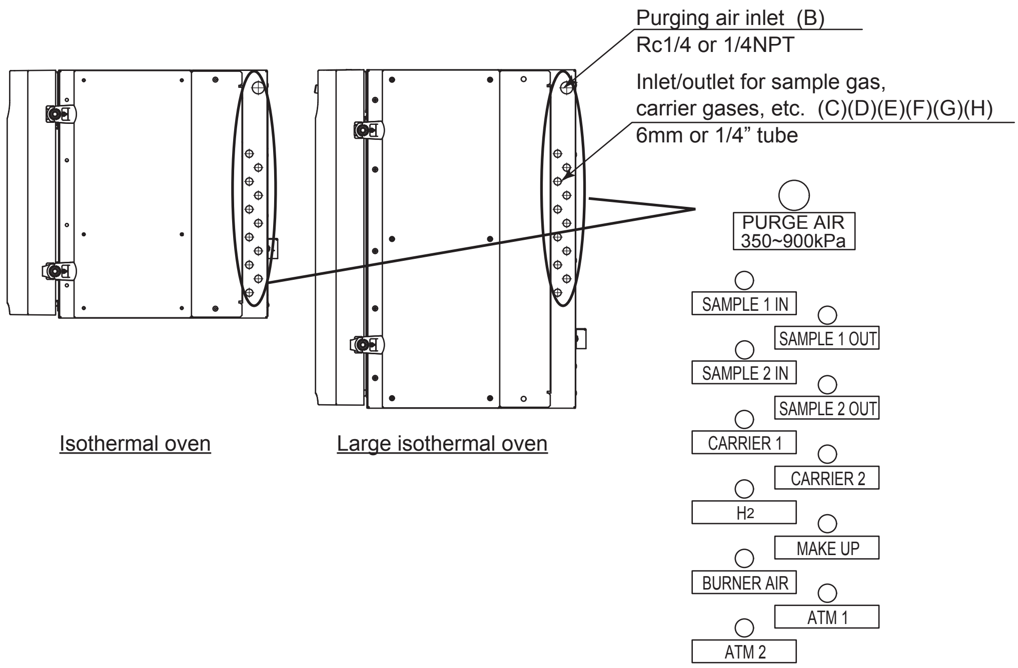


Figure 2.7 Left side of isothermal oven and large isothermal oven

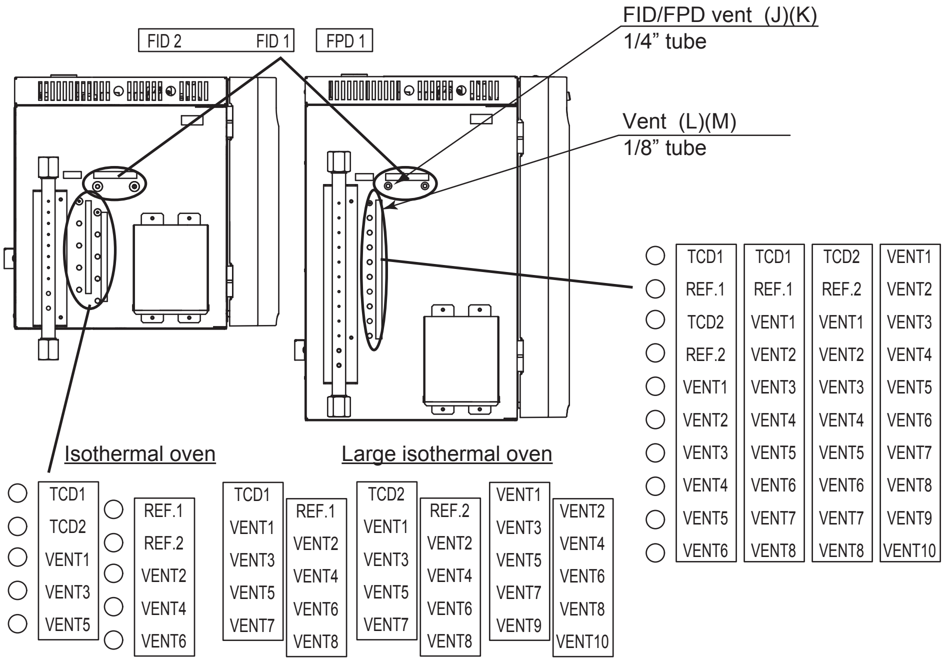


Figure 2.8 **Left side of isothermal oven and large isothermal oven**

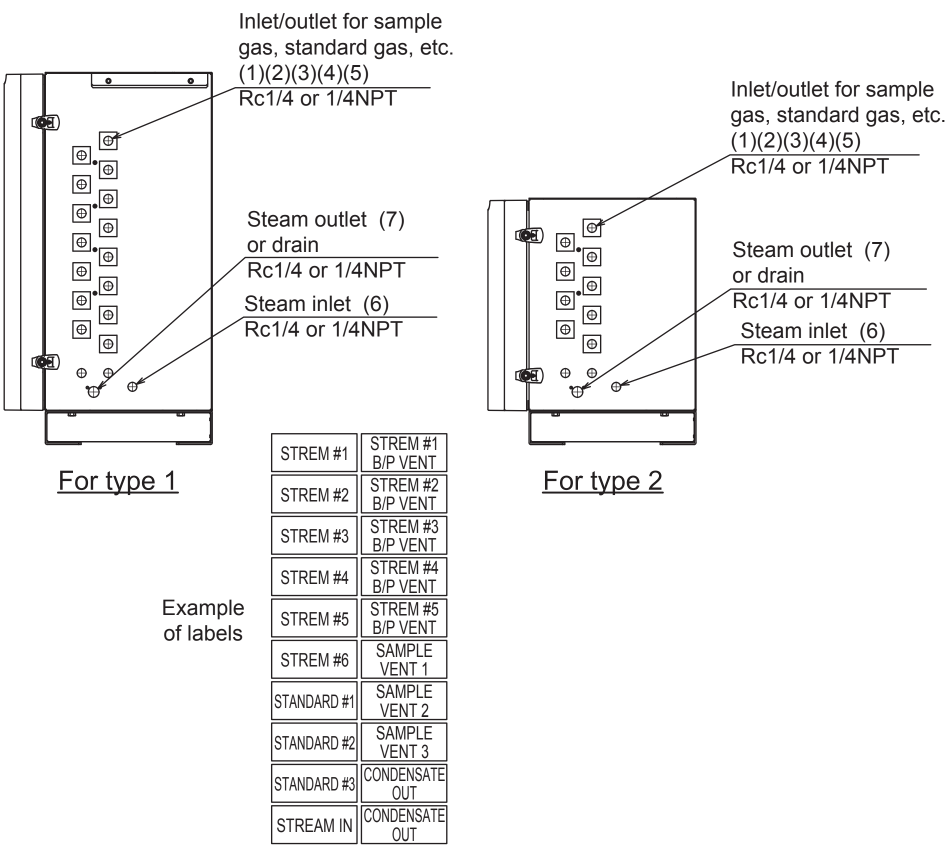


Figure 2.9 **Analyzer base sampling unit (GCSMP)**

2.2.2 Connecting Piping

For connection, refer to “1.2 External Dimensions.”

For the user-specific connection, refer to “Operation Data.”

(a) Sample inlet pipes

These are pipes to lead samples from process lines or an external sampling system into analyzer STREAMS #1 to #12 or the sample inlet of the pressure control section.

The analyzer can analyze up to 31 sample streams. For more than 31 sample streams, an external sampling system is employed, which has a stream switching function. In this case, one sample inlet pipe is used to lead multiple samples into the analyzer. When providing more than one pipe, see the “Operation Data” so that the specified sample can flow into the analyzer from the designated inlet port. STREAM and No. are marked at the piping port.

Use stainless steel of O.D. 6 mm or 1/4 inch with any oil cleaned off.

(b) Standard sample inlet pipes

These are pipes between the outlets of pressure regulators for standard gas cylinders and STANDARD #1 to #3 ports of the analyzer.

When different standard gases are used, provide separate pipes for each gas to lead them into the analyzer.

Use stainless steel of O.D. 6 mm or 1/4 inch with any oil cleaned off.

(c) Carrier gas inlet pipes

These are pipes to introduce the carrier gas to the analyzer between the outlets of carrier gas cylinder pressure regulators and CARRIER IN ports of the analyzer.

When two different carrier gases are used, provide separate pipes for each gas to lead them into the analyzer.

The following is recommended. By arranging the two gas cylinders in this way, there is no contamination of air.

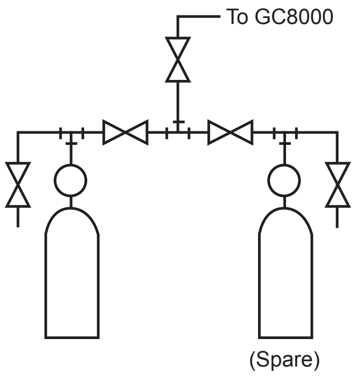


Figure 2.10

Confirm that the insides of the pipes and pipe fittings are not contaminated.

Confirm that the piping connections are done with no leakage.

CAUTION

The following explosionproof requirements must be satisfied for hydrogen gas.

- No leakage
- Use a extra regulator to supply hydrogen gas to the analyzer at 500 kPa.

If the carrier gas contains moisture with a dew point of –60°C or above, it is recommended that a desiccant, such as a molecular sieve, be used to remove moisture to prevent deterioration of the columns.

Use stainless steel of O.D. 6 mm or 1/4 inch with any oil cleaned off.

CAUTION

Do not use solvents containing impurities such as non-volatile components to clean the inside of the pipes. They will contaminate the inside of the pipes and prevent correct analysis. If it is necessary to use a solvent for cleaning, use highly pure acetone.

(d) Instrument air pipe

These are the pipes for supplying air to the analyzer for actuating sampling and backflush valves and for purging the inside of the electronics section and the ovens.

An air pressure of 350 to 900 kPa is required. Use general instrument air as the source and do the piping to the analyzer PURGE AIR port. A pressure regulator should be installed in-between.

Use stainless steel of O.D. 6 mm or 1/4 inch with any oil cleaned off.

(e) Piping combustion air for FID/FPD

The FID/FPD air must not contain impurities that have an adverse effect on the analyzed results. Use an air supply meeting the above condition and do the piping between this supply and the analyzer BURNER AIR port.

Use stainless steel of O.D. 6 mm or 1/4 inch with any oil cleaned off.

(f) Piping combustion hydrogen gas for FID/FPD

Connect the piping between the outlet of the pressure regulator of a hydrogen gas cylinder and the analyzer BURNER FUEL port. An extra-regular should be installed in-between at 500 kPa.

Use stainless steel of O.D. 6 mm or 1/4 inch with any oil cleaned off.

(g) Steam pipe

This is necessary for heating the sample with steam.

Connect the piping between a steam supply that can provide the required pressure (see Operation Data) and the analyzer STEAM IN port.

(h) Venting pipes

These are used for backflush venting, foreflush venting, detector venting, etc. With a vent header, the piping is provided. Without a vent stack, install piping to the vent stack.

Use large pipes for venting to minimize pressure losses.

Connect venting pipes of 1/4 inch for FID/FPD or 1/8 inch for others to about a 2-inch header.

When ejector suction is used in the sample outlet system, connect the venting pipes to the downstream of the vent header with a pipe of I.D. 10 mm or more.

CAUTION

Please keep safety in mind because the sample vent is usually open to the atmosphere.

When the sample vent is connected to the flare stack, please consider the pressure and the flow rate of the stack.

(i) Steam drain pipe

This is used to drain the condensate of the steam for heating the sample.

Connect the piping from the steam trap of the analyzer and also from the condensate drain piping port (CONDENSATE OUT), if provided, to the drain pit on the down-grade.

(j) Pipes for external valves

These are used for piping between the analyzer valve actuating pneumatic outlet and the external sampling system to actuate the stream valves and atmospheric balance valves provided in the external sampling system. Connect the piping properly according to the piping diagram.

Use stainless steel of O.D. 6 mm or 1/4 inch.

2.3 Wiring

See "1.1 Wiring and Piping Diagram" for wiring.

Note that the specifications determines the number of the protection system, which results in different wiring.

Table 2.3 Number of protection system

Explosionproof Specifications	Type 1 (100)	Type 2 (120)		Type 3 (222)
		100 V (-A, B, C, D)	200 V (-E, F, G, H)	
TIIS (-T)	1	2	1	2
FM X (-F)	1	2	1	2
FM Y (-G)	0			
ATEX (-A)	1	2	1	2

( ): Suffix codes

WARNING

In case of TIIS-certified wiring, the attached cable packing adapter must be used.

Otherwise, it does not comply with TIIS explosion protection.

CAUTION

- Lay the signal wiring and electrical wiring in separate conduit pipes or ducts.
- Use independent grounding with a grounding resistance of 100 ohms or less.

2.3.1 Types of Wiring and Locations

The following types of wiring are required for the GC8000.

The wiring required varies with the specifications.

(A) Electric circuit and heater power
(B) Heater power
(C) Contact output for system alarm 1
(D) Contact output for annunciator
(E) Analog input (4 to 20 mA)
(F) Contact input (Operation start/stop, mode-selection request, etc.)
(G) Contact output
(H) Communication wiring (RS-422 and analyzer bus)
(J) Analog output (4 to 20 mA), Analog hold output
(K) Grounding
(L) External I/O cutoff output (Power cutoff signal)
(M) Ethernet (twisted-pair cable)
(N) Ethernet (optic fiber cable)

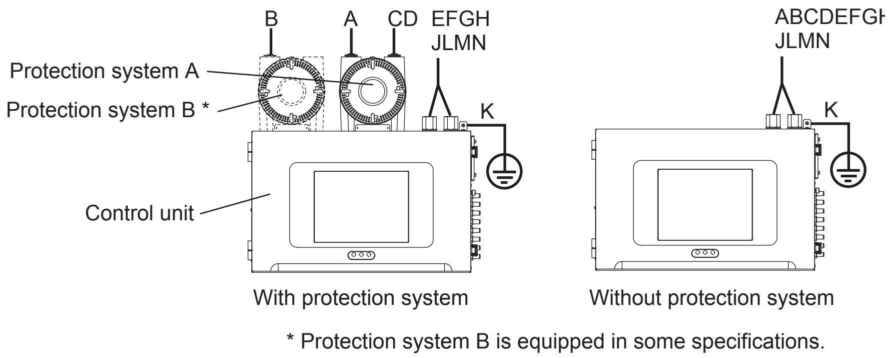


Figure 2.11 Cable connection locations

2.3.2 Recommended Cables

Table 2.4

Wiring Connections	Cable Inlet	Cable O.D.	Wiring	Cable Condition	Terminal	Cable Shield
Protection system	A (right): 2 B (left): 1	ø8.0 to 16.0 mm for cable packing adapter	Protection system A: (A) Electric circuit and heater power Protection system B: (B) Heater power	3.5 to 5.5 mm^2 max. 1.25 to 5.5 mm^2 max.	M4 screw crimp-on terminal	Not required
			(C) Contact output for system alarm 1 (D) Contact output for annunciator	0.75 to 1.5 mm^2 max. Cable length 1 km max.	For MKKDSN (Note 2)	Required
Electronics section	6 (Junction box as needed)	ø9.0 to 16.0 mm	Without protection system: (A) Electric circuit and heater power (B) Heater power	3.5 to 5.5 mm^2 max. 1.25 to 5.5 mm^2 max.	M4 screw crimp-on terminal	Not required
			Without protection system: (C) Contact output for system alarm 1 (D) Contact output for annunciator	0.75 to 1.5 mm^2 max. Cable length 1 km max.	For FKC (Note 2)	Required
			(E) Analog input (16 points max.)			
			(F) Contact input (32 points max.)			
			(G) Contact output (Note 1) (20 points max.)			
			(H) Serial communication			
			(J) Analog output (32 points max.)	0.5 to 1.5 mm^2 max. Cable length 1 km max.	For FKC (Note 2)	Required
			(K) Grounding	5.5 mm^2 or more Grounding resistance of 100 ohms max.	M4 screw crimp-on terminal	Not required
			(L) External I/O cutoff output (Power cutoff signal)	0.75 to 1.5 mm^2 max. Cable length 1 km max. Twisted-pair cable	For FKC (Note 2)	Required
			(M) Ethernet (shielded twisted-pair cable)	CAT.5/CAT.5E 50 m or less	RJ45	Required
			(N) Ethernet (fiber-optic cable)	For 1300 nm Outdoor type multi-mode of 50/125 µm or 62.5/125 µm	SC	

Note 1: Use double-isolation cables for the contact output line (AC).
Double-isolate either contact output line (AC) or (DC) if they are mixed.

Note 2: Use MKKDSN series terminals (manufactured by Phoenix Contact Ltd.) for the protection system, and FKC series terminals (manufactured by Phoenix Contact Ltd.) for the electric circuit except for the power or Ethernet line. For these wiring connections, use AI series crimp-on terminals manufactured by the same company. Four types of crimp-on terminals are used according to the wire diameters (see Table 2.5).

Table 2.5 Crimp-on terminals

Terminal Series	Cable Core	Cable O.D.	Terminal Type	Peel off length
MKKDSN	0.75 mm^2	Less than ø2.8 mm	AI 0.75-6GY	Approx. 6 mm
	1 mm^2	Less than ø3.0 mm	AI 1-6RD	
	1.5 mm^2	Less than ø3.4 mm	AI 1.5-6BK	
FKC	0.5 mm^2	Less than ø2.5 mm	AI 0.5-10WH	Approx. 10 mm
	0.75 mm^2	Less than ø2.8 mm	AI 0.75-10GY	
	1 mm^2	Less than ø3.0 mm	AI 1-10RD	
	1.5 mm^2	Less than ø3.4 mm	AI 1.5-10BK	

Contact Phoenix Contact Ltd. for details.

2.3.3 Preparing Wiring Depending on Specifications

Perform wiring carefully because the connection of wiring varies depending on the GC8000 explosionproof specifications.

IMPORTANT

Cables should be arranged in an orderly manner in the protection system.

Otherwise, they may damage the parts (e.g. relay).

■ FM

WARNING

- All wiring shall comply with National Electric Code ANSI/NFP A 70 and Local Electric Codes.
- In a hazardous area, use conduits for wiring in the explosionproof enclosure or to electronics sections.

CAUTION

- The unused electrical connection ports should be closed with an appropriate flameproof-certified plug.
- Analyzers have pressurized enclosures. The cable end should be sealed in order to apply pressure to the pressurized enclosure. Otherwise, power does not supplied to the electronics section.

In the FM-Y, all wiring must be connected to the electronics section since the protection system is not provided.

Six connection ports are provided in the electronics section. Use convenient ones.

Remove the attached plug of the connector and perform wiring.

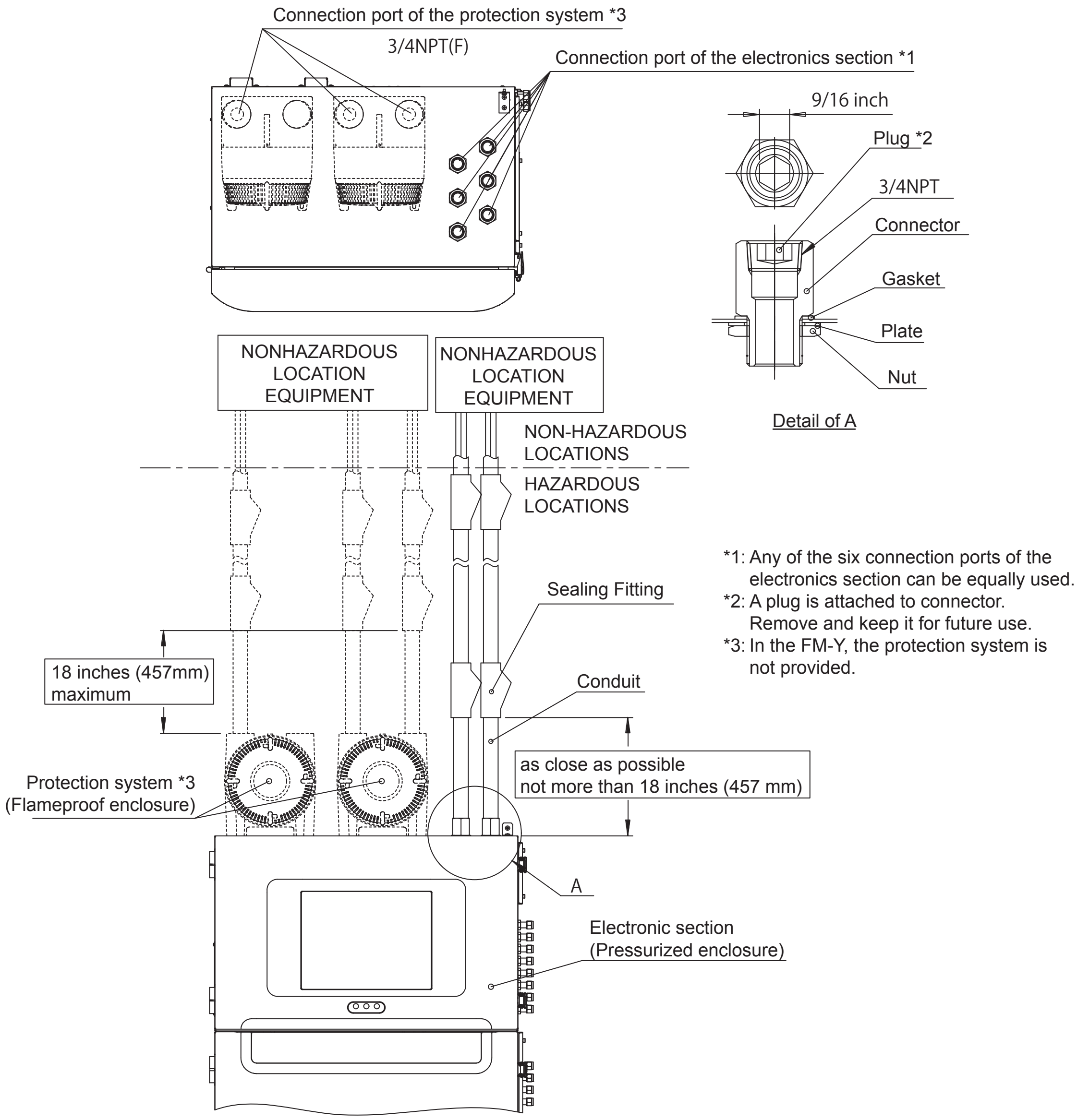


Figure 2.17 **Wiring in FM specification**

■ ATEX

WARNING

- All wiring shall comply with Local Electric Codes and Requirements.
- In a hazardous area, use appropriate flameproof-certified parts for connecting cables.

CAUTION

- The unused electrical connection ports should be closed with an appropriate flameproof-certified plug.
- The blind plug shall not be used with an adapter.
- Analyzers have pressurized enclosures. The cable end should be sealed in order to apply pressure to the pressurized enclosure. Otherwise, power does not supplied to the electronics section.

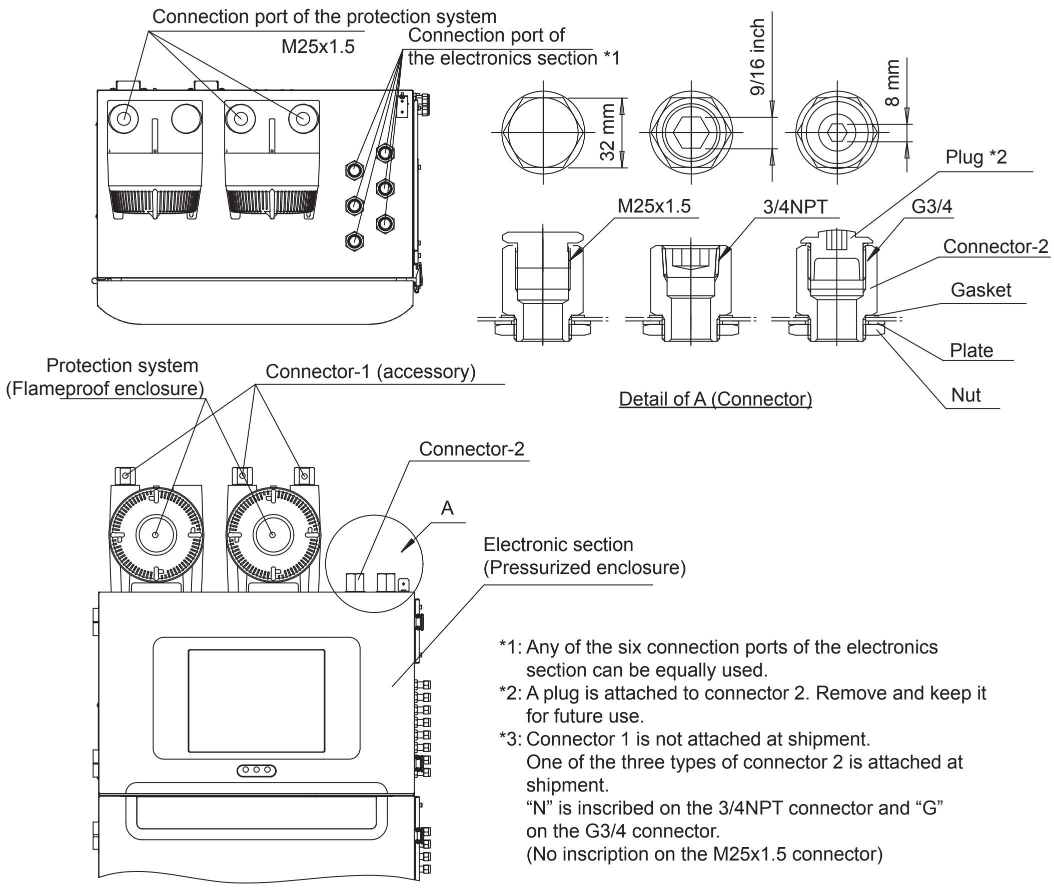


Figure 2.16 Wiring in ATEX specification

● Connection port for the protection system

Remove the attached plug and perform wiring.

For the 3/4NPT or G3/4 connection port, use the connectors in the accessory kit.

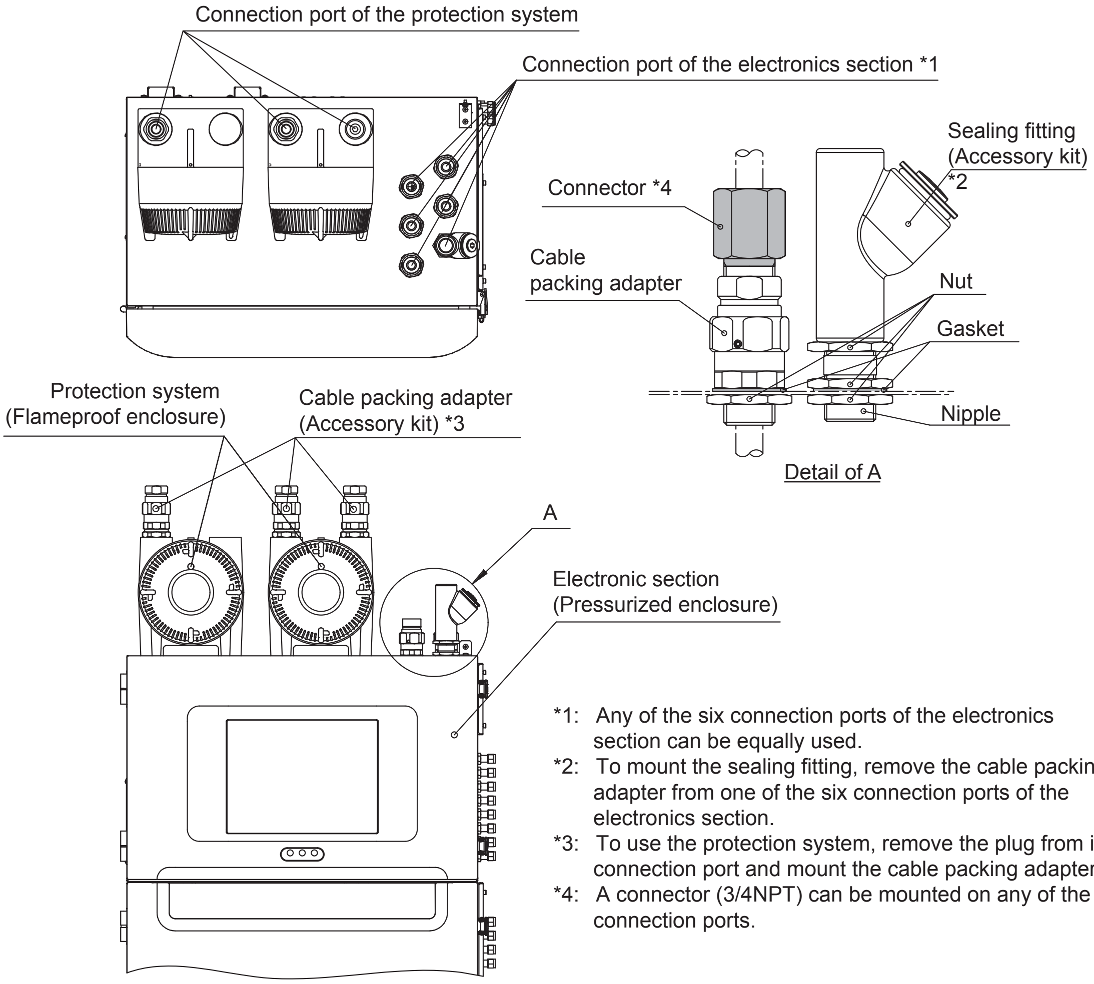
● Connection port for the electronics section

Six connection ports are provided in the electronics section. Use convenient ones.

Remove the attached plug of the connector and perform wiring.

■ TIIS

For TIIS explosionproof wiring connections, use cable packing adapters or sealing fittings (for Ethernet cable).



*1: Any of the six connection ports of the electronics section can be equally used.
*2: To mount the sealing fitting, remove the cable packing adapter from one of the six connection ports of the electronics section.
*3: To use the protection system, remove the plug from its connection port and mount the cable packing adapter.
*4: A connector (3/4NPT) can be mounted on any of the connection ports.

Figure 2.12 Wiring in TIIS specification

● Connecting cables to the protection system

Remove the attached plug and mount the cable packing adapter (G3/4) in the accessory kit on the connection port. Use the connector in the accessory kit for the cable packing adapter (3/4NPT).

⚠ CAUTION

The minimum packing (for ø8.0 to ø9.0) is attached to the cable packing adapters at shipment. Change it to an appropriate packing for the cable O.D. (See Table 2.6.)

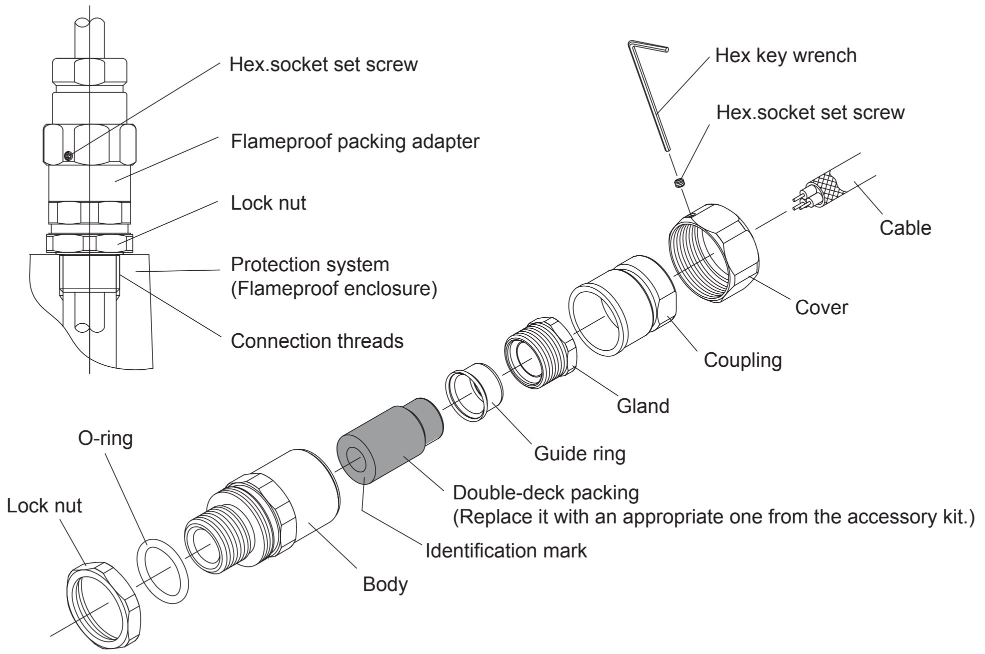


Figure 2.13 Procedure for mounting a cable packing adapter for a protection system

The cable packing adapters comply with the Technical Standard of the Ministry of Health, Labour and Welfare, Japan.

Table 2.6 Size of double-deck packing for the protection system

Connection port screw	Applicable cable O.D.	Identification mark	Recommended torque for the gland (N·m)
G3/4	ø8.0 to ø9.0	SFFP209 ø8.0 to ø9.0	17
	ø9.0 to ø10.0	SFFP2010 ø9.0 to ø10.0	25
	ø10.0 to ø11.0	SFFP2011 ø10.0 to ø11.0	20
	ø11.0 to ø12.0	SFFP2012 ø11.0 to ø12.0	20
	ø12.0 to ø13.0	SFFP2013 ø12.0 to ø13.0	20
	ø13.0 to ø14.0	SFFP2014 ø13.0 to ø14.0	25
	ø14.0 to ø15.0	SFFP2015 ø14.0 to ø15.0	20
	ø15.0 to ø16.0	SFFP2016 ø15.0 to ø16.0	20

*: When a cable O.D. falls under two categories, try both and choose the more suitable one.

● Connecting cables to the electronics section

Six connection ports are provided in the electronics section. Use convenient ones.

The cable packing adapters (G3/4) and plates for sealing are mounted as standard. Remove the plate before using the port for wiring, and keep it for future use. (Do not remove the plate for the unused connection port.)

⚠ CAUTION

The minimum packing (for ø9.0 to ø10.0) is attached to the cable packing adapters at shipment. Change it to an appropriate packing for the cable O.D. (See Table 2.7.)

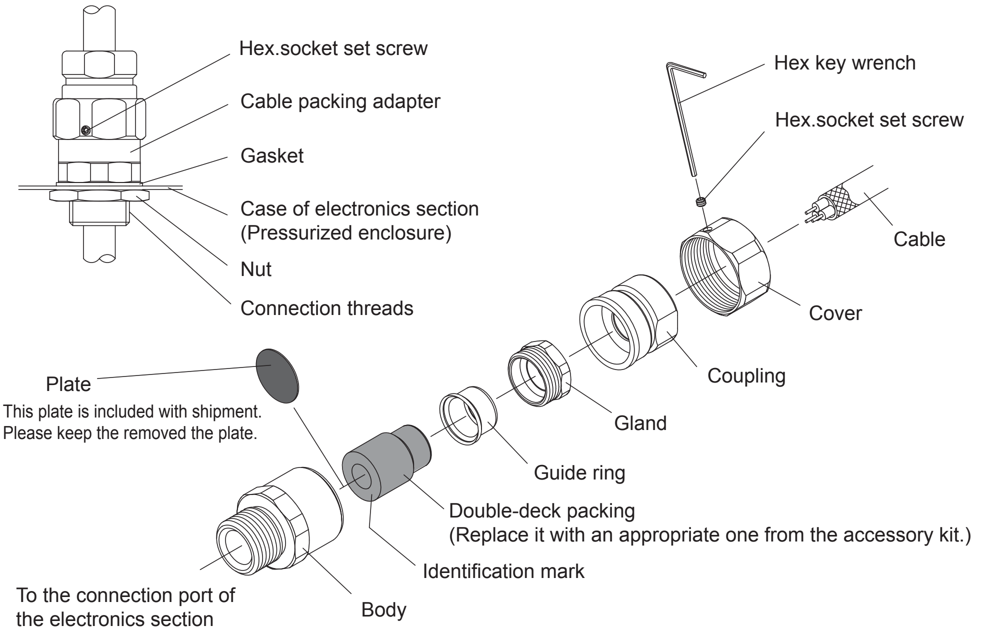


Figure 2.14 Procedure for mounting a cable packing adapter for the electronics section

The cable packing adapters comply with the Technical Standard of the Ministry of Health, Labour and Welfare, Japan.

Table 2.7 Double-deck packing size for electronics section

Connection port screw	Applicable cable O.D.	Identification mark	Recommended torque for the gland (N·m)
G3/4	ø9.0 to ø10.0	SCFP2010 ø9.0 to ø10.0	25
	ø10.0 to ø11.0	SCFP2011 ø10.0 to ø11.0	20
	ø11.0 to ø12.0	SCFP2012 ø11.0 to ø12.0	20
	ø12.0 to ø13.0	SCFP2013 ø12.0 to ø13.0	20
	ø13.0 to ø14.0	SCFP2014 ø13.0 to ø14.0	25
	ø14.0 to ø15.0	SCFP2015 ø14.0 to ø15.0	20
	ø15.0 to ø16.0	SCFP2016 ø15.0 to ø16.0	20

*: When a cable O.D. falls under two categories, try both and choose the more suitable one.

For Ethernet cable, use sealing fittings in the accessories kit for the connection port (see Figure 2.15). Remove the attached cable packing adapter and mount the sealing fitting back in place. Six connection ports are provided in the electronics section. Use convenient ones.

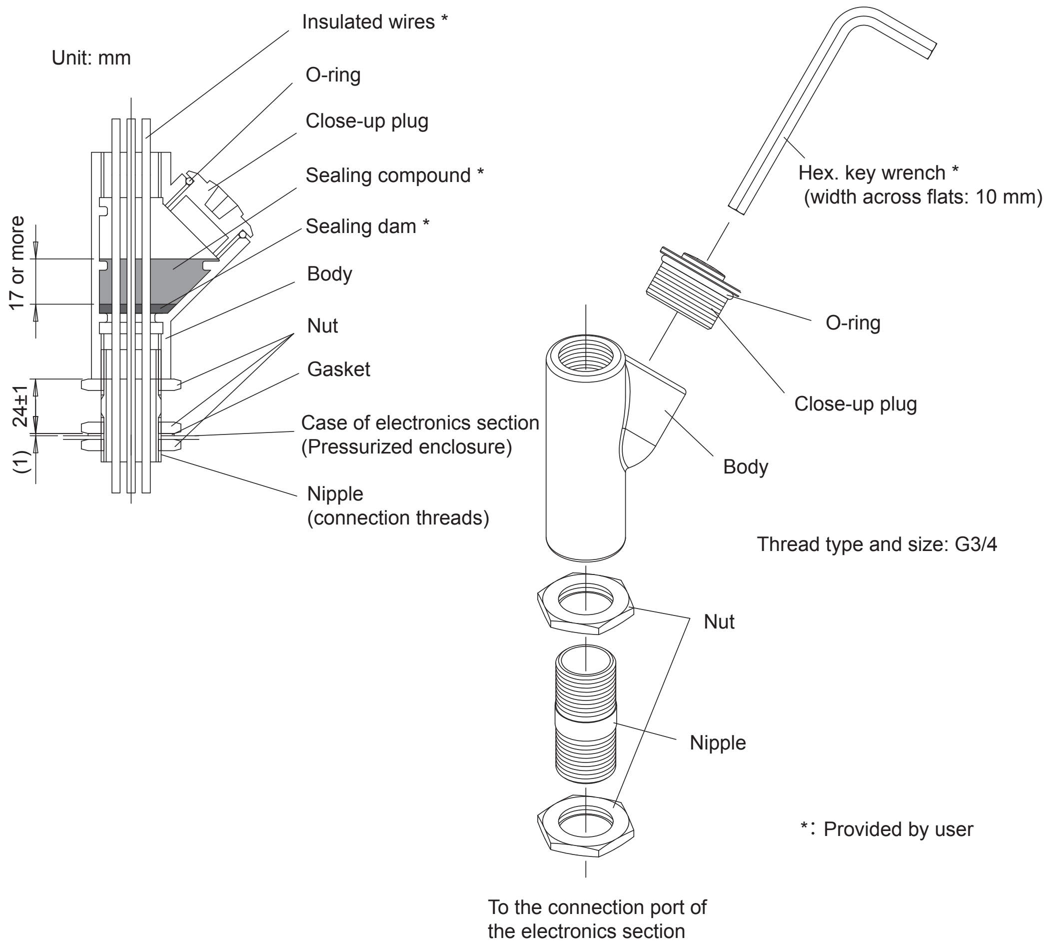


Figure 2.15 Mounting procedure for sealing fitting (accessory)

CAUTION

The cable end should be sealed in order to apply pressure to the electronics section. Otherwise, power does not be supplied to the electronics section.

For the 3/4NPT connection port, use the connectors in the accessory kit to all of the connections.

TIP

Refer to "USERS' GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry" for more details.

2.3.4 Connecting Power Cable and Grounding

CAUTION

- Wire the power supply cable keeping the distance of 1 cm or more from other signal wires.
- The power supply cable shall comply with UL or CSA.
- Do wiring after securing protective grounding.

Use crimp-on terminals for all power cables and grounding (see Figure 2.18).

Use crimp-on terminals suitable for the cable core (see Table 2.8).

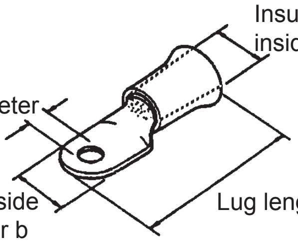


Figure 2.18 Crimp-on terminal

Table 2.8 Size of crimp-on terminal

Nominal cross sectional area	Screw (mm)	Hole diameter a (mm)	Outside diameter b (mm)	Length c (mm)	Insulation covering inside diameter d (mm)	Applicable terminal*
5.5 mm^2	4	4 to 5	9.8 or less	25 to 29	5.8 or less	AMP 170785-1 JST 5.5-4
2.0 mm^2	4	4.3 or more	8.7 or less	approx. 21	5.8 or less	AMP 170782-1 JST V2-4
1.25 mm^2	4	4.3 or more	8.7 or less	approx. 21	5.8 or less	AMP 170782-1 JST V1.25-4

*: AMP: Japan AMP Co., Ltd.
JST: JST Co., Ltd.

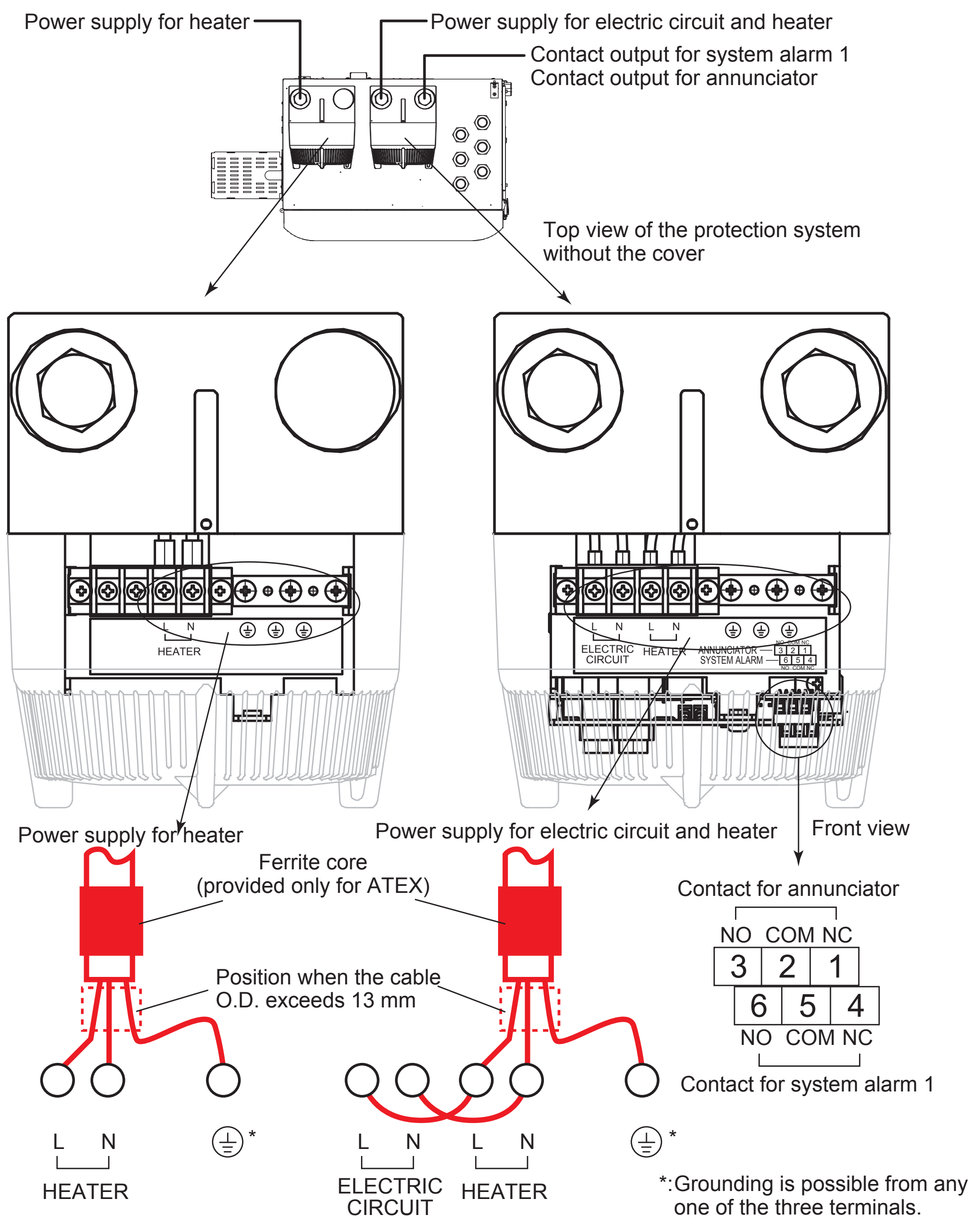
● Power supply line to the protection system (A) (B)

The power supply to protection system A is used for both heater power and electric circuit power.

The power supply or protection system B is used only for heater power.

Connect the attached ferrite core for ATEX.

Grounding must be wired.



Power supply for heater
Power supply for electric circuit and heater
Contact output for system alarm 1
Contact output for annunciator
Top view of the protection system
without the cover
HEATER
ELECTRIC CIRCUIT
ANNUNCIATOR
SYSTEM ALARM
Power supply for heater
Power supply for electric circuit and heater
Front view
Ferrite core
(provided only for ATEX)
Position when the cable
O.D. exceeds 13 mm
Contact for annunciator
NO COM NC
3 2 1
6 5 4
NO COM NC
Contact for system alarm 1
L N
HEATER
*
L N
ELECTRIC
CIRCUIT
L N
HEATER
*
*:Grounding is possible from any
one of the three terminals.

Figure 2.19

● Power supply line of the electronics section (A) (B) without the protection system

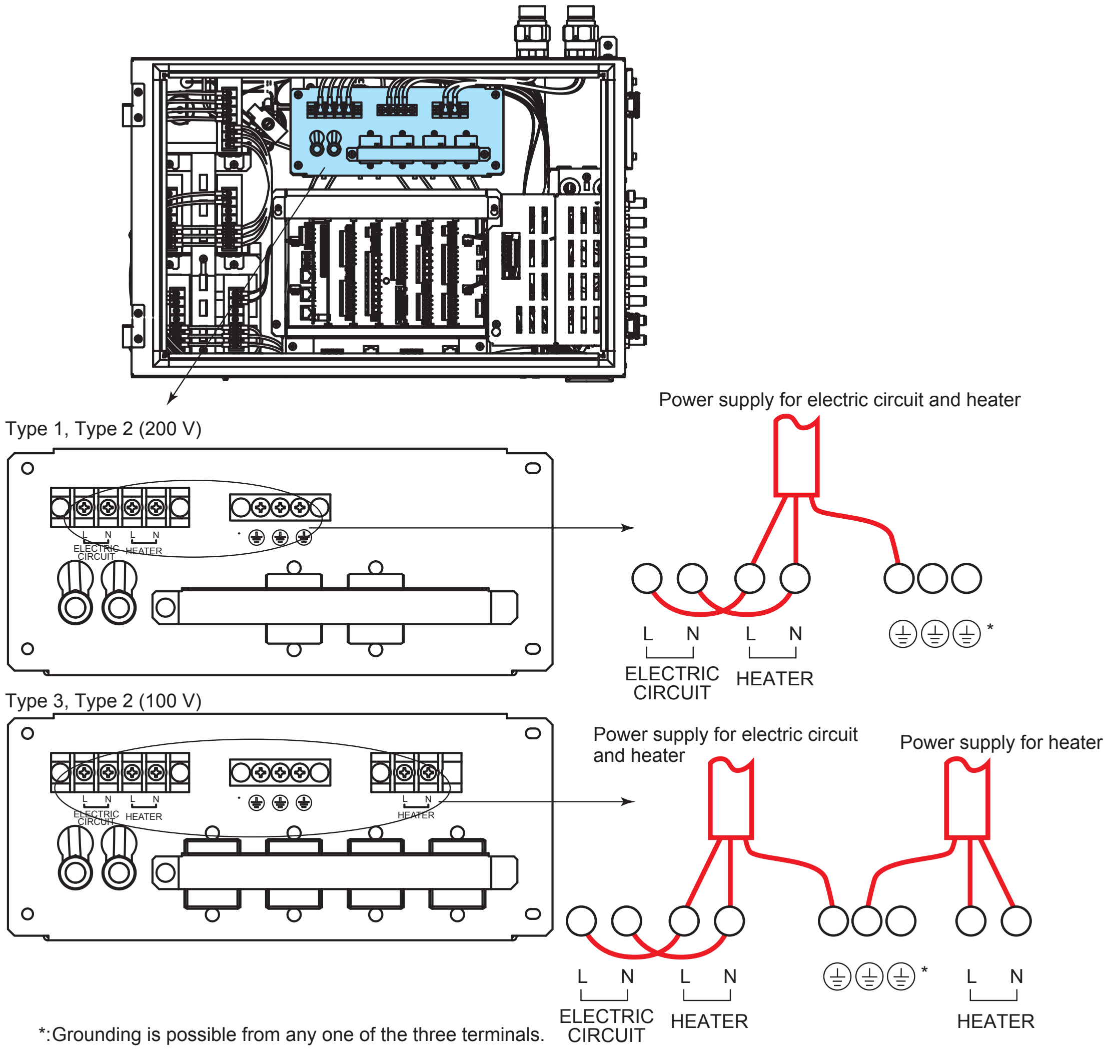


Figure 2.20

● Grounding (K)

CAUTION

Use independent grounding with a grounding resistance of 100 ohms or less.

Connect the earth terminal to the upper right of the control unit as shown in Figure 2.21.

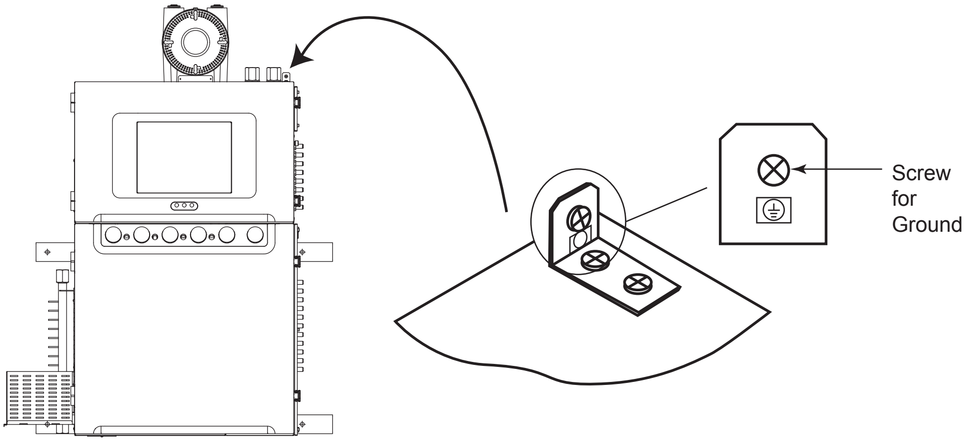


Figure 2.21 Earth terminal for the GC8000

2.3.5 Connecting Signal Cables

CAUTION

Be sure to keep the power and signal cables apart. Avoid placing them in parallel.

NOTE

- For analog input, use twisted pair cables with a common shield (a twist pitch of 50 mm or less), to avoid induction noise.
  Use twisted pair cables for digital signals as well.
- Stranded cables are superior to single-conductor cables in the following respects:
  - Stranded cables are more flexible and easy to lay in a curved pit or cramped space.
  - Stranded cables provide better contact with crimp-on terminal, with less aging over time.
- Secure the cables so they do not weight on the terminals.
- Fasten the terminal screws securely.

■ Signal Cable Termination

CAUTION

- Use crimp-on terminal with insulated covering.
- Wire crimp-on terminal with the dedicated tool.
- The tool must be suitable for the size of wires.

Use crimp-on terminal for all signal cables.

The specifications of the crimp-on terminal are determined by the nominal cross sectional area of the power cable.

For the protection system, use MKKDSN series terminals from Phoenix Contact Ltd., and FKC series terminals from the same company for the contact output line (D) (G), analog input line (E), contact input line (F), serial communication line (H), analog output line (J), and explosionproof status line (L) of the electronics section.

For the Ethernet line (L) (M), use twisted pair cables of CAT.5 or CAT.5E or multi-mode optical fiber of 50/125 µm or 62.5/125 µm.

For these wiring connections, use AI series crimp-on terminal from Phoenix Contact Ltd.

There are four types of crimp-on terminal for respective wire diameters (see Table 2.5).

Peel off the cover of wire by 6 mm for MKKDSN series terminals and 10 mm for FKC series terminals (maker-recommended values).

CAUTION

- Parts such as the signal line, relay terminal, relay, and power supply to be connected to the contact input/output shall comply with IEC1010 or CSA 1010.
- Connect wiring after securing protective grounding.

● External I/O cutoff output (power cutoff signal) (L)

Wiring for the cutoff signal must be performed in case the explosionproof requirements are not satisfied.

The shield is grounded at the earth bar (see Figure 2.22). Remove the cover on the upper right of the electronics section and perform wiring.

■ Contact output for system alarm 1 (C) and contact output for annunciator (D)

The wiring locations differ depending on whether the protection system is provided or not.

● Wiring to protection system A

Perform wiring to the terminals shown in Figure 2.19.

The MKKDSN series terminals from Phoenix Contact Ltd. are used.

For these wiring connections, use AI series crimp-on terminals from the same company. Check if the crimp-on terminals meet wire diameters in Table 2.5.

● Wiring to the electronics section (without the protection system)

Perform wiring to the electronics section of the control unit (see Figure 2.22).

FKC series terminals from Phoenix Contact Ltd. are used.

For these wiring connections, use AI series crimp-on terminals from the same company. Check if the crimp-on terminals meet wire diameters in Table 2.5.

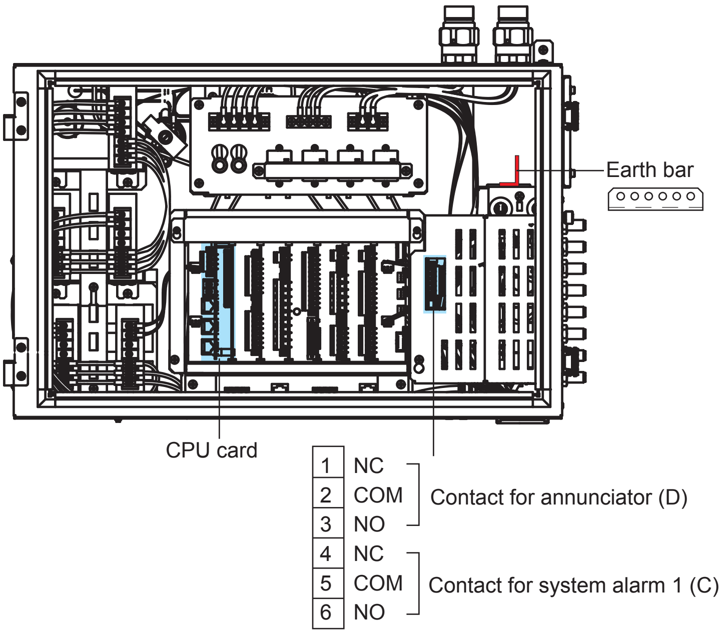


Figure 2.22

■ Ethernet (twisted pair) (M) (L)

Connect the twisted pair cable of the RJ-45 connector to the CPU card.

The CPU card is labeled “CTRL.CPU”.

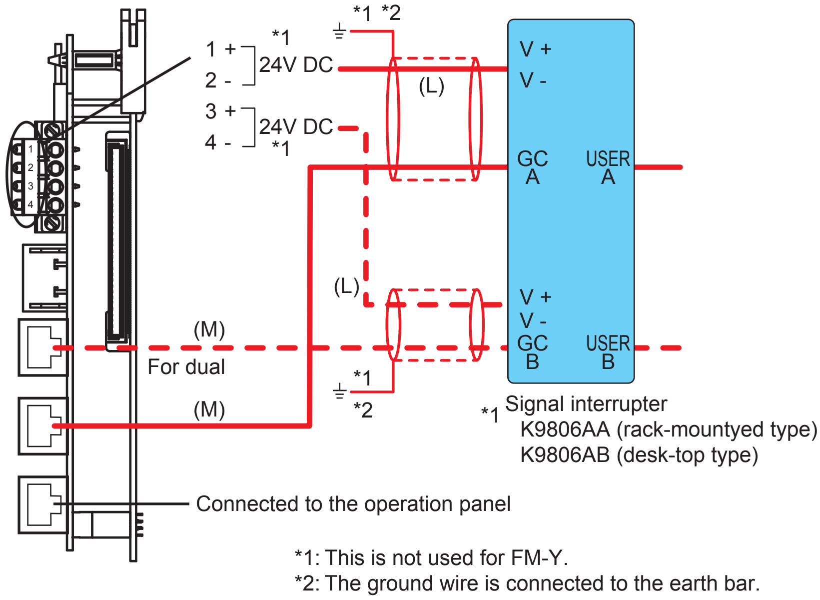


Figure 2.23 Ethernet (twisted pair cable)

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar shown in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

■ Ethernet (optical fiber) (N)

Connect an optical fiber to the media converter shown in Figure 2.24.

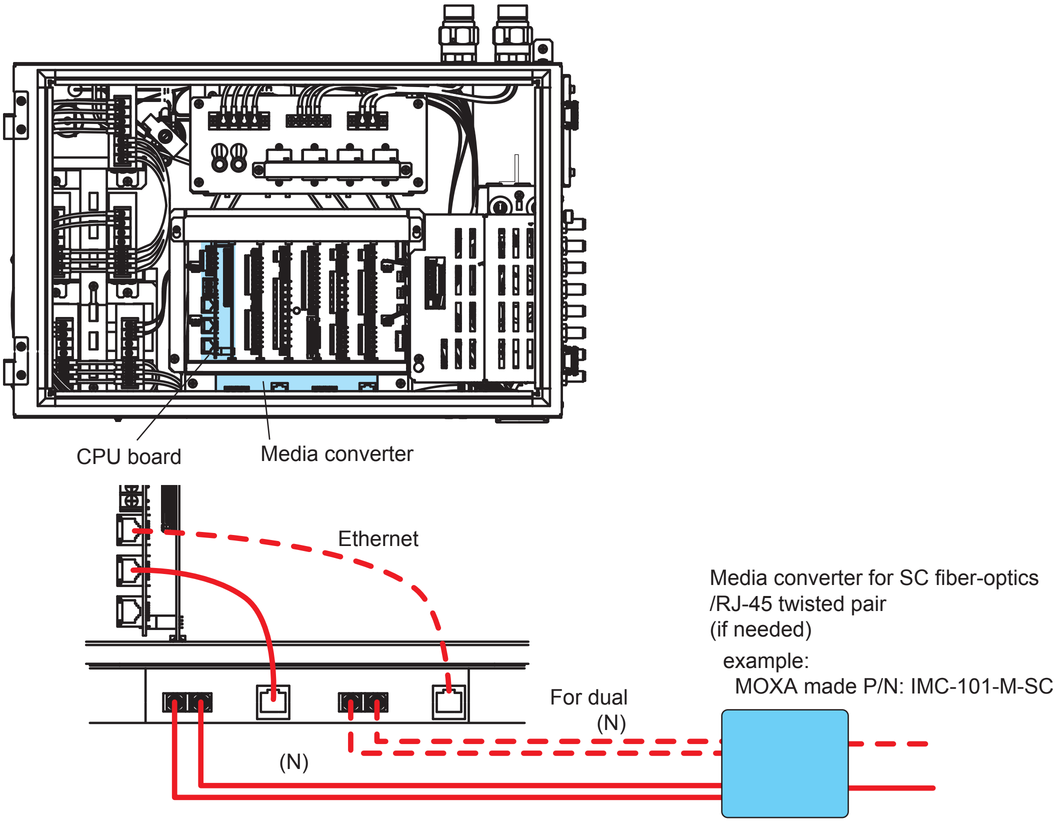


Figure 2.24 Ethernet (optical fiber)

■ Wiring to slots 1 to 5

Perform wiring to slots 1 to 5 for each card.

CAUTION

After the card is removed, return it to its original position. There is a label on the card.

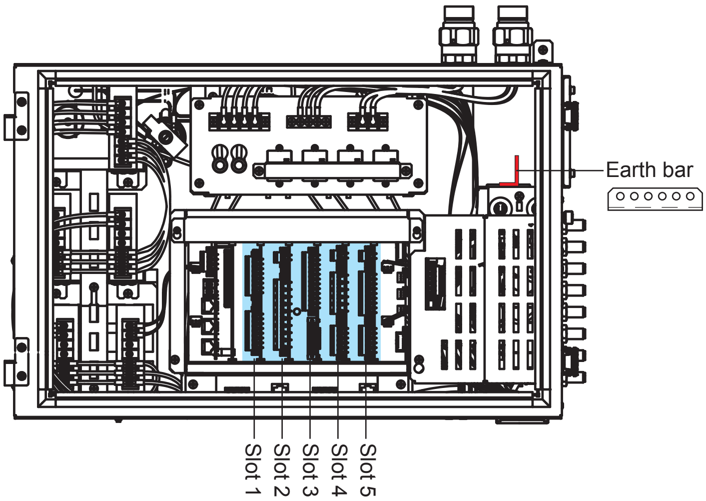
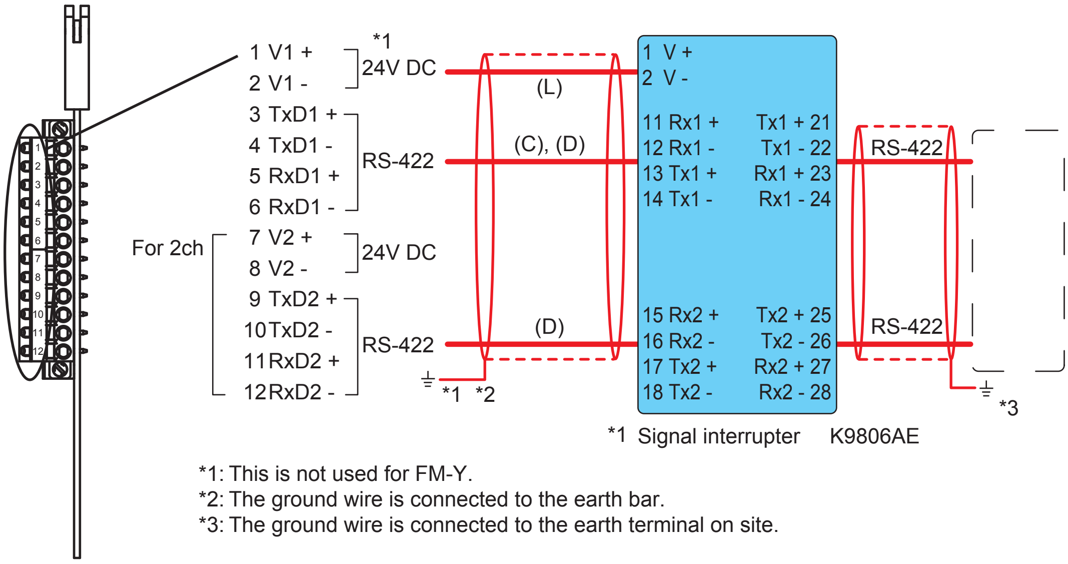


Figure 2.25

FKC series terminals from Phoenix Contact Ltd. are used.

For these wiring connections, use AI series crimp-on terminals from the same company. Check if the crimp-on terminals meet wire diameters in Table 2.5.

● Serial communication (1ch) (Code: C) and serial communication (2ch) (Code: D) (H) (L)



*1: This is not used for FM-Y.
*2: The ground wire is connected to the earth bar.
*3: The ground wire is connected to the earth terminal on site.

Figure2.26 Wiring for serial communication cards

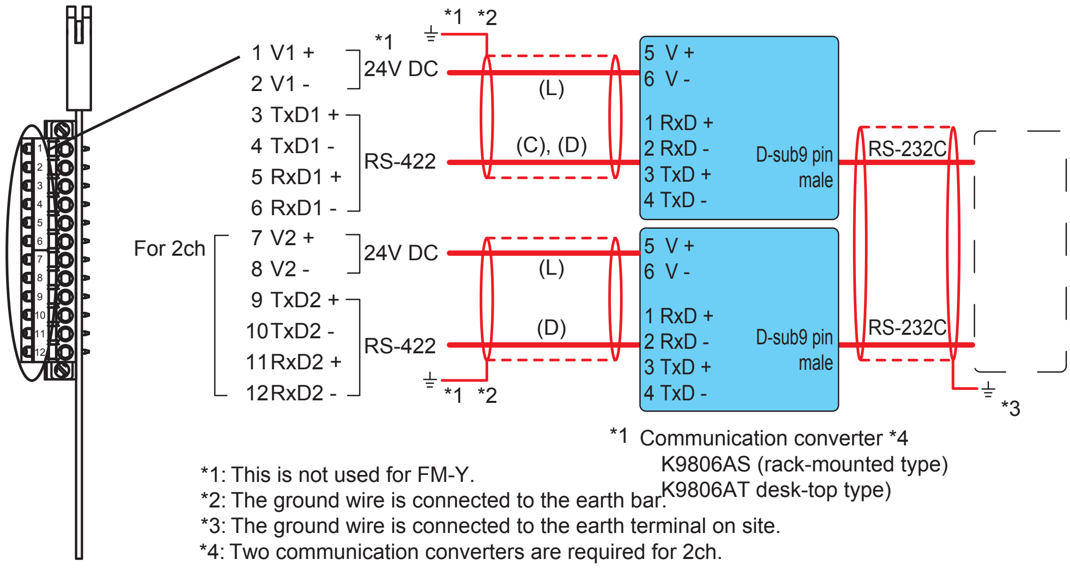


Figure2.27 Wiring for serial communication cards

The serial communication card is labeled "COM".

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

● Analog output (system isolation) (Code: 1) and analog output (channel isolation) (Code: 2) (J)

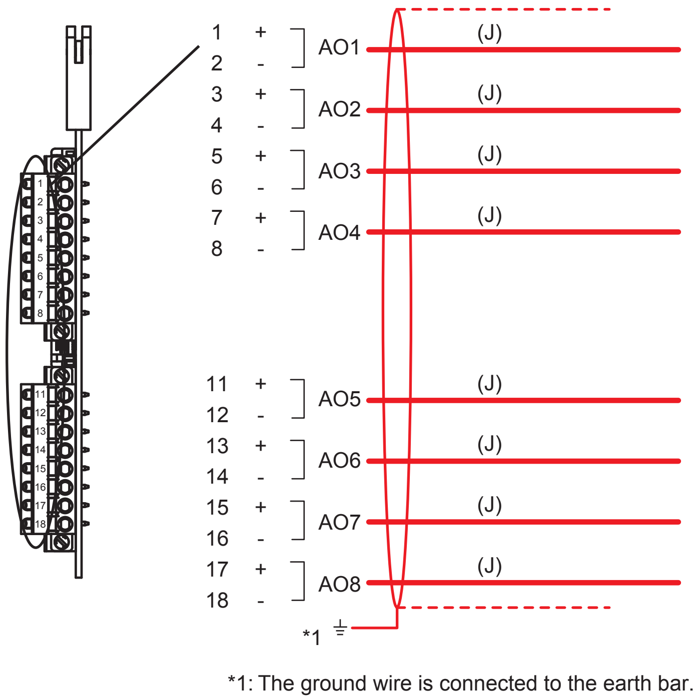
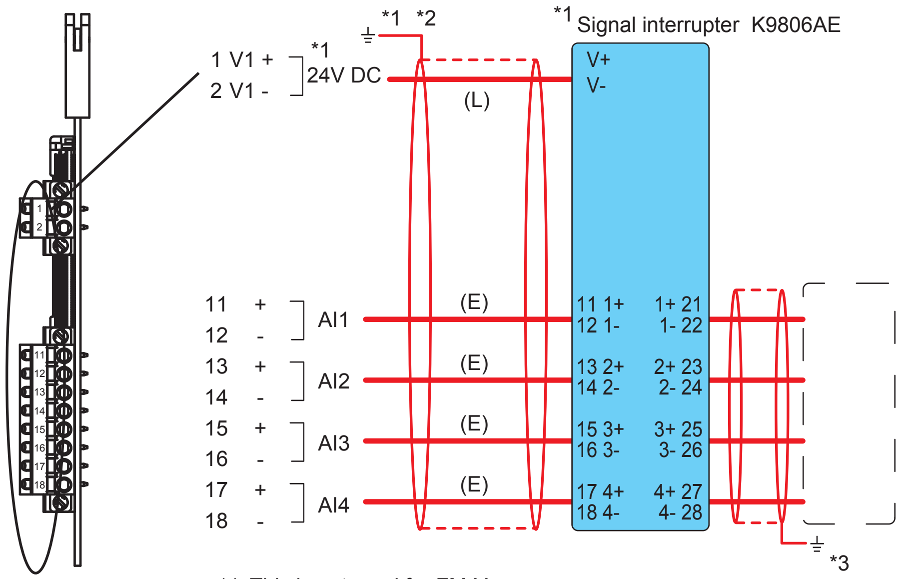


Figure 2.28 Wiring for an analog output card

The analog output card is labeled "AO".

Analog input (voltage) (Code: 3) and analog input (current) (Code: 4) (E) (L)



*1: This is not used for FM-Y.
*2: The ground wire is connected to the earth bar.
*3: The ground wire is connected to the earth terminal on site.

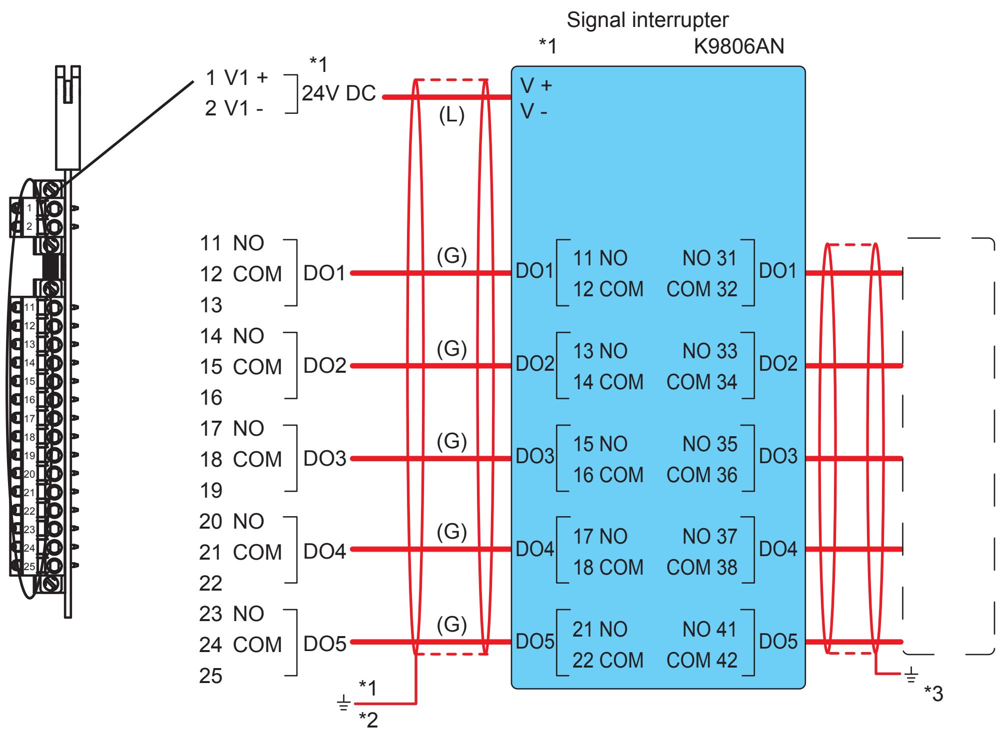
Figure 2.29 Wiring for an analog input card

The analog input card is labeled “AI”.

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

Contact output (AC) (Code: 8) (G) (L)



*1: This is not used for FM-Y.
*2: The ground wire is connected to the earth bar.
*3: The ground wire is connected to the earth terminal on site.

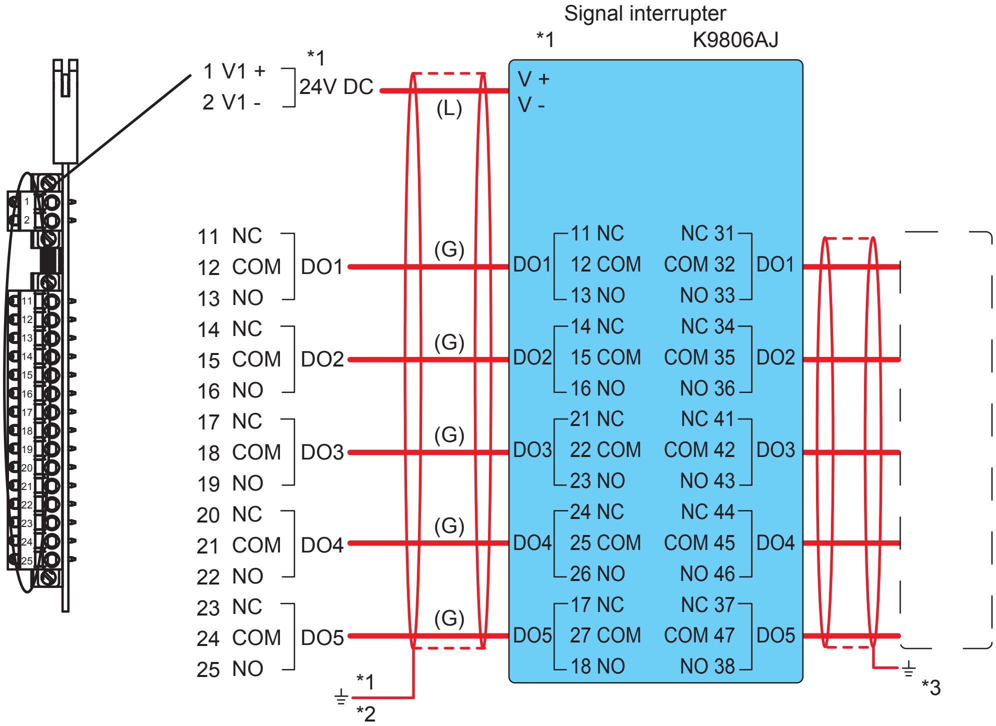
Figure 2.30 Wiring for a contact output card

The contact output card is labeled “DO”.

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

● Contact output (DC) (Code: 7) (G) (L)



*1: This is not used for FM-Y.
*2: The ground wire is connected to the earth bar.
*3: The ground wire is connected to the earth terminal on site.

Figure 2.31 Wiring for a contact output card

The contact output card is labeled “DO”.

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

● Contact input (Code: A) (F)

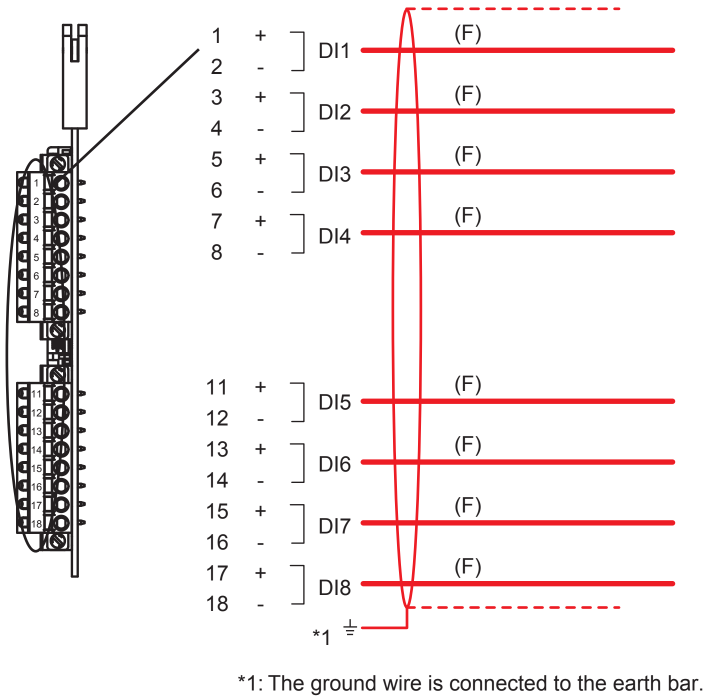


Figure 2.32 Wiring for a contact input card

The contact input card is labeled "DI".

● Contact input/output (AC) (Code: 6) (F) (G) (L)

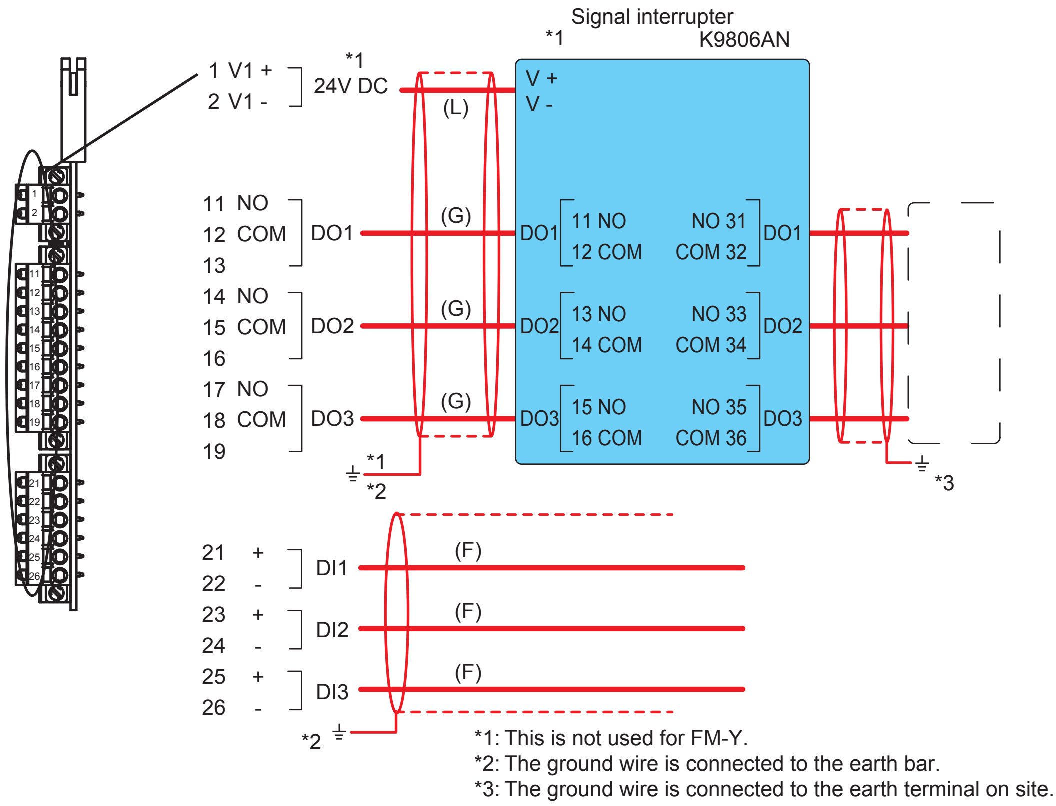


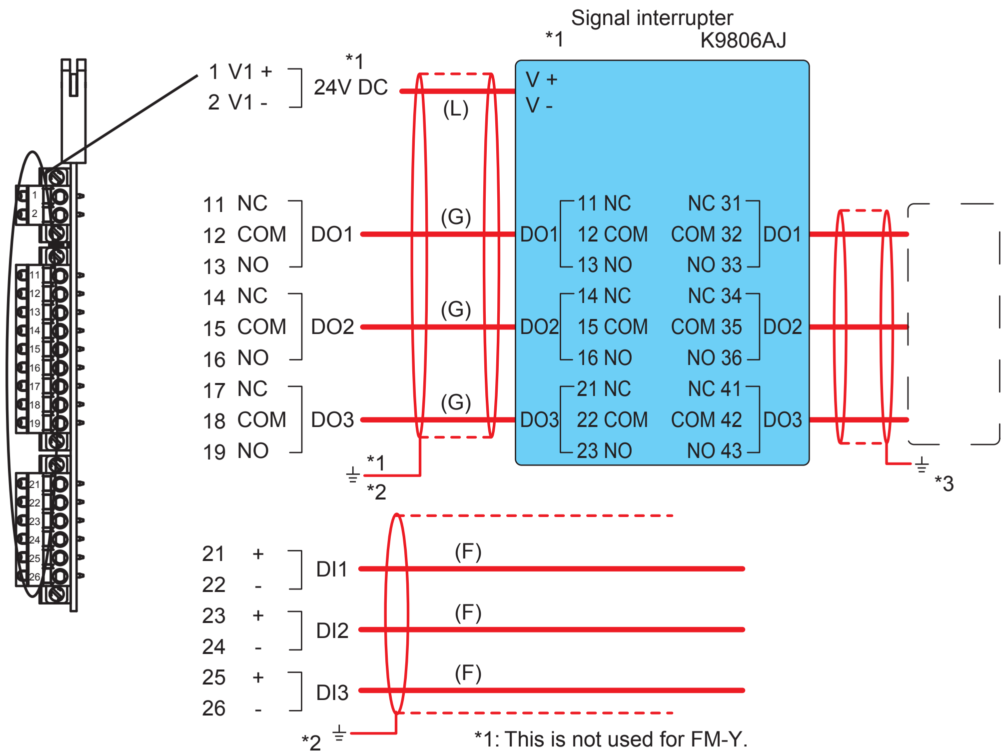
Figure 2.33 Wiring for a contact input/output card

The contact input/output card is labeled "DIO".

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

● Contact input/output (DC) (Code: 5) (F) (G) (L)



*1: This is not used for FM-Y.
*2: The ground wire is connected to the earth bar.
*3: The ground wire is connected to the earth terminal on site.

Figure 2.34 Wiring for a contact input/output card

The contact input/output card is labeled "DIO".

The external I/O cutoff output (power cutoff signal) (L) is also wired.

The shield is grounded at the earth bar in Figure 2.22. Remove the cover on the upper right of the electronics section and perform wiring.

3. Basic Operation and Startup

3.1 Checking the pressure in the pressurized enclosure

3

3.1.1 How to check the Status Indication of the Protection System

The LED (Green) of "POWER" is turned ON and the LED (Red) of "ALARM" is turned OFF when the pressure of the electronics section is in the normal condition. See Figure.3.1.

The pressurized enclosure is divided into "Electronics section" and "Isothermal oven". How to check the pressure in each enclosure is as follows.

<Electronics section>

WARNING

When the cover of the protection system is uninstalled, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.

The status of the protection system can be checked with the LEDs as shown in Figure 5.

The meaning of each LED is written on the status display.

POWER: ON when power is supplied to the protection system

PRESSURE: ON when the specified internal pressure is applied to the electronics section. This LED is ON in the normal condition. If the internal pressure becomes low, it turns off.

PURGING: ON when purging the electronics section. After purging, it turns off.

When power is supplied and “PRESSURE” LED is on, this LED turns ON and purging begins.

After the electronics section is purged for 21 ± 3 min, the LED turns off and power is supplied to the electronics section.

The LED is OFF in the normal condition after purging.

If purging ends incompletely, the status of purging is reset and purging begins again.

OVERRIDE: ON when the override function is activated.

<Isothermal oven>

If the internal pressure in the isothermal oven becomes low, the following alarms appear on the operation panel.

Top isothermal oven: Alarm for low internal pressure No. 112 “OVEN1 PRESS DOWN”

Middle isothermal oven: Alarm for low internal pressure No. 113 “OVEN2 PRESS DOWN”

Bottom isothermal oven: Alarm for low internal pressure No. 114 “OVEN3 PRESS DOWN”

Alarms are displayed on the “ASET” PC software for the specification without the operation panel on GC8000.

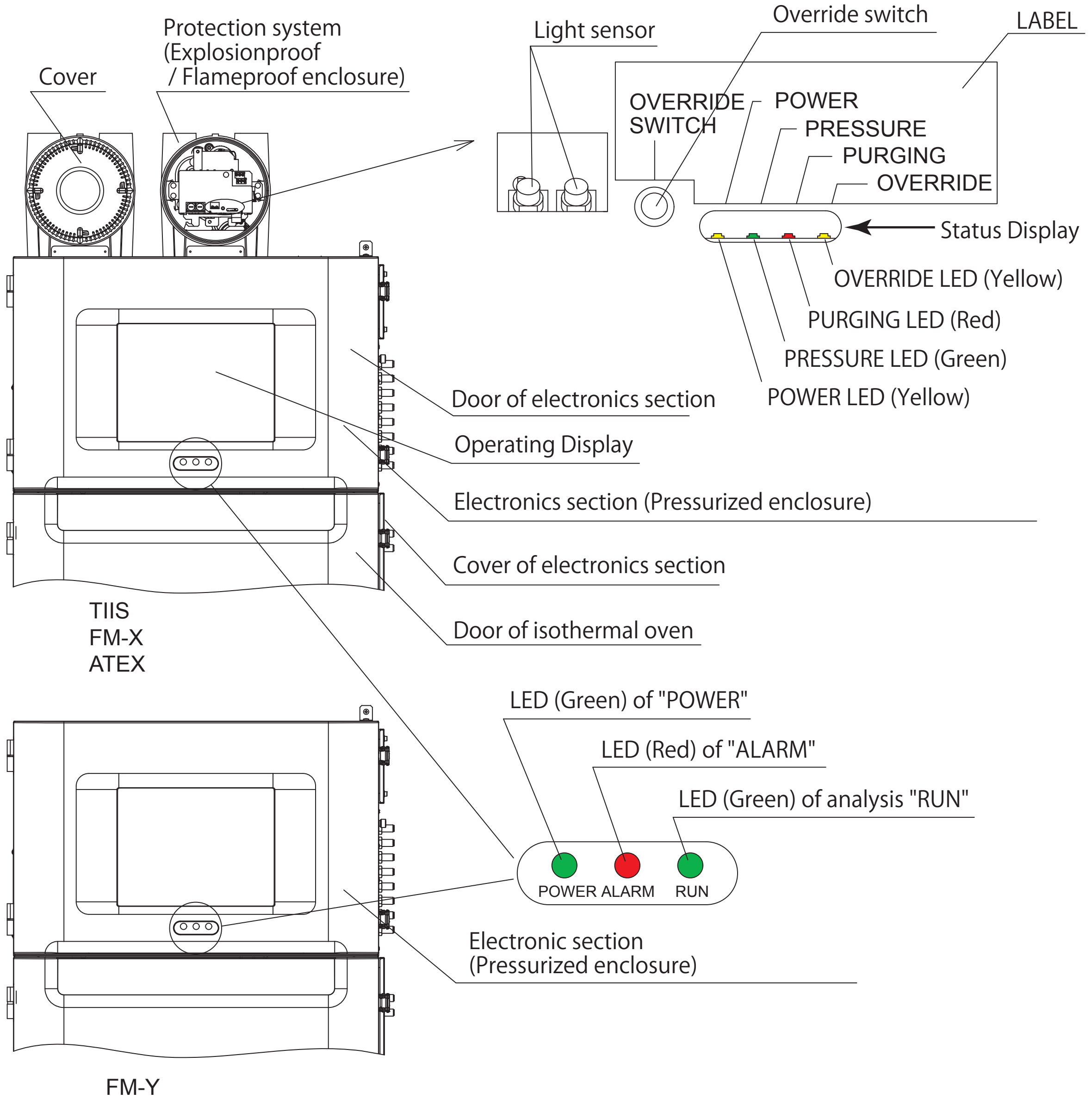

Cover
Protection system
(Explosionproof
/ Flameproof enclosure)
Light sensor
Override switch
LABEL
OVERRIDE
SWITCH
POWER
PRESSURE
PURGING
OVERRIDE
Status Display
OVERRIDE LED (Yellow)
PURGING LED (Red)
PRESSURE LED (Green)
POWER LED (Yellow)
Door of electronics section
Operating Display
Electronics section (Pressurized enclosure)
Cover of electronics section
Door of isothermal oven
TIIS
FM-X
ATEX
LED (Green) of "POWER"
LED (Red) of "ALARM"
LED (Green) of analysis "RUN"
POWER ALARM RUN
Electronic section
(Pressurized enclosure)
FM-Y

Figure 3.1

3.1.2 GC-HMI (Touch Panel)

■ Screen Layout

The display screen consists of three display areas:

(A) Caption banner: Shows various items of information on the GC-HMI.

(B) Navigation bar: Displays controls to change to different screens on the contents area, and content types.

(C) Contents area: Displays operations and status of the GC8000.

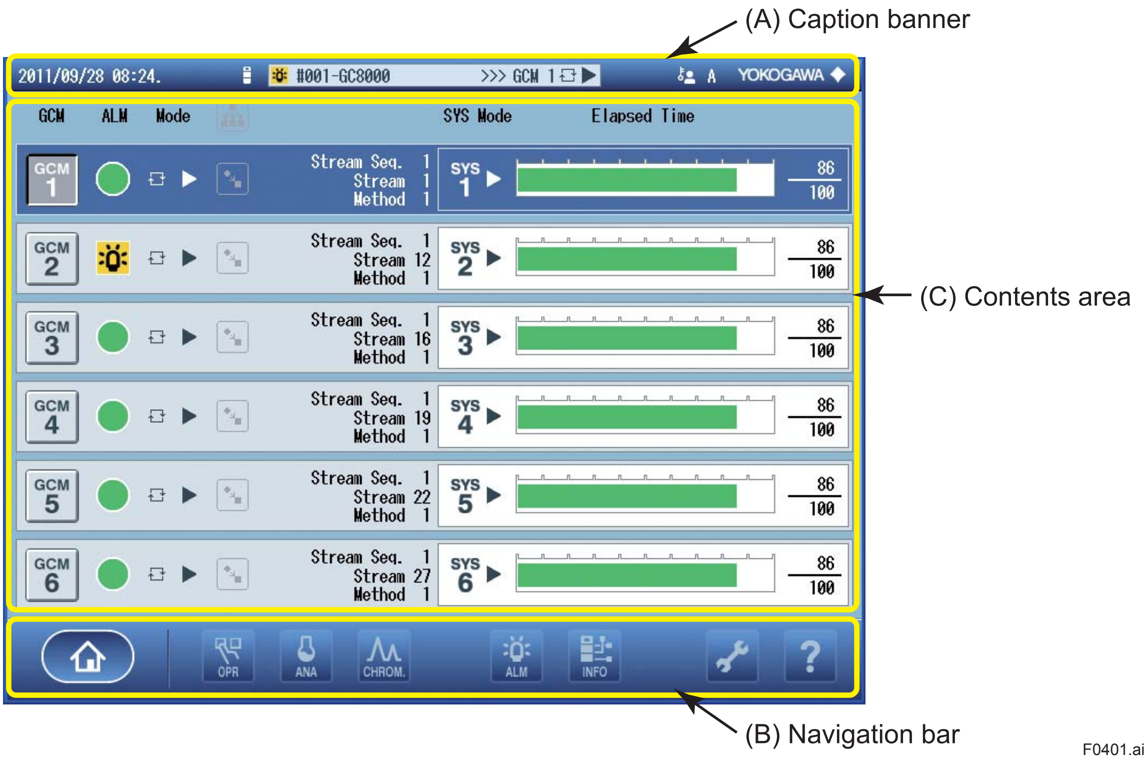


Figure 4.1 Screen Layout

(A) Caption banner

This banner shows various items of information on the GC-HMI. It is displayed on almost all screens.

Figure 4.2 Items Displayed on the Caption Banner

Table 4.1 Items Displayed on the Caption Banner

Symbol	Item	Description
(1)	Date/time	Displays the current date and time (year, month, day, hour, minute) of the GC8000. This item is hidden when the EtherLCD is connected.
(2)	Type of connected analyzer	Indicates the type of the currently connected GC8000. Currently connected to the GC8000 equipped with the GC-HMI being operated on. (Note: This icon is also displayed when no analyzer is connected.) Currently connected to any other GC8000.
(3)	Overall alarm	Indicates an overall alarm. No alarm Level-1 alarm (blinking) Level-2 alarm (blinking)
(4)	Tag name of GC8000	Indicates the tag name of the currently connected GC8000. The name may be up to 16 ASCII characters long. The tag name and analyzer number of the CG8000 are indicated while the GC8000 is connected. This item is hidden when no connection is made.
(5)	Active GCM number	Indicates the active GCM number (GCM1 to GCM6). This item is hidden when no connection is made.
(6)	Analyzer status	Indicates the current operating status of the analyzer. This item is hidden when no connection is made. Manual Process
(7)	Operating mode	Indicates the current operating mode. This item is hidden when no connection is made. Run Pause Stop
(8)	DB changed	Indicates that the initial database of the GC-HMI is different from the one set on the GC8000. (The indication blinks.) Usually, this item is hidden.
(9)	User level	Indicates the user level (A, B, C, or C+). This item is hidden when the EtherLCD is connected.

(B) Navigation bar

The navigation bar allows for navigation between different screens.

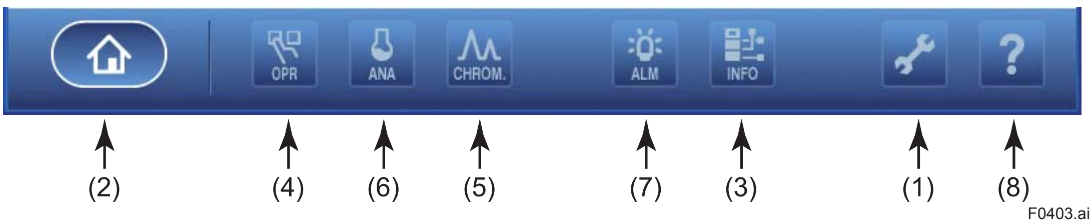


Figure 4.3 Navigation Bar

Table 4.2 **Navigation Bar**

Symbol	Description	Reference
(1)	Navigates to the setting screen.	4.1 Setting Screen
(2)	Navigates to the analyzer overview screen. This item is only displayed when the GC8000 is connected.	4.2 Analyzer Overview Screen
(3)	Navigates to the analyzer map screen. This item is only displayed when the GC8000 is connected.	4.3 Analyzer Map Screen
(4)	Navigates to the analyzer operation screen. This item is only displayed when the GC8000 is connected.	4.4 Analyzer Operation Screen
(5)	Navigates to the chromatogram screen. This item is only displayed when the GC8000 is connected.	4.5 Chromatogram Screen
(6)	Navigates to the analysis result screen. This item is only displayed when the GC8000 is connected.	4.6 Analysis Result Screen
(7)	Navigates to the alarm screen. This item is only displayed when the GC8000 is connected.	4.7 Alarm Screen
(8)	Navigates to the help screen. Provides a description of the icons displayed on the currently selected screen: one of (1) to (7).	4.8 Help Screen

3.1.3 How to Check the Temperature at Each Part

(1) When the icon (4) on the navigation bar is pressed (see Figure 3.4), the analyzer operation screen is displayed.

(2) The SYS tab with the oven to be checked is selected.

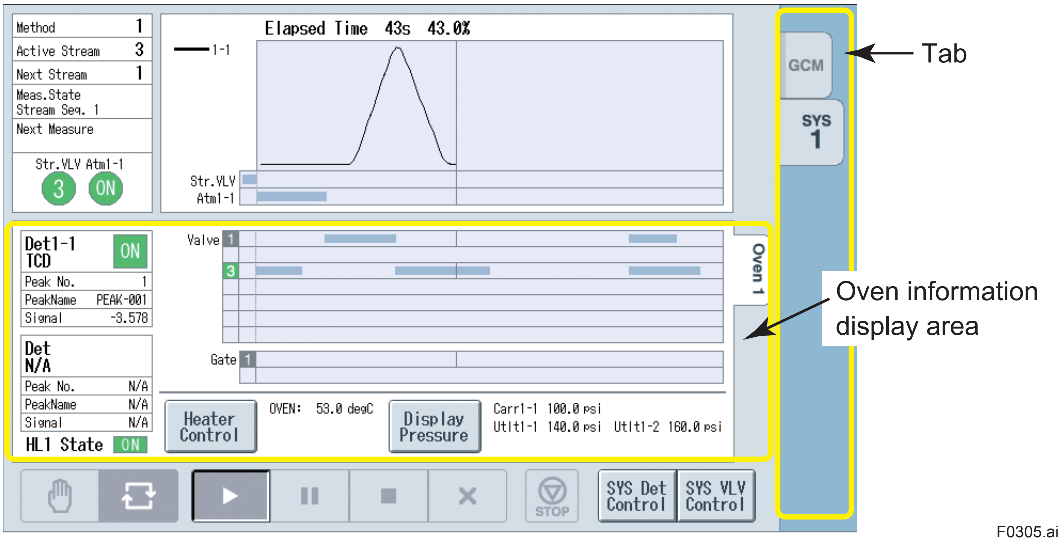


Figure 3.5 SYS Tab Layout

(3) The temperature information can be checked. Refer to figure 3.6.

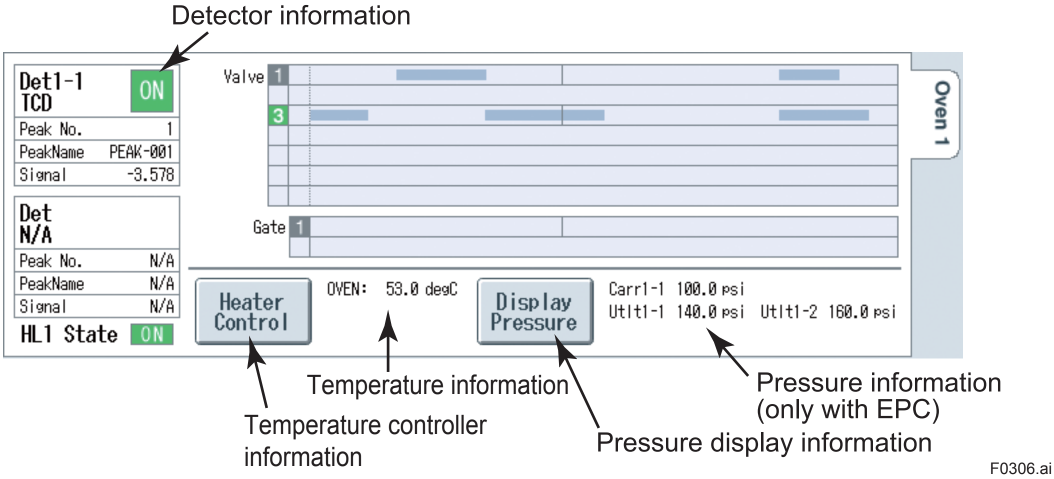


Figure 3.6 Example of Oven Information Display Area

(4) When Heater Control is pressed, the set temperature, present temperature, and heater ON/OFF status of the isothermal oven, LSV, and FPD, are indicated.

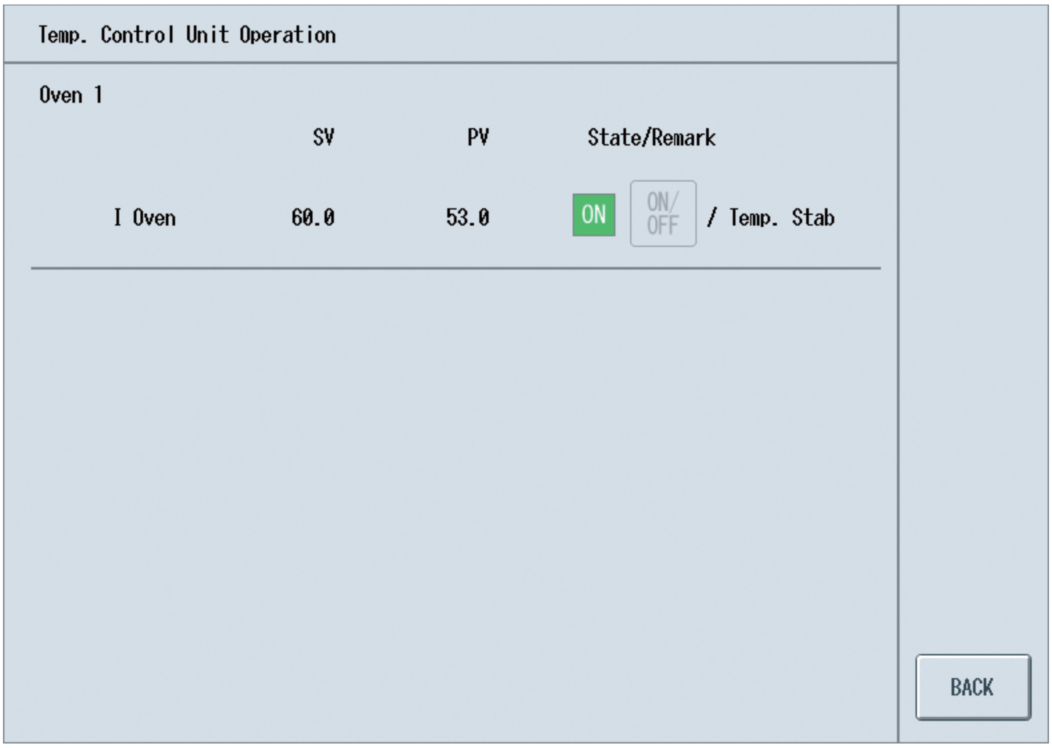


Figure 3.7

3.1.4 How to Check the Operating Status of the Detector

(1) The SYS tab with the detector to be checked is selected.

(2) The detector information can be checked. Refer to figure 3.6.

(3) When SYS Det Control is pressed, the following information are indicated

Input signal: The analog signal from the detector, which has been sampled every 40 msec, converted to digital values, and then averaged by the given sample rate

Filtered signal: Input signal, which has been filtered using the filter constant set as a detector signal parameter

Standard deviation of signal: Standard deviation of input signal for the past 20 inputs
Applied voltage: Bridge voltage of TCD (for TCD only)
Current: Bridge current of TCD (for TCD only)
Flame detection level: Set value of flame detection level (FID, FID-MC, FPD)
Thermocouple signal: Thermocouple signal (FID, FID-MC, FPD)
Flame detection status: Flame detection status (now burning/burning stopped) (FID, FID-MC, FPD)
Methanizer voltage: Voltage of methanizer (for FID-MC only)

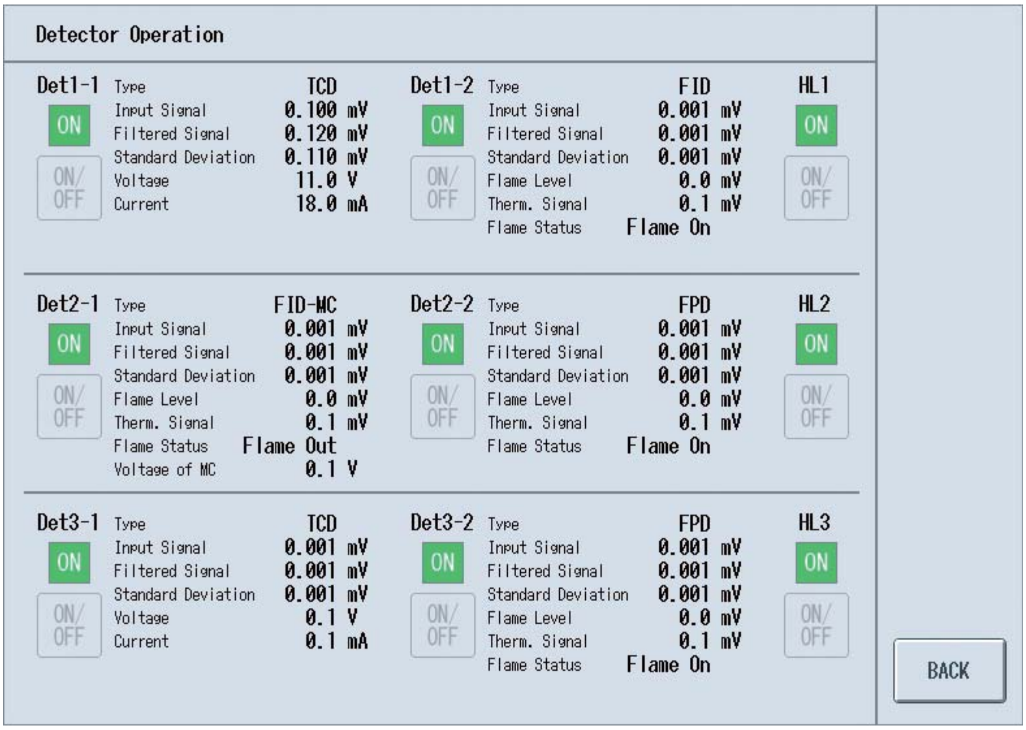


Figure 3.8

3.1.5 How to Measure/Set the Pressure and Flow Rate of Various Gases

The GC8000 uses gases such as a carrier gas, combustion gas for FID/FPD, and combustion air for FID/FPD.

Normal analysis cannot be expected unless the specified value is set for each gas.

While measuring the flow rate in a way described below, set the values according to the "Operation Data."

The pressure of each gas can be checked by pressure gauges on the Flow Control unit.

The flow rate of each gas can be checked by the flow meter and adjusted by the pressure regulator or restrictor.

With EPC (Electric Pressure Controller)

(1) The SYS tab with the EPC to be checked is selected.

(2) The pressure information can be checked. Refer to figure 3.6.

(3) When 

is pressed, the set pressure, present pressure, and EPC ON/OFF status of the Carrier n-n-1 to n-4 and Utility n-1 to n-4 are indicated.

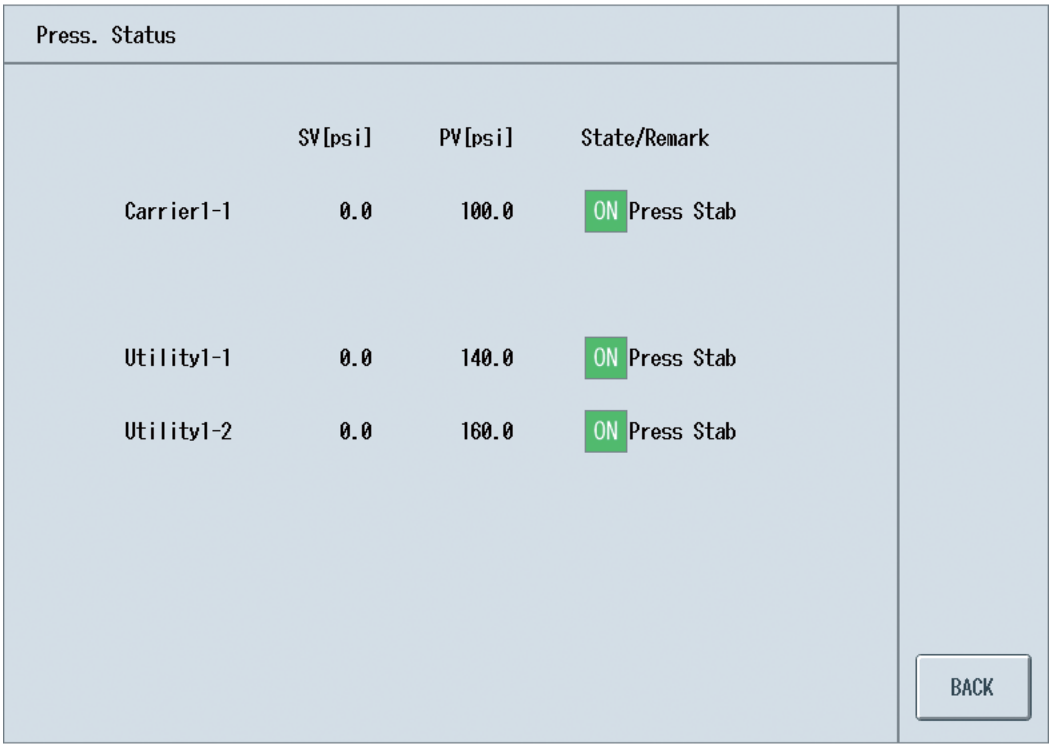


Figure 3.9

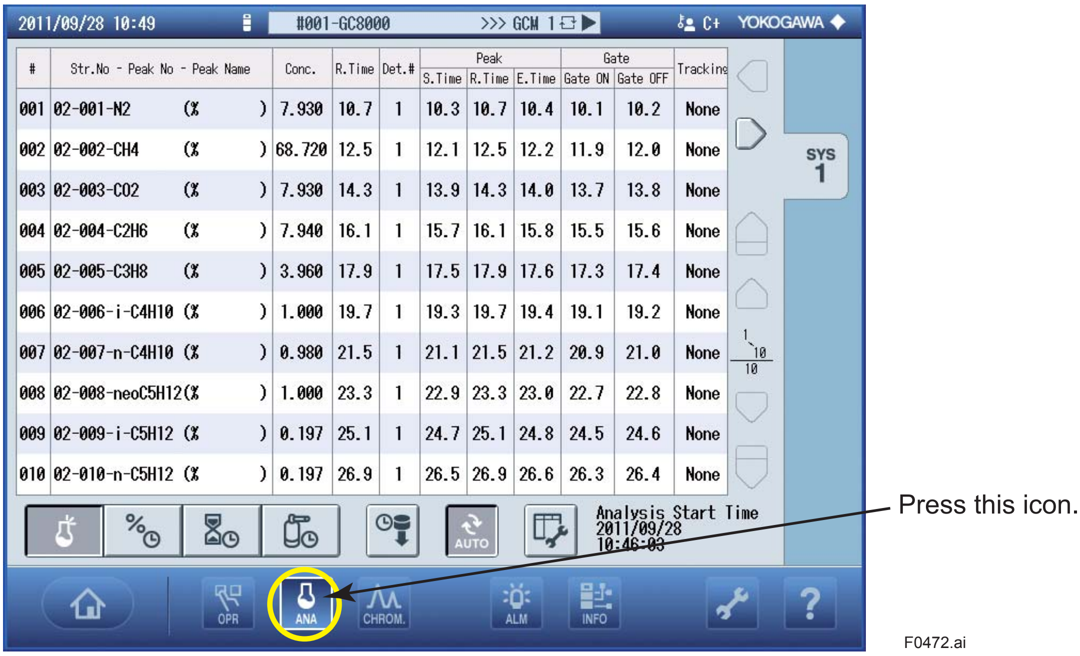
NOTE

Measure the pressure and flow rate of each gas after the temperatures of the isothermal oven have fully stabilized. If the temperature is low, the pressure is likely to be higher. The time required for the temperature to stabilize depends on the set temperature: the isothermal oven with the temperature of below 146°C requires 2 to 4 hours, and the one with the temperature of at or above 146°C requires 4 to 8 hours. For the FID or FPD detector, the “Therm signal” on the Detector Status screen becomes 0 mV after the temperature of the isothermal oven has stabilized (see Figure 3.8). See Section 3.1.4, “How to Check the Operating Status of the Detector”.

For the FID and FPD, a carrier gas, combustion gas, and combustion air are discharged together from the DET vent. Therefore, before measurement close the primary valves of cylinders of gases that are not to be measured. For the FID and FPD, supplying the gas may simply result in natural ignition. In the Flame on status, condensation forms on the vent line and the “Therm signal” on the Detector Status screen indicates 2 to 6 mV. Measure the gas flow rate under the condition that the “Therm signal” is 0 mV.

3.1.6 How to Check the Analysis Result

When the icon (6) on the navigation bar is pressed (see Figure 3.4), the analysis result screen is displayed.



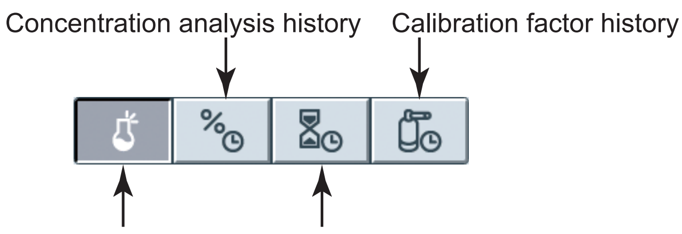
F0472.ai

Figure 3.10 Example of Analysis Result Screen

The display screen consists of the following screens:

Analysis result screen
Concentration analysis history screen
Retention time history screen
Calibration factor history screen

The above screens are displayed by pressing the corresponding buttons located in the lower left of the screen:



F0473.ai

Figure 3.11 Buttons for Analysis Result Screens

■ Analysis Result Screen

Screen components are as shown below.

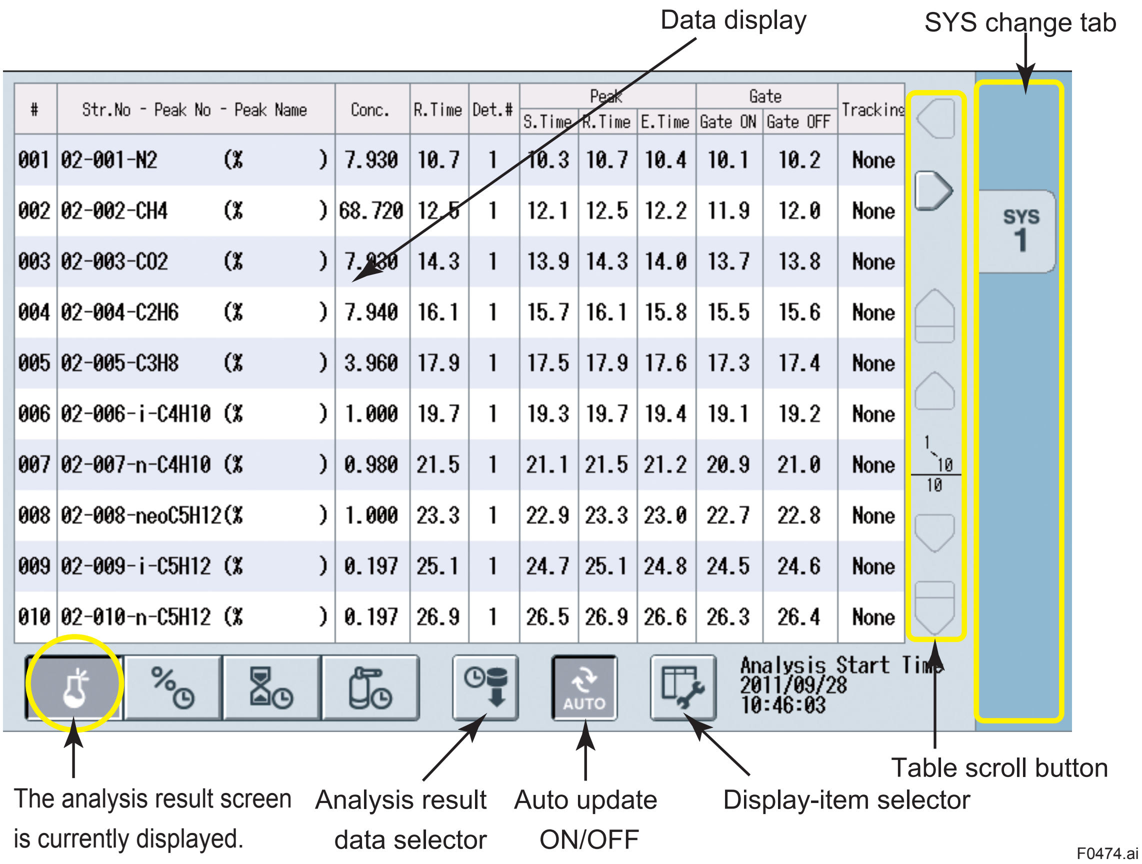


Figure 3.12 Analysis Result Screen Layout

SYS change tab:	Selects the SYS assigned to the active GCM and displays the analysis results on the SYS tab.
Table scroll button:	Scrolls through the display area.
Auto update ON/OFF:	When the auto update function is ON, the on-screen data is automatically updated with the latest data when the measurement finishes. When the auto update function is OFF, data update does not occur.
Analysis result data selector:	Allows for displaying past data. A dialog appears for selecting the start time of the analysis to be displayed. See (A) Selecting analysis result data.
Display-item selector:	A dialog appears, allowing to select which items to display in the data columns. See (B) Selecting display items.

(A) Selecting analysis result data

To select the data to be displayed, select the year/month/day, hour, and time from the dialog below.

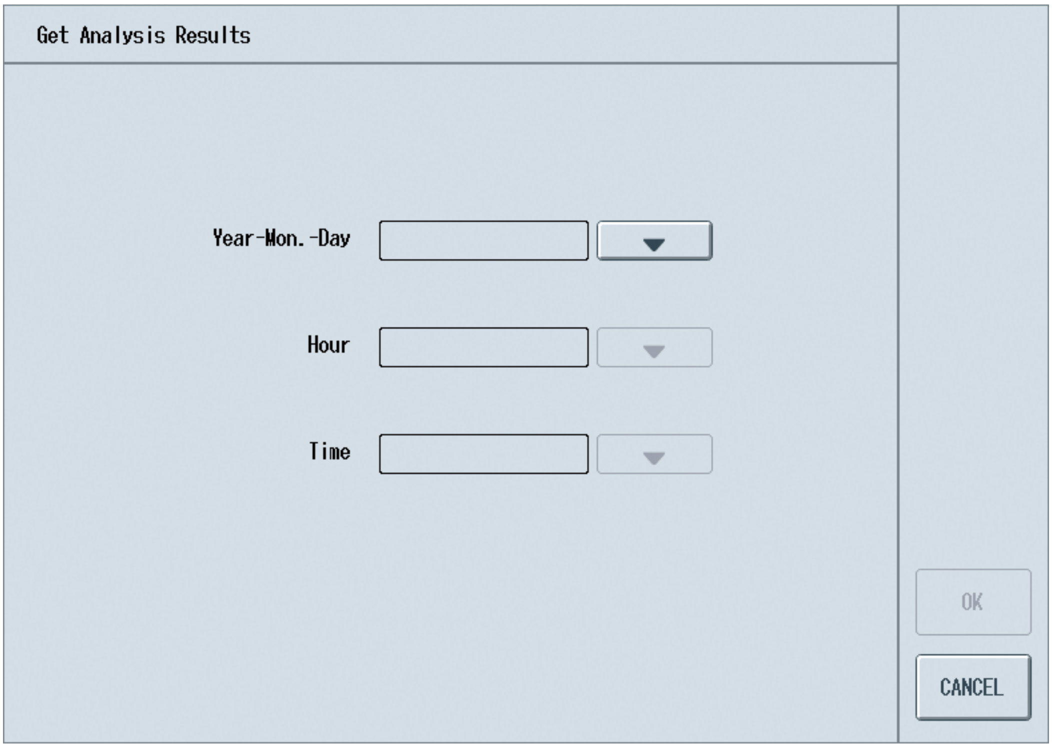


Figure 3.13

(B) Selecting display items

In the dialog below, select the items to be displayed as analysis result data, by adding a check mark.

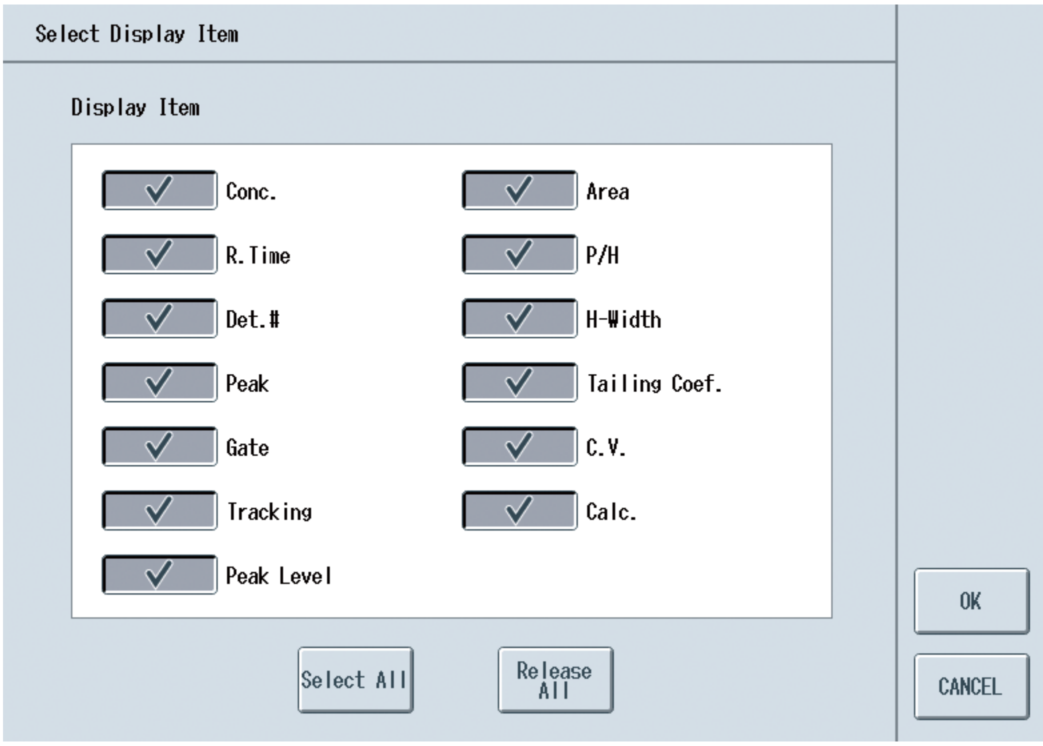


Figure 3.14

■ Concentration Analysis History Screen, Retention Time History Screen, and Calibration Factor History Screen

A common screen layout is used for the concentration analysis history screen, retention time history screen, and calibration factor history screen.

These screens display the changes over time of concentration analysis data, retention time data, and calibration factor data, respectively, as measured by the active GCM.

Each screen can contain up to 999 peaks. The maximum displayable number of analysis clock times is limited to 250 for concentration analysis history and retention time history, and to 100 for calibration factor history.

Screen components are as shown below.

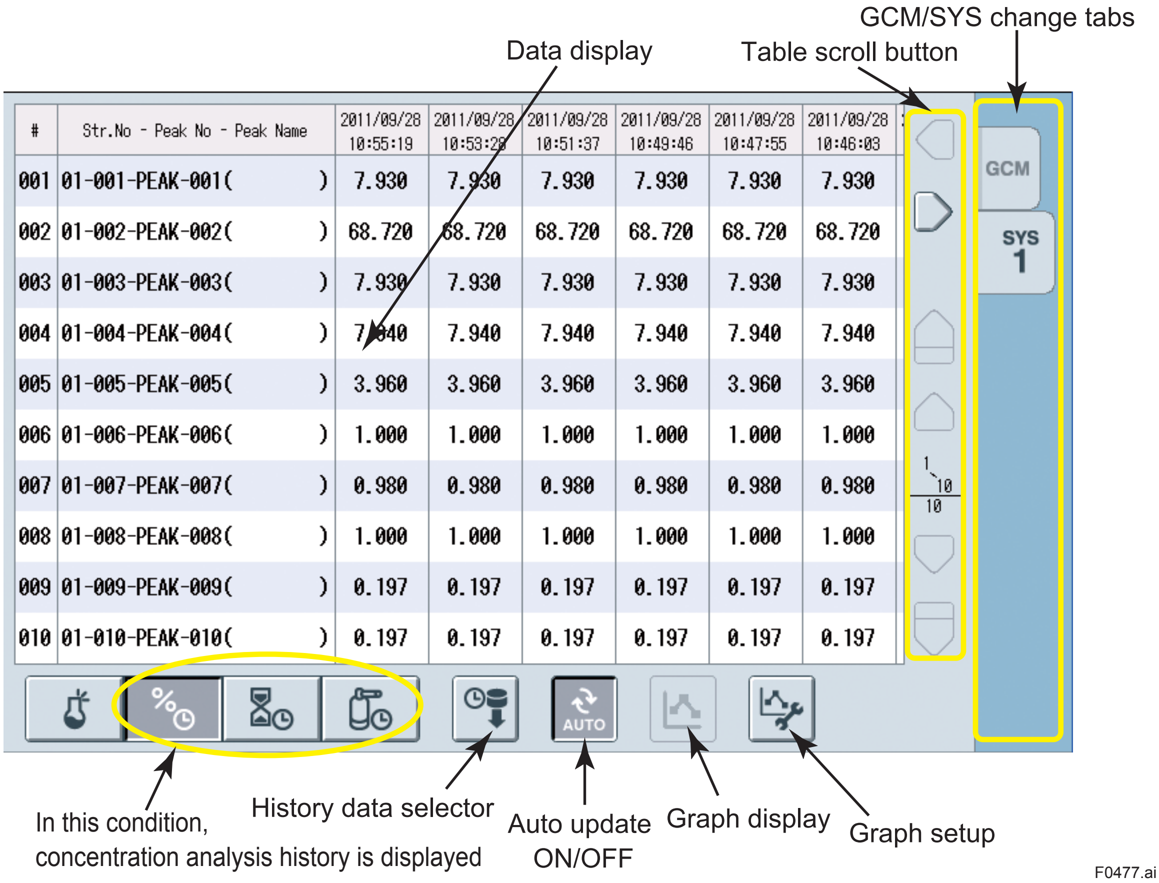


Figure 3.15 History Screen Layout

GCM/SYS change tabs:	Either the whole of active GCM, or the SYS assigned to the active GCM, can be selected, so that the history data is displayed on the SYS tab.
Table scroll button:	Scrolls through the display area.
Auto update ON/OFF:	When auto update is ON, the on-screen data is automatically updated with the latest data when the measurement finishes. When auto update is OFF, data update does not occur.
Graph setup:	Sets up a graph of the data to be displayed.
Graph display:	Displays the graph configured with the graph setup function.

3.1.7 How to Check the Alarm

There are three levels of alarms for the GC8000. These three levels are explained below. For details, refer to Section 7.1 "Alarm Message".

- **Level 1:**

An alarm if a system or hardware failure occurs. Once the alarm is generated, the alarm status will be held until the alarm is reset.If a level-1 alarm is generated during the Run mode, the operation mode changes to Stop after an ongoing measurement has been completed.

- **Level 2:**

An alarm if a failure in the measurement conditions occurs. Once the alarm is generated, the alarm status will be held until the alarm is reset. The analysis is ongoing.

- **Component:**

An alarm if a measurement result such as concentration and retention time becomes out of the specified range. Once the alarm is generated, the alarm status will be held until the alarm is reset. The analysis is ongoing.

- **Level 3:**

An alarm for signalling a minor error besides level-1 and level-2 alarms or for information. The alarm status is not be held.

When the ALARM key is pressed, the Alarm Status screen (Figure 1.17) appears.

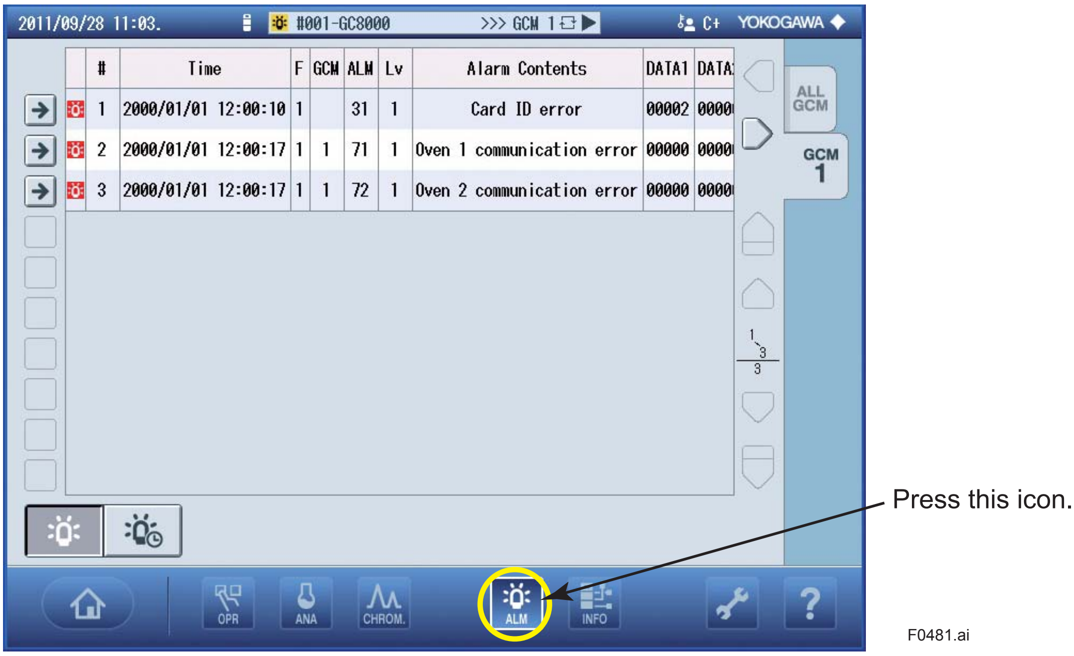


Figure 3.16 **Example of Alarm Screen**

The alarm screen consists of the following screens:

Alarm status screen
Alarm history screen
Alarm details screen

■ Alarm Status Screen

Screen components are as shown below.

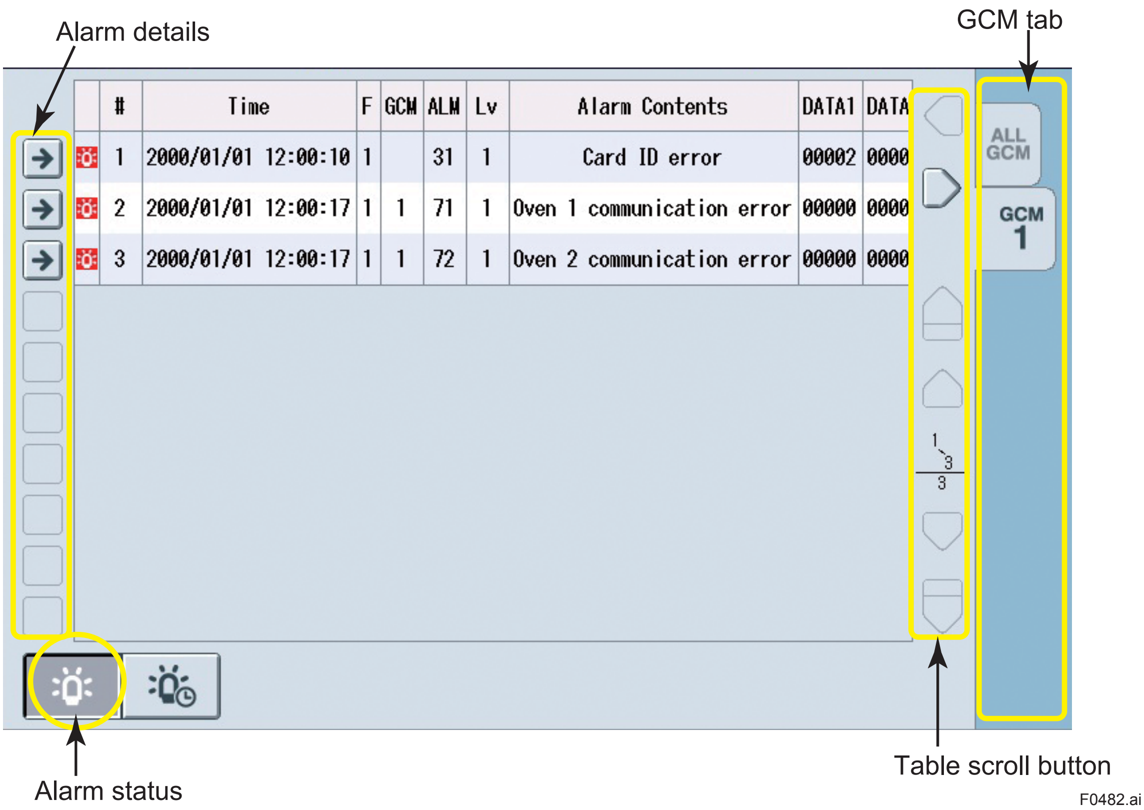


Figure 3.17

Pressing the alarm status button on the lower left of the screen causes a transition to the alarm status screen.

This screen displays the alarms which are current with the GC8000, either for all GCMs or for each GCM.

Pressing the table scroll button causes scrolling through the table display area.

Pressing the alarm details button displays the alarm details screen. See 4.7.3 Alarm Details.

■ Alarm History Screen

Screen components are as shown below.

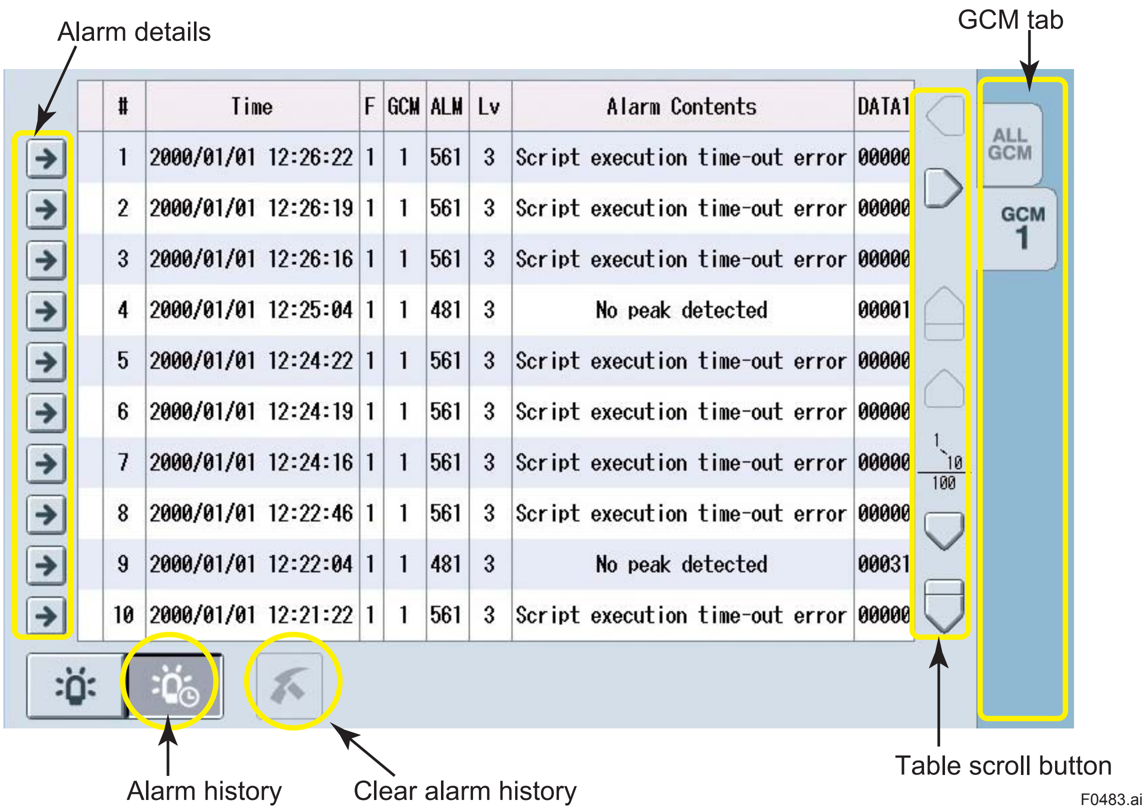


Figure 3.18

Pressing the alarm history button on the lower left of the screen causes a transition to the alarm history screen.

This screen displays a history of alarms which occurred with the GC8000 until the alarm display is requested, either for all GCMs or for each GCM.

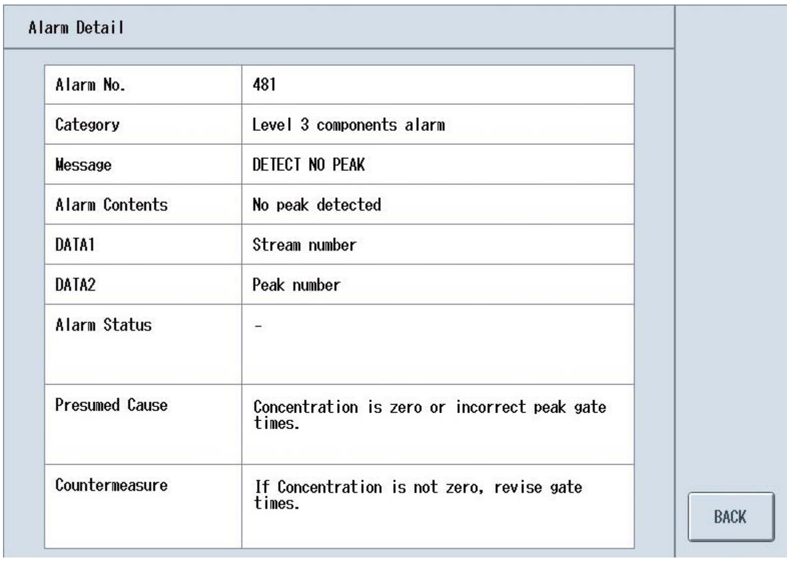
Pressing the table scroll button causes scrolling through table display area.

Pressing the clear alarm history button erases the alarm history. This operation is available if the user level is set to B or higher.

Pressing the alarm details button displays the alarm details screen. See Alarm Details.

■ Alarm Details

The alarm details screen displays details of alarms.



Alarm Detail

Alarm No.	481
Category	Level 3 components alarm
Message	DETECT NO PEAK
Alarm Contents	No peak detected
DATA1	Stream number
DATA2	Peak number
Alarm Status	-
Presumed Cause	Concentration is zero or incorrect peak gate times.
Countermeasure	If Concentration is not zero, revise gate times.

Figure 3.19

3.1.8 How to Check the Chromatogram

When the icon (5) on the navigation bar is pressed (see Figure 3.4), the Chromatogram screen is displayed.

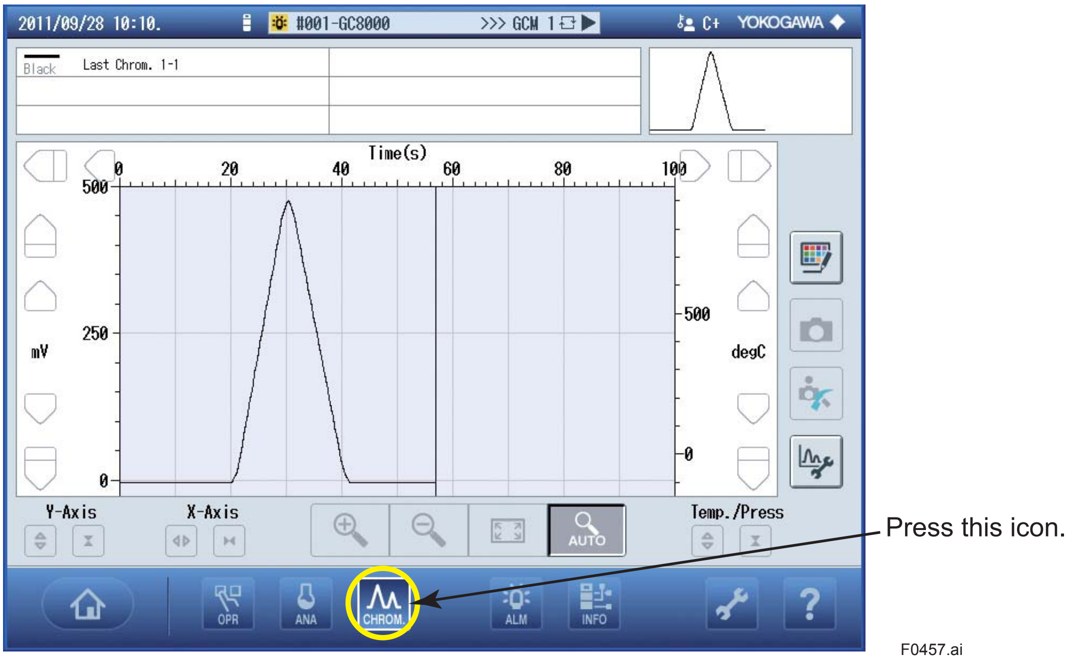


Figure 3.20 Example of Chromatogram Screen

Screen description

Screen components are as shown below.

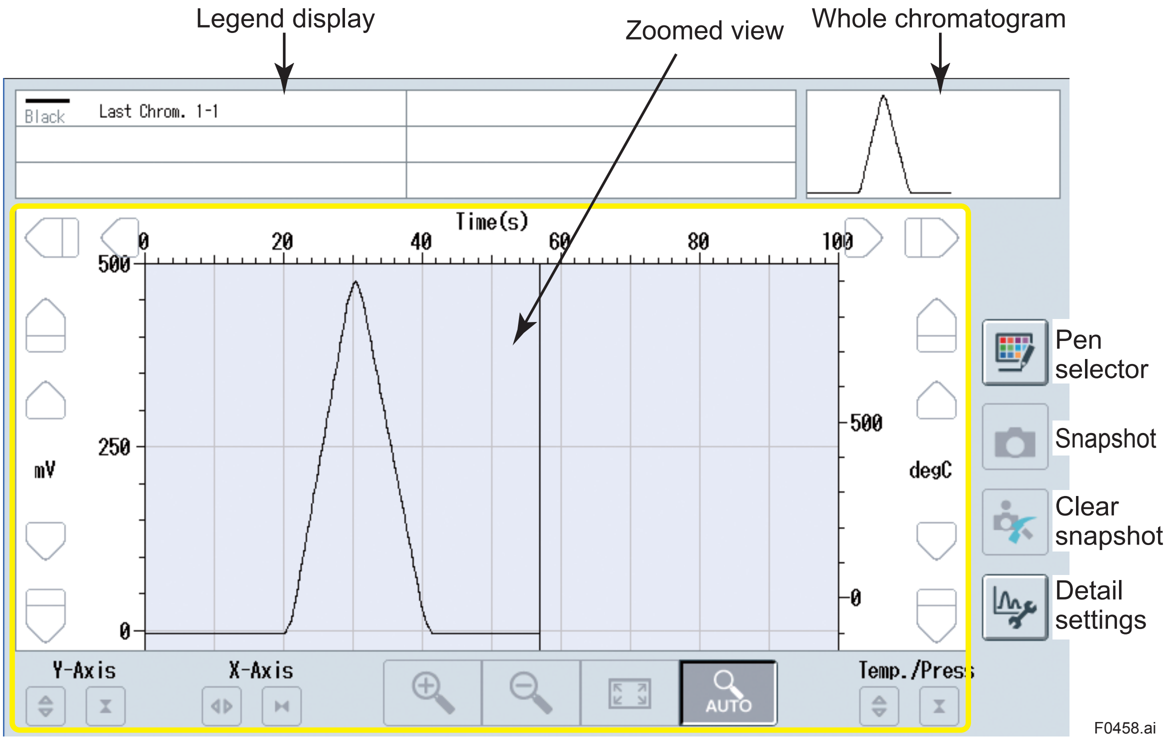


Figure 3.21 Chromatogram Screen Layout

Legend display: Indicates pen color, chromatogram type, and detector number.

Whole chromatogram display area:
Displays the whole chromatogram, including portions which are not shown in the zoomed view.

Pen selector: Configures the graph to be displayed. See 4.5.1 Pen Selector.

Snapshot: Records the magnification and position of zoomed view. See 4.5.2 Snapshot.

Detail settings: Provides detail settings of the chromatogram screen. See 4.5.3 Detail Settings.

Zoomed view area: Displays a zoomed view of a selected part of the chromatogram. The chromatogram includes gate mark, peak mark, peak number, as well as the temperature and pressure data for the chromatogram. See 4.5.4 Zoomed View.

3.2 Startup

3.2.1 Preparation and check before the power is supplied

Prepare and confirm the following items before the power is supplied.

For the status of installation, wiring, piping, and the setting of operation conditions, see Chapter 2 Installation, Piping, and Wiring, the Delivery specifications, and the Operation data.

(1)Checking the status of installation

Confirm that the main body and the external sampling unit satisfy the requirements of Chapter 2 Installation, Piping, and Wiring. Confirm that there is no damage during transportation.

(2)Preparation and check of accessory equipment

Check accessory equipment required for operation, such as gas cylinders (carrier gas, combustion hydrogen or makeup gas, and standard gas), air, and steam. When the fill pressure of carrier gas, combustion hydrogen or makeup gas is 1 MPa or less, or that of standard gas is 5% or less of the maximum value, prepare a new cylinder.

Confirm that utilities such as gases and purge air satisfy the requirements in the Delivery specifications.

(3)Checking external piping

- Connect a pipe after having let air flow through it (air purge) to confirm that there is no stain in it.
- Confirm that the material and bore diameter of a pipe are equal to those described in the Installation manual.
- Confirm that all piping is equal to that described in the Operation data.
- Use leak detecting liquid (such as Snoop manufactured by Swagelok) to confirm that there is no leak from joints after piping.
- Before heating a sample with steam, confirm that steam piping and thermal insulation have been attached properly to the sample piping.

IMPORTANT

Do not use a pipe or joint possibly stained with oil. Since stain such as metal powder may adhere in a pipe just after constructed, purge it thoroughly with air, etc. before connecting it to GC8000.

The main body may be filled with gas to protect columns. When leaving the startup work up to service persons, do not remove the sealing plug from the main body.

(4)Checking the status of wiring

Confirm that power supply wiring, signal wiring, and earth wiring have been connected properly in reference to the terminal wiring chart in the Delivery specifications and Operation data.

WARNING

Always use attached cable packing fittings at the wiring work of the TIIS explosionproof specification.

The use of fittings other than attached cable packing fittings does not satisfy the TIIS explosionproof specification.

IMPORTANT

During wiring work, take enough care to prevent a cable from touching a part (such as a relay) in the equipment to cause damage to it.

CAUTION

If the sealing at the inlet of a cable is not proper, the internal pressure of the pressurized enclosure does not rise and the power is not supplied to the electronics section.

(5)Mounting columns

The equipment is shipped with a megabore column and capillary column removed to avoid damage during transportation.

Mount a column delivered as an accessory. When mounting a column, do correct wiring in reference to the Operation data.

Use leak detecting liquid (such as Snoop manufactured by Swagelok) to confirm that there is no leak from joints of the carrier gas line after carrier gas has been supplied.

(6)Checking the inside

Confirm that there is no loosening of piping, dropping-out of connectors, and loosening of screws in the main body.

(7)Supplying air

Start the supply of instrument air.

IMPORTANT

Confirm that the supply pressure is equal to the value described in the Specifications. If the supply pressure is low, the internal pressure of the pressurized enclosure does not rise and the power is not supplied to the electronics section.

(8)Supplying steam

Start the supply of steam if steam is used at the sample process section. Confirm that the steam pressure is equal to the value described in the Specifications.

(9)Supplying gases

Start the supply of gases (carrier gas, combustion hydrogen for FID or FPD, etc.)

Confirm that the supply pressure is equal to the value described in the Specifications. After the indications of the pressure gauge, flow rate, and the temperature of the isothermal oven of GC8000 have become stable, confirm that they are equal to the values described in the Operation data.

NOTE

While the power supply is cut, the supply of hydrogen gas into the isothermal oven is stopped according to the explosionproof standard. To supply hydrogen gas, it is necessary to turn on the hydrogen limiting unit on the analyzer operation screen after the power has been supplied.

Multiple hydrogen limiting units can be used depending on the specifications.

IMPORTANT

Since a pressure of higher than 1 MPa may damage GC8000, follow the procedure below when supplying gas from a cylinder:

(1) Shut the regulator of the cylinder.
(2) Confirm that the secondary pressure of the regulator is zero.
(3) Open the main valve of the cylinder gradually.
(4) Set the secondary pressure of the regulator to 700 kPa.
(5) For hydrogen gas, set the secondary pressure of the regulator to 500 kPa. The explosionproof standard requires the supply pressure of hydrogen gas to be 500 kPa.

3.2.2 Power supply

Follow the procedure below when supplying the power.

● FM-X, ATEX, TIIS

<Power on>

(1) Power is supplied to the protection system (flameproof enclosure).
(2) Protective gas (air) is supplied to the protective gas (Purging air) inlet.
(3) When the internal pressure in the electronics section, which is both the control unit and oven unit, exceeds 392 ±20 (Pa), purging to the electronics section begins.
(4) After 21 ±3 minutes purging, power is applied to the electronics section both of the control unit and oven unit. On the other hand, it does not be applied to the heater and detector in the oven yet.
(5) When the internal pressure in the oven unit exceeds 392 ±20 (Pa), purging to the oven unit begins.
(6) After the purging time as follows, power is applied to the heater and detector in the oven. The purging time depends on the flameproof certifications.

TIIS, FM:	9 ±2.5 minutes
ATEX:	11 ±3 minutes

● FM-Y

<Power on>

(1) Protective gas (air) is supplied to the protective gas (Purging air) inlet.
(2) The pressure value is checked if it is indicated the specified one at the pressure gauge.
(3) Power is supplied to the electronics section of the control unit.
(4) When the internal pressure in the electronics section, which is both the control unit and oven unit, exceeds 392 ±20 (Pa), purging to the electronics section begins.
(5) After 21 ±3 minutes purging, power is applied to the electronics section both of the control unit and oven unit. On the other hand, it does not be applied to the heater and detector in the oven yet.
(6) When the internal pressure in the oven unit exceeds 392 ±20 (Pa), purging to the oven unit begins.
(7) After 9 ±2.5 minutes the purging, power is applied to the heater and detector in the oven.

IMPORTANT

Confirm as daily inspection that the pressure gauge of the electronics section in the pressure control section indicates the specified pressure.

3.2.3 Operation after supplying power

This section describes preparatory work before measuring process or standard samples.

(1)Setting day and hour

Since GC8000* (in TIIS explosionproof specification) does not keep the day/hour settings, always set the day and hour after supplying power.

● Setting hour

The setting procedure is as follows:

(1) Change the user level.
(2) Press the button (4) in the navigation bar on the analyzer operation screen (Figure 3.4).
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press the button (1) in the navigation bar on the analyzer operation screen.
(6) Press EtherLCD in the General setting.
(7) Set the passward.
(8) Press Table and select the System setting.
(9) Enter the day and hour and press Set/Ent key.
(10) Press the key Close EtherLCD.

(2)Checking the set values

The set values are described in the Operation data. Confirm that all items are equal to the values described in the Operation data.

● Checking the set values

The procedure for confirming the set values is as follows:

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press the button (1) in the navigation bar on the analyzer operation screen.
(6) Press EtherLCD in the General setting.
(7) Set the passward.
(8) Press Table. The set values are described along the items on the Table menu screen. Confirm that all items are set as described in the Operation data.
(9) Press the key Close EtherLCD.

NOTE

- Even if the set item of the calibration/validation method has been set to Auto, it changes to Manual since turning Off/On the power of the main body requires the setting of automatic start time again.

  When confirming the set value of the item, set the set item of the calibration/validation method to Auto, and reenter start time.
- When a set value has been changed, load the initial database again to make the set information of GC-HMI agree with that of GC8000.

● Procedure to make the set information of GC-HMI agree with that of GC8000

The procedure to make the set information of GC-HMI agree with that of GC8000 is as follows:

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press the button (1) in the navigation bar on the analyzer operation screen.
(6) Press the Initial DB reload of GC8000 and the message “Do you execute the Initial DB reload?” appears on the screen, and then press Yes.

(3)On/Off operation of the hydrogen limiting unit

The procedure to supply hydrogen gas into the isothermal oven is as follows:

● Turning on the hydrogen limiting unit

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press GCM DET Control in the GCM tab.
(6) Press ON/OFF under HL* and the message “Turn on” appears on the screen, and then press Yes. Press ON/OFF again to turn it off.

(4)Start/Stop operation of the temperature control of an oven

The ovens (isothermal oven, programmed temperature oven, LSV, and FPD) are off even after the power is supplied. However, the detector is turned on automatically after the power-on if the Automatic operation setting of the System setting has been set to Yes.

The procedure to operate the temperature control of an oven is as follow:

● Starting the temperature control of an oven

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press the Temperature controller operation in the SYS tab.
(6) Press ON/OFF of the temperature controller to be started and the message “Turn on” appears on the screen, and then press Yes. Press ON/OFF again to turn it off.

(5)Additional tightening of LSV

Tighten LSV additionally by 1/8 turn with an LSV hook spanner wrench after the temperature of the isothermal oven has become stable.

(6)Supplying combustion hydrogen or makeup gas and combustion air

This applies to FID, FID with a methanizer, or FPD.

Start the supply of combustion hydrogen or makeup gas and combustion air. Set the pressure according to 1.5 Methods of Measuring and Setting the Pressure and Flow Rate of Gases. Finally decide on pressure and flow rate after the temperature of the isothermal oven has become stable.

NOTE

While the power supply is cut, the supply of hydrogen gas into the isothermal oven is stopped according to the explosionproof standard.

IMPORTANT

Since a pressure of higher than 1 MPa may damage GC8000, follow the procedure below when supplying gas from a cylinder:

(1) Shut the regulator of the cylinder.
(2) Confirm that the secondary pressure of the regulator is zero.
(3) Open the main valve of the cylinder gradually.
(4) Set the secondary pressure of the regulator to 700 kPa.
(5) For hydrogen gas, set the secondary pressure of the regulator to 500 kPa. The explosionproof standard requires the supply pressure of hydrogen gas to be 500 kPa.

When using instrument air as combustion air, set the supply pressure 100 kPa higher than the set pressure of combustion air described in the Operation data.

(7)Confirming flow rate of various gases

Confirm that the flow rates of various gases are equal to the values described in the Operation data.

3.2.4 On/Off operation of detectors

The detectors of GC8000 are off even after when the power is supplied. However, the detector is turned on automatically after the power-on if the Automatic operation setting of the System setting has been set to Yes.

The On/Off operation differs for each detector. The On/Off operation method and notes for each detector are as follows:

Only TCD can be turned off. FID and FPD stop combustion and are turned off only when the supply of combustion hydrogen or combustion air is cut while the alarms of DET1-1 FRAME OUT, DET1-2 FRAME OUT, DET2-1 FRAME OUT, DET2-2 FRAME OUT, DET3-1 FRAME OUT, and DET3-2 FRAME OUT are raised.

When using hydrogen as carrier gas, turn on the hydrogen limiting unit and then turn on the detector. The indication of input signals, filtered signals, and standard deviation of signals of the detector is updated only when the operation mode is Run or Manual run status.

(1)TCD

When TCD is turned on with air filled in the carrier gas line, the filament of TCD may burn out. Continue to let carrier gas flow for at least 10 minutes before turning on TCD. The output of TCD does not become stable until the temperature becomes stable (the baseline drifts). Do normal operation and calibration after at least 12 hours have elapsed after TCD was turned on.

Procedure

(1) Confirm that the temperature of the isothermal oven has become stable.
(2) Check the temperatures on the Oven information display section in the User level SYS tab.
(3) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(4) Set the operation mode to Manual in the GCM tab.
(5) Press GCM Det Control in the GCM tab.
(6) Press ON/OFF under TCD.
(7) The message “Turn on” appears on the screen, and then press Yes.

(2)FID and FID with a methanizer

Turn on (ignite) FID after the temperature of the isothermal oven has become substantially stable. Depending on the set temperature, it takes 2 to 4 hours for the temperature to become stable when the temperature of the isothermal oven is 145°C or less and 4 to 8 hours when the temperature of the isothermal oven is higher than 146°C. After the temperature of the isothermal oven has become stable, the Thermocouple signal on the Detector signal screen becomes 0 mV. After the power has been supplied, the temperature of the isothermal oven rises, and the Thermocouple signal changes from 0 mV → –3 to –2 mV → 0 mV until the temperature becomes stable. When FID is turned on (ignition) at the Thermocouple signal of –3 to –2 mV, the Thermocouple signal does not exceed the Flame detection signal level and remains at the Combustion stop though combustion occurs, and the alarms of DET1-1 FRAME OUT, DET1-2 FRAME OUT, DET2-1 FRAME OUT, DET2-2 FRAME OUT, DET3-1 FRAME OUT, and DET3-2 FRAME OUT are risen.

FID is ignited with a platinum coil. Only the supply of carrier gas, combustion hydrogen or makeup gas, and combustion air may cause self-ignition by catalysis of the platinum coil. Self-ignition can be detected by water drops attached to the vent line. When FID is turned on under self-ignition, peaks may not appear on the chromatogram and only the baseline may be output. When self-ignition occurred, turn on FID after having set the Flame detection level in the Detector signal setting to the value of the Thermocouple signal +0.5 mV. The procedure to turn on FID is as follows:

(1) Confirm that the temperature of the isothermal oven has become stable.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Check the temperatures on the Oven information display section in the User level SYS tab.
(4) Set the operation mode to Manual in the GCM tab.
(5) Press GCM Det Control in the GCM tab.
(6) Confirm that the Thermocouple signal of FID is 0 ± 0.1 mV.
(7) Press ON/OFF under FID.
(8) The message “Turn on” appears on the screen, and then press Yes.

CAUTION

When self-ignition occurred (the Thermocouple signal becomes higher than 2 to 3 mV), turn on FID after having set the Flame detection level to the value of the Thermocouple signal +0.5 mV.

(9) The indication remains OFF until FID becomes Combustion. When ignition failed, the alarms of DET1-1 FRAME OUT, DET1-2 FRAME OUT, DET2-1 FRAME OUT, DET2-2 FRAME OUT, DET3-1 FRAME OUT, and DET3-2 FRAME OUT are raised. In this case, restart the procedure from the beginning.

(10) When FID becomes Combustion, the indication changes from OFF → ON.

(3)FPD

Turn on (ignite) FPD after the temperature of the isothermal oven has become substantially stable. It takes 2 to 4 hours for the temperature to become stable (the maximum temperature of the isothermal oven is 145°C). After the temperature of the isothermal oven has become stable, the Thermocouple signal on the Detector signal screen (see Figure 1.12) becomes 0 mV. After the power is supplied, the temperature of the isothermal oven rises, and the Thermocouple signal changes from 0 mV → –3 to –2 mV → 0 mV until the temperature becomes stable. When FPD is turned on (ignition) at the Thermocouple signal of –3 to –2 mV, the Thermocouple signal does not exceed the Flame detection signal level and remains at the Combustion stop though combustion occurs, and the alarms of DET1-1 FRAME OUT, DET2-1 FRAME OUT, and DET3-1 FRAME OUT are risen.

FPD is ignited with a platinum coil. Only the supply of carrier gas, combustion hydrogen, and combustion air may cause self-ignition by catalysis of the platinum coil. Self-ignition can be detected by water drops attached to the vent line. When FPD is turned on under self-ignition, peaks may not appear on the chromatogram and only the baseline may be output. When self-ignition occurred, turn on FPD after changing the Flame detection level in the Detector signal setting. The procedure to turn on FPD is as follows:

(1) Confirm that the temperature of the isothermal oven has become stable.

(2) Set the pressure of combustion air to twice as large as the value described in the Operating condition setting in the Operation data.

(3) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.

(4) Check the temperatures on the Oven information display section in the User level SYS tab.

(5) Set the operation mode to Manual in the GCM tab.

(6) Press GCM Det Control in the GCM tab.

(7) Confirm that the Thermocouple signal on the Detector signal screen (see Figure 1.12) is 0±0.1 mV.

(8) Press ON/OFF under FPD.

(9) The message “Turn on” appears on the screen, and then press Yes.

⚠ CAUTION

When self-ignition occurred (the Thermocouple signal becomes higher than 2 to 3 mV), set the Flame detection level to the value of the Thermocouple signal +0.5 mV.

(10) The indication remains OFF until FPD becomes Combustion. When ignition failed, the alarms of DET1-1 FRAME OUT, DET2-1 FRAME OUT, and DET3-1 FRAME OUT are raised. In this case, restart the procedure from the beginning.

(11) When FPD becomes Combustion, the indication changes from OFF → ON.

(12) Return the Flame detection level to the value described in the Operating condition setting in the Operation data.

(13) After one minute has elapsed after FPD became Combustion, return the pressure of combustion air to the value described in the Operating condition setting in the Operation data.

(4)Checking the baseline

To confirm that the detector operates normally, press the button (5) (CHROM) in the navigation bar on the analyzer operation screen and display the baseline on the Chromatogram screen and compare it with the chromatogram in the Operation data. If the signal level and noise of the baseline significantly differ from those of the chromatogram in the Operation data, there may be something wrong with the detector, detector card, or wiring.

3.2.5 Measuring the standard sample (gas or liquid)

CAUTION

Always measure the standard sample after installation to confirm that nonconformity has not occurred with equipment by transportation, installation work, or others. The measurement result at the factory is attached to the Operation data; compare it with the measurement result of the standard sample.

(1)Connecting a standard gas cylinder or standard liquid pump

Connect a standard gas cylinder or a standard liquid pump to the standard sample line. If there are two or more streams of the standard sample line, connect a standard gas cylinder properly according to the Stream setting and Individual peak setting in the Operation data. When a small-sized standard liquid pump is connected to the standard sample line, the capacity of the standard liquid may become short. In such a case, remove the joint of the pipe connecting the sample process section with the isothermal oven and connect a standard liquid pump.

(2)Substituting the standard sample line

Measure the standard sample after thoroughly substituting the sample stream according to the following procedure:

● The automatic stream valve

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press GCM VLV Control in the GCM tab.
(6) Press ON/OFF under Str VLV.
(7) Confirm that all stream valves are closed.
(8) Select the number of the valve to be operated and press OK.
(9) The message "Turn on the stream valve number *" appears on the screen, and then press Yes.
(10) The stream valve switches.
(11) Control the throttle valve of the sample process section, let the standard sample flow and substitute the standard sample line.
(12) After the substitution of the standard sample is finished, operate the stream valve again and turn it off.

● The manual stream valve

(1) Confirm that all stream valves are closed.
(2) Open the stream valve of the sample process section manually.

(3) Control the throttle valve of the sample process section, let the standard sample flow and substitute the standard sample line.

(4) After the substitution of the standard sample is finished, operate the stream valve again and turn it off.

(3)Measuring the standard sample

Measure the standard sample according to the following procedure. When the operation mode is other than Stop, follow the following procedure after changing the operation mode to Stop:

(1) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.

(2) Check the temperatures on the Oven information display section in the User level SYS tab.

(3) Set the operation mode to Process in the GCM tab.

(4) Press the Stream specification.

(5) Press the Stream specification of the standard sample.

(6) Select the Stream number, enter any number in the Repetition number of times, and press OK.

(7) Press Run. The operation mode becomes Run and the measurement of the standard sample starts.

(8) Press Stop. After the present measurement is finished, the operation mode becomes Stop and the measurement of the standard sample stops.

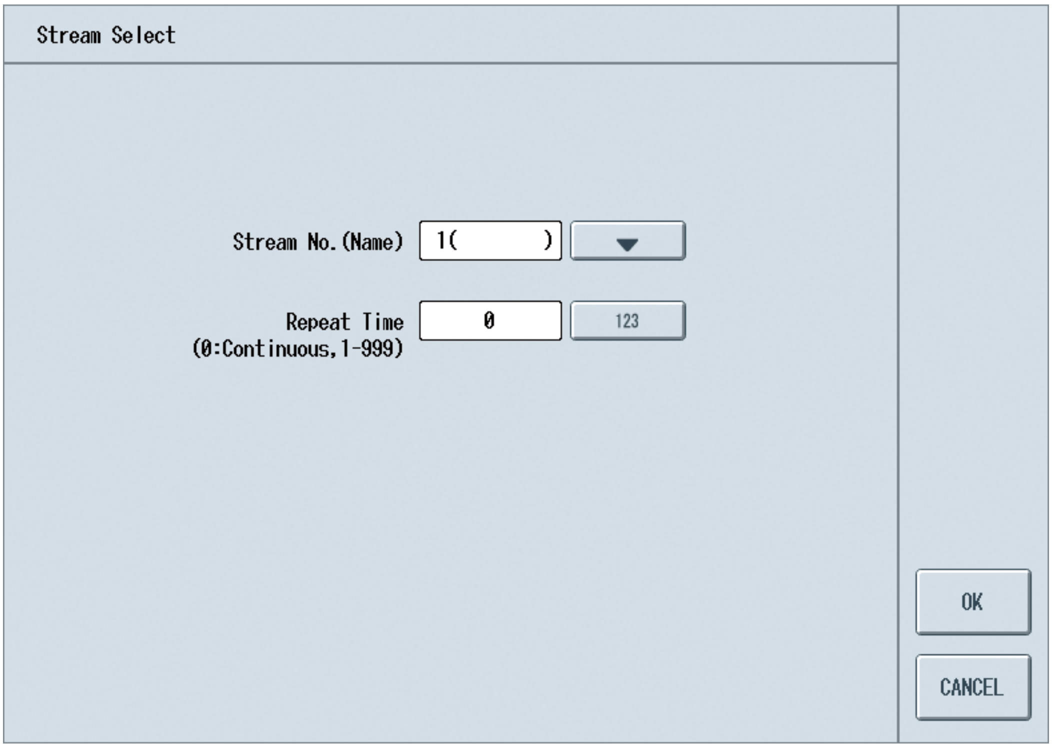


Figure 3.22 Stream specification screen

3.2.6 Calibration

Although calibration with the standard sample is conducted at the factory, it is recommended to conduct calibration with the standard sample at startup. After the start of continuous operation of process measurement, it is recommended to conduct calibration once a month to a half year.

(1)Type of calibration method

For a method of calculating concentration from the area or height obtained in the chromatogram, see the Appendix E Mechanism of Calculation. A method of calculating concentration differs depending on the Process specification in the Individual peak setting.

When the Process specification is the External third (external standard), conduct calibration with the standard sample. The following are the equation of concentration by External third:

$$C = RK(\alpha Si / Sb)(A(\alpha Si / Sb) 2 + B(\alpha Si / Sb) + 1)$$

C: concentration
α: calibration factor
Sb: reference area or height
Si: measured area or height
R: measuring range
K: factor
A: factor
B: factor

If the area or height is confirmed to be proportional to the concentration, the following equation applies:

K=1, A=0, and B=0

$$C = R\alpha Si / Sb$$

If the user want to calculate concentration and enter the calibration value by yourself, first obtain the calibration factor or the reference area (height) by using the area (height) measured with the standard sample and the above equation, and then enter the value in the Individual peak setting of the calibration stream (Figure 3.23). For more information about the entering method, see the Individual peak specification by EtherLCD.

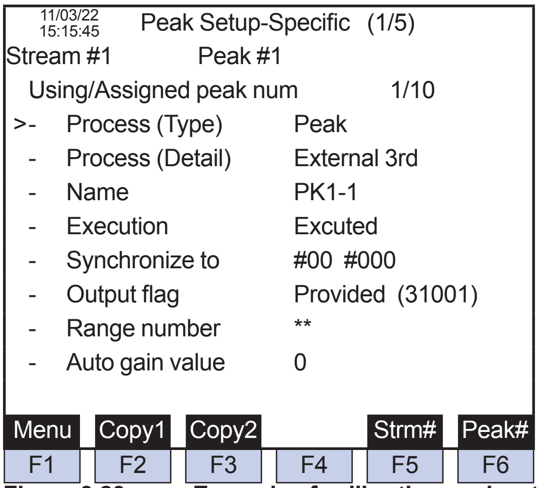


Figure 3.23 Example of calibration peak setting screen

GC8000 has two automatic calibration methods. Both automatically change the Reference area or the Calibration factor based on a set value in the Calibration factor range in the Common peak setting (Figure 3.24).

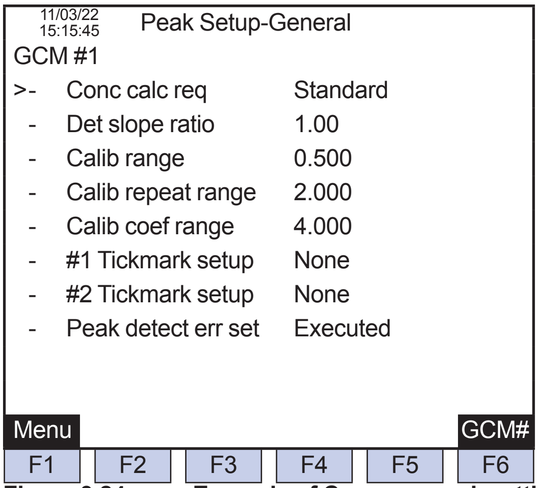


Figure 3.24 Example of Common peak setting screen

● The method of changing the Reference area

Setting the Calibration factor range to 0 changes the Calibration factor in the Individual peak setting (Figure 3.23) to 1 after the calibration and also changes the Reference area to the value obtained by calculation. In this method, values are changed regardless of the value of the Reference area obtained, so the automatic calibration finishes normally and the calibration value is updated even if the measurement result of the standard sample is abnormal. Therefore, from the set values of the Calibration range and the Calibration repetition range, decide by the following method if the calibration result should be reflected.

When the Calibration range has been set to α and the measurement result of the standard sample is out of the Reference concentration ± the Measuring range × α, an alarm message appears and the calibration result is not reflected.

When the Calibration repetition range has been set to α and the variation coefficient obtained from n times of measurement results of the standard sample is larger than α, an alarm message appears and the calibration result is not reflected. A variation coefficient is a value obtained by the division of a standard deviation by a measuring range. For the equation, see the Appendix E Calculation.

This method is not suitable for the history management of calibration. A method of changing the Calibration factor, described below, is recommended to normal calibration.

At the factory, calibration has been conducted according to the method of changing the Reference area.

● The method of changing the Calibration factor

Setting the Calibration factor range to other than 0 does not change the Reference area in the Individual peak setting after the calibration (Figure 3.23) but changes the Calibration factor to the value obtained by calculation.

In this method, decide by the following method if the calibration result should be reflected from the Calibration factor. At the same time, use the Calibration range and the Calibration repetition range.

When the Calibration factor range is set to α and the obtained Calibration factor is between 1 – α and 1 + α, the calibration result is reflected. If the obtained Calibration factor is smaller than 1 – α or larger than 1 + α, an alarm message appears and the calibration result is not reflected. For example, when the Calibration factor range is set to 0.1 and the obtained Calibration factor is between 0.9 and 1.1, the calibration result is reflected.

(2)Calibration method

If the stream valve on the standard sample stream is automatic, automatic calibration and semi-automatic calibration can be selected. If the stream valve is manual, only manual calibration can be selected. For the contents of calibration methods, see 5.1.4 Operation of Calibration and Validation.

(3)Checking parameter settings

Before giving a calibration command, confirm the setting of the preset calibration stream number, the pre-calibration (post-calibration) validation stream number, and the pre-calibration (post-calibration) validation stream number of times. See the EtherLCD calibration setting screen.

(a) Cal/Val Setup screen

(1) Display the Cal/Val Set (Main) screen of the EtherLCD.

The procedure is as follows:

- Press the button (1) in the navigation bar on the analyzer operation screen to display the setting screen.
- Press General Setting.
- Press EtherLCD.
- Press Table key.
- Press Next key.
- Confirm that the cursor (>) is on the left to the Cal/Val Setup.
- Press Set/Ent key.

(2) Items of the Cal (Val) method

See the Operation data for the values set at shipment.

When the stream valve on the standard sample stream is an automatic valve, either Auto cal or Semi-auto can be selected.

When the stream valve is a manual valve, only Manual cal can be selected.

For specific calibration methods, see XXX Operation of Calibration and Validation.

(3) Other items

When the Auto is selected in the Cal (Val) method, the periodic calibration is automatically conducted.

In the case of Auto cal, set the following items.

1. Auto start date sets the starting day of calibration
2. Auto start time sets the starting time of calibration (24-hour clock)
3. Time interval sets the interval of calibrations
4. Confirm Executing is displayed in the Auto cal status.

   Pressing F2 (Start) or F3 (Stop) alternates Executing and Stopping in the Auto cal status.

   When the power is turned on, the Auto cal status changes to Stopping. Follow the above 1. and 2. settings to return it to Executing.

IMPORTANT

In the case of Auto cal, set the respective items on Cal/Val Set (Main) screen and then Auto cal status to Executing. Automatic calibration starts according to the settings. Any change after that is not reflected.

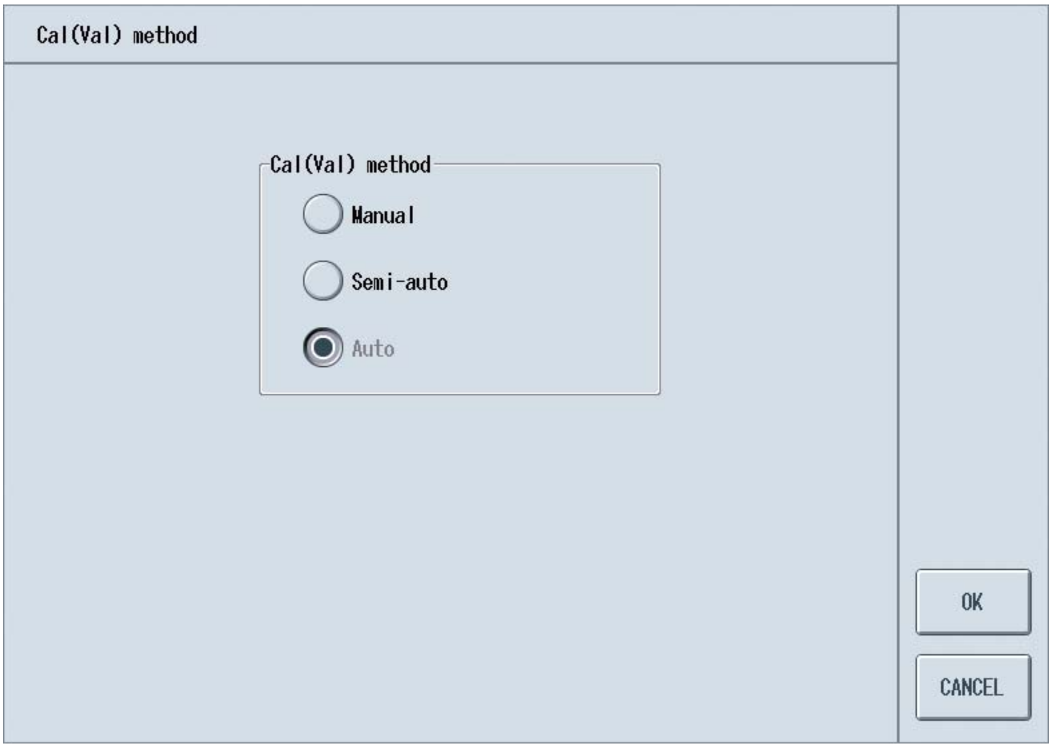


Figure 3.25 Calibration (validation) Method Setting Screen

(b) Calibration setting screen

(1) Press F4 key (Cal) on the Cal/Val Set (Main) screen. (The screen of Figure 3.26 appears.)

(2) Cal stream sets the calibration stream to be measured.

(3) Cal times sets the number of times of measurement of the calibration stream.

(4) Auto cal sets whether the calibration of this calibration number is conducted or not at automatic calibration (effective only for the automatic calibration).

(5) ValStr# before Cal sets the number of the validation stream to be measured before measuring the calibration stream.

(6) ValStr# after Cal sets the number of the validation stream to be measured after measuring the calibration stream.

(7) Val before Cal times sets the number of times of measurement of the validation stream before measuring the calibration stream.

(8) Val after Cal times sets the number of times of measurement of the validation stream after measuring the calibration stream.

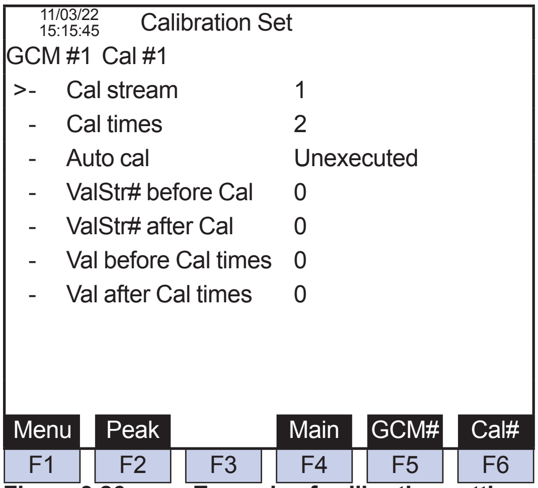


Figure 3.26 Example of calibration setting screen

(4) Calibration command

Give a calibration command after finishing the procedure in 3.2.5 Parameter Setting. The procedure is as follows:

(a) Auto calibration

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Set the operation mode to Process.
(4) Display the EtherLCD screen and display the Calibration Set screen.
(5) Confirm the set values of the Cal/Val Setup screen.

IMPORTANT

If the operation mode is Run at the time set in Auto start time, calibration starts after the measurement of the stream. After the calibration, the mode returns to Run and the measurement restarts. (When the operation mode is Stop or Pause, calibration is not conducted.)

(b) Semi-auto calibration

(1) Connect a cylinder or a pump to the standard sample stream in reference to Connecting a Standard Gas Cylinder or Standard Liquid Pump.
(2) Change the user level.
(3) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(4) Open the GCM tab, and set the operation mode to Process.
(5) Select Semi-auto in the Cal (Val) method screen (see Figure 3.25) and press OK.
(6) Select a desired calibration number in the Cal (Val) method screen and press OK.
(7) After the calibration stream and the validation stream are measured according to the settings, the calibration finishes.

NOTE

To cancel the Cal (Val) command during the continuous measurement, press the Specification Cancel button in the GCM tab. However, the command cannot be canceled after the measurement of the calibration stream has started.

If the measurement status before calibration is Stream sequence or Stream (continuous) and the operation mode is Run, the status returns to the original status and the operation mode returns to Run after the calibration and the measurement restarts. If the operation mode is Stop or Pause, the status returns to the original status after the calibration and the operation mode becomes Stop.

IMPORTANT

After the automatic calibration, set Auto start date and Auto start time to any time from the current time, and change Auto cal status to Executing.

(c) Manual calibration

(1) Connect a cylinder or a pump to the standard sample stream in reference to Connecting a Standard Gas Cylinder or Standard Liquid Pump.

(2) Change the user level.

(3) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.

(4) Open the GCM tab, and set the operation mode to Process.

(5) Press Cal (Val) button.

(6) Select a desired calibration number in the Cal (Val) screen and press OK.

(7) Close all open stream valves.

(8) Manually open the stream valve on the standard sample stream of the sample process section.

(9) Adjust the throttle valve of the sample process section, let the standard sample flow, and substitute the standard sample line.

NOTE

To cancel the Cal (Val) command during the continuous measurement, press the Specification Cancel button in the GCM tab. To cancel it after the continuous measurement, press Cal (Val) Stop and then press Yes.

(10) After finishing the substitution of the standard sample, press Cal (Val) start button and then press Yes.

(11) After the measurement of the calibration stream and the validation stream according to the settings, the calibration finishes and Calibration (validation) Stop in the GCM tab becomes active. Press it and then press Yes.

(12) Manually close the stream valve on the standard sample stream of the sample process section.

3.3 Normal operation (continuous measurement of process sample)

After finishing the procedures above, do the normal operation.

3.3.1 Setting Stream sequence

Unless otherwise specified, streams are set at the factory in descending order in Stream sequence 1. To change the number of times, order, etc. of the stream to be measured, change the setting of Stream sequence. For the change method, see 5.1.2 Operation of Stream Sequence.

3.3.2 Setting pressure and flow rate of process samples

Set the pressure and flow rate of a sample in each stream according to the following procedure. For set values of pressure and flow rate, see the Operation data.

● Automatic stream valve

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab.
(4) Set the operation mode to Manual.
(5) Press GCM VLV Control in the GCM tab.
(6) Press ON/OFF under Str VLV.
(7) Press ON and select the number of the valve to be operated, and then press OK.
(8) The message “Turn on the stream valve number *” appears on the screen, and then press Yes.
(9) The stream valve switches.
(10) Adjust the throttle valve of the sample process section and set the pressure and flow rate of the process sample.
Repeat steps (7) to (10) to set the pressure and flow rate of all process sample streams.
(11) After finishing the setting of the pressure and flow rate of the process samples, operate the stream valve again to turn it off.

● Manual stream valve

(1) Confirm that the operation mode is not Run.
(2) Confirm that all stream valves are closed.
(3) Manually open the stream valve of the sample process section.
(4) Adjust the throttle valve of the sample process section to set the pressure and flow rate of the process sample.
Repeat steps (2) to (4) to set the pressure and flow rate of all process sample streams.
(5) Open only the stream valve to be used, and confirm the pressure and flow rate of process samples.

3.3.3 Starting operation

Start operation according to the following procedure. When the operation mode is not Stop, change the operation mode to Stop and follow the procedure below:

(1) Change the user level.
(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.
(3) Open the GCM tab, and set the operation mode to Process.

(4) Press Stream sequence and select a Stream sequence number to be measured, and then press OK.

(5) Press Run in Operation mode. The operation mode becomes Run and the measurement of the sample in the specified stream starts.

3.3.4 Stopping operation

Stop operation according to the following procedure:

(1) Change the user level.

(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.

(3) Open the GCM tab.

(4) Press Stop in Operation mode. After the measurement of the stream is finished, the operation mode becomes Stop and the measurement of the sample of the specified stream stops. To cancel the Stop mode, press Cancel button.

IMPORTANT

To stop supplying the power after the operation stops, follow the procedure below. Otherwise, it may damage the detectors, columns, etc.

(1) As for TCD, turn off TCD and leave it for at least four hours until it cools. For this procedure, see 3.2.4 On/Off operation of detectors.

As for FID, FID with a methanizer, or FPD, stop the supply of combustion hydrogen or nitrogen and combustion air (close the main valve of the cylinder) while continuing the supply of carrier gas. Leave the detector for at least four hours after combustion stops.

(2) Turn off the heaters of the isothermal oven, LSV, and FPD while continuing the supply of carrier gas. For this procedure, see Procedure to Turn off the Heater below. Leave the isothermal oven for at least one hour until it cools.

(3) Stop the power supply.

Continue the supply of carrier gas.

● Procedure to Turn off the Heater

(1) Change the user level.

(2) Press the button (4) (OPR) in the navigation bar on the analyzer operation screen.

(3) Open the GCM tab.

(4) Set the operation mode to Manual.

(5) Open the SYS tab.

(6) Press Temperature Controller.

(7) When the ON/OFF button is pressed, the message “Are you sure you want to turn off the temperature controller?” appears on the screen, and then press Yes.

3.3.5 Checking data in upper systems

If GC8000 communicate with or transfer signals to/from upper systems, confirm that the measured value of GC8000 is identical to the indication of the system.

3.3.6 Storing parameters

Read parameters from the GC8000 settings and store the initial parameters at startup.

3.3.7 Precautions for long-term operation stop

When GC8000 is not used for a long time, stop the supply of power and air according to 3.4 Operation Stop. Continue the supply of carrier gas with the pressure of 1/10 the set value. If the supply of carrier gas is also stopped, close the main valve of the carrier gas cylinder by sealing the vent lines to be pressurized.

If carrier gas is hydrogen, the power and purging air must be supplied and the hydrogen limiting unit must be turned on.

4. GC-HMI (Touch Panel)

Screen Layout

The display screen consists of three display areas:

(A) Caption banner: Shows various items of information on the GC-HMI.

(B) Navigation bar: Displays controls to change to different screens on the contents area, and content types.

(C) Contents area: Displays operations and status of the GC8000.

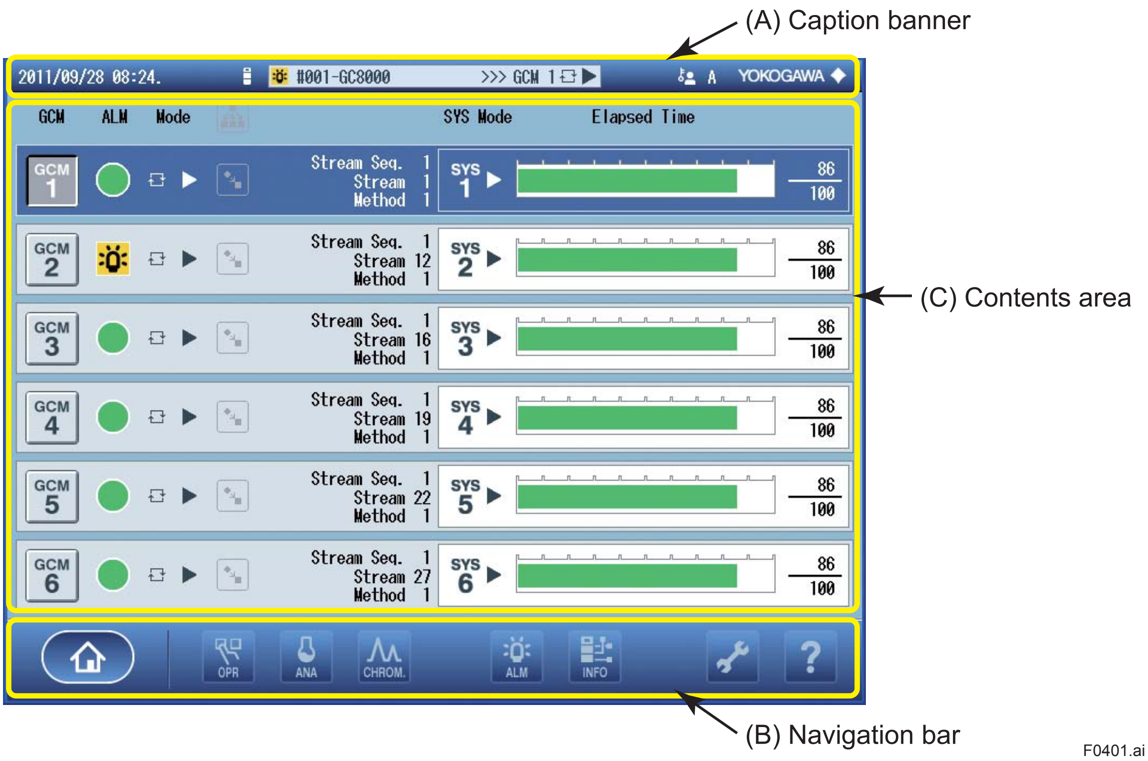


Figure 4.1 Screen Layout

(A) Caption banner

This banner shows various items of information on the GC-HMI. It is displayed on almost all screens.

Figure 4.2 Items Displayed on the Caption Banner

Table 4.1 Items Displayed on the Caption Banner

Symbol	Item	Description
(1)	Date/time	Displays the current date and time (year, month, day, hour, minute) of the GC8000. This item is hidden when the EtherLCD is connected.
(2)	Type of connected analyzer	Indicates the type of the currently connected GC8000. Currently connected to the GC8000 equipped with the GC-HMI being operated on. (Note: This icon is also displayed when no analyzer is connected.) Currently connected to any other GC8000.
(3)	Overall alarm	Indicates an overall alarm. No alarm Level-1 alarm (blinking) Level-2 alarm (blinking)
(4)	Tag name of GC8000	Indicates the tag name of the currently connected GC8000. The name may be up to 16 ASCII characters long. The tag name and analyzer number of the CG8000 are indicated while the GC8000 is connected. This item is hidden when no connection is made.
(5)	Active GCM number	Indicates the active GCM number (GCM1 to GCM6). This item is hidden when no connection is made.
(6)	Analyzer status	Indicates the current operating status of the analyzer. This item is hidden when no connection is made. Manual Process
(7)	Operating mode	Indicates the current operating mode. This item is hidden when no connection is made. Run Pause Stop
(8)	DB changed	Indicates that the initial database of the GC-HMI is different from the one set on the GC8000. (The indication blinks.) Usually, this item is hidden.
(9)	User level	Indicates the user level (A, B, C, or C+). This item is hidden when the EtherLCD is connected.

(B) Navigation bar

The navigation bar allows for navigation between different screens.

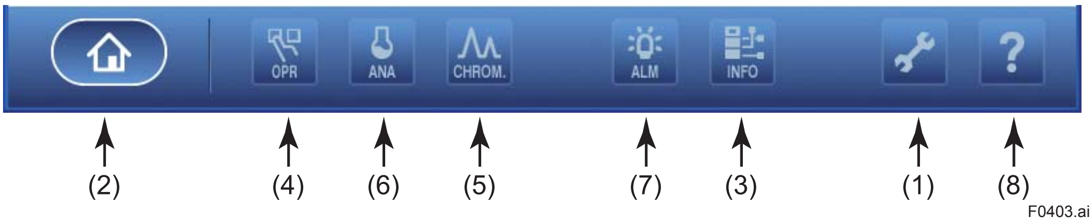


Figure 4.3 Navigation Bar

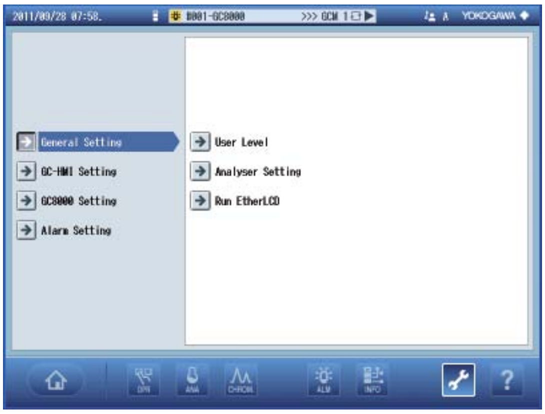
Table 4.2 Navigation Bar

Symbol	Description	Reference
(1)	Navigates to the setting screen.	4.1 Setting Screen
(2)	Navigates to the analyzer overview screen. This item is only displayed when the GC8000 is connected.	4.2 Analyzer Overview Screen
(3)	Navigates to the analyzer map screen. This item is only displayed when the GC8000 is connected.	4.3 Analyzer Map Screen
(4)	Navigates to the analyzer operation screen. This item is only displayed when the GC8000 is connected.	4.4 Analyzer Operation Screen
(5)	Navigates to the chromatogram screen. This item is only displayed when the GC8000 is connected.	4.5 Chromatogram Screen
(6)	Navigates to the analysis result screen. This item is only displayed when the GC8000 is connected.	4.6 Analysis Result Screen
(7)	Navigates to the alarm screen. This item is only displayed when the GC8000 is connected.	4.7 Alarm Screen
(8)	Navigates to the help screen. Provides a description of the icons displayed on the currently selected screen: one of (1) to (7).	4.8 Help Screen

(C) Contents area

This area displays operations and status of the GC8000.

Different screens are displayed by pressing the corresponding button icons on the navigation bar.



Setting screen

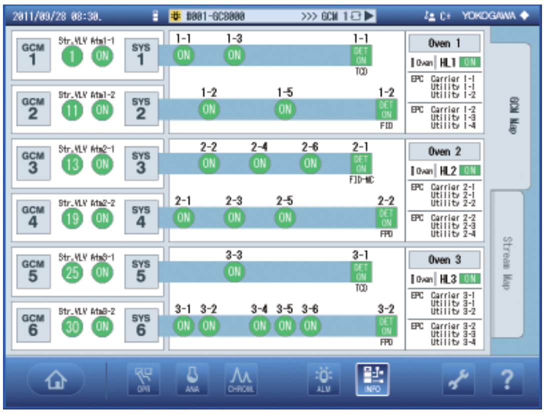
Allows for making various settings.

(See 4.1 Setting Screen.)

Analyzer overview screen

Indicates the measurement status of each GCM.

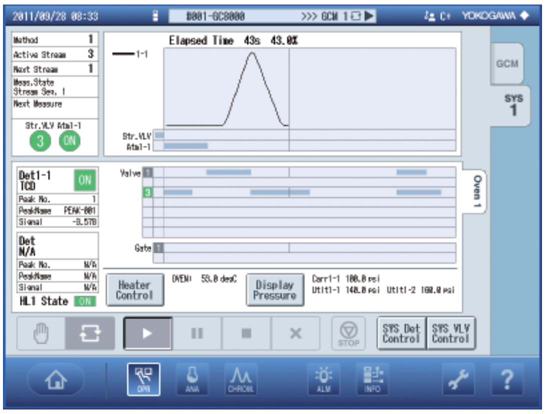
(See 4.2 Analyzer Overview Screen.)



Analyzer Map Screen

Displays the GCM and SYS definitions, as well as the equipment configuration including ovens, detectors, and valves.

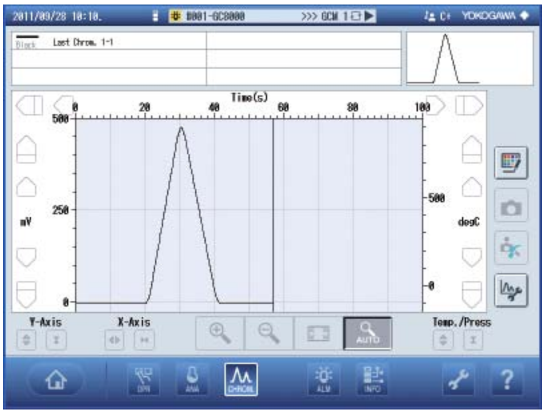
(See 4.3 Analyzer Map Screen.)



Analyzer operation screen

Allows for controlling and monitoring the operating status of the active GCM.

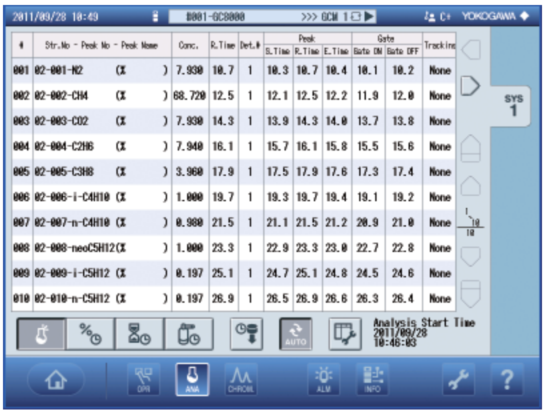
(See 4.4 Analyzer Operation Screen.)



Chromatogram screen

Displays the chromatogram for the active GCM.

(See 4.5 Chromatogram Screen.)



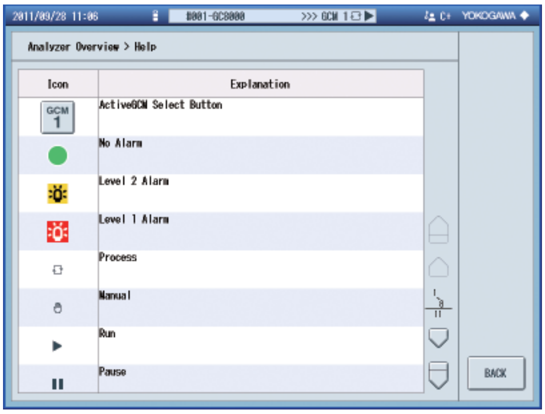
Analysis Result Screen

Displays the analysis results (latest analysis results, concentration analysis history, retention time history, and calibration factor history) obtained from the active GCM.

(See 4.6 Analysis Result Screen.)

Alarm screen

Displays the alarm status of the GC8000. (See 4.7 Alarm Screen.)



Help screen

Displays on-line help for each screen. (See 4.8 Help Screen.)

4.1 Setting Screen

The setting screen is used to change the settings of the GC-HMI and the currently connected GC8000. Press the on the navigation bar to display the setting screen.

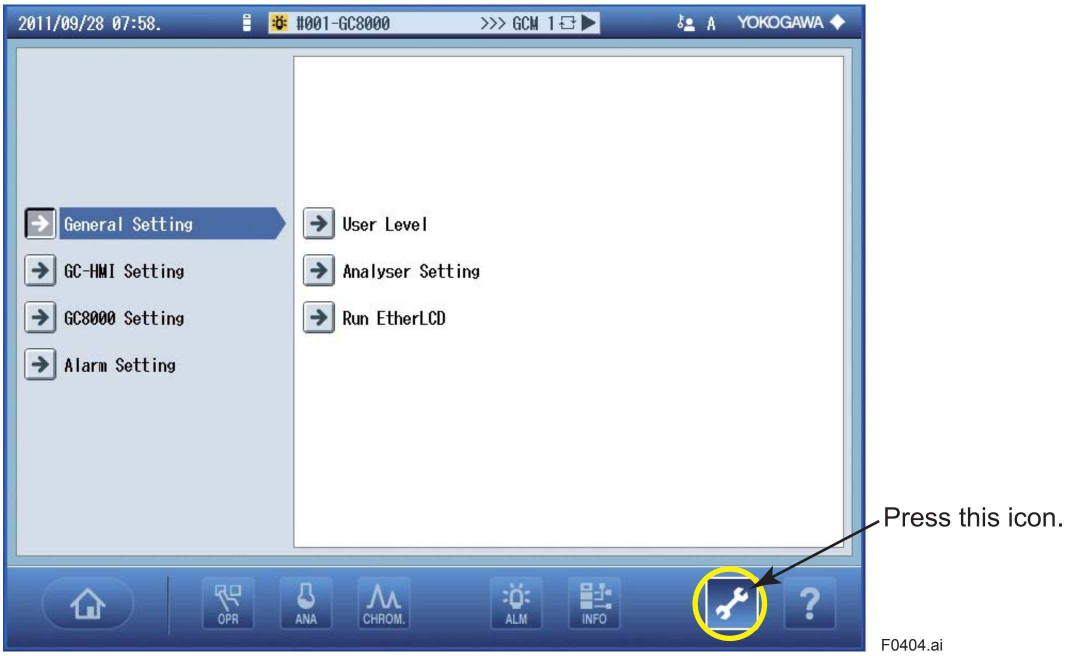


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Figure 4.4 Setting Screen

Table 4.3 Setting Screens and User Levels

Setting screen		User level				Reference
		A	B	C	C+	
General Setting	User Level Setting					4.1.1 General Setting
	Analyzer Setting					
	EhteLCD					
GC-HMI Setting	Network Settings	—	—			4.1.2 GC-HMI Setting
	Display Setting	—				
	GC-HMI Reset	—	—			
	Communication Management	—	—	—	—	
GC8000 Setting	Reload Initial Database	—				4.1.3 GC8000 Setting
	Parameter Import	—	—			
	Parameter Export	—	—	—	—	
Alarm Setting	Clear Alarm Status	—	—	—		4.1.4 Alarm Setting
	Alarm Popup Restriction	—	—			

—: Cannot be selected.

4.1.1 General Setting

This section describes the General Setting of the setting screen.

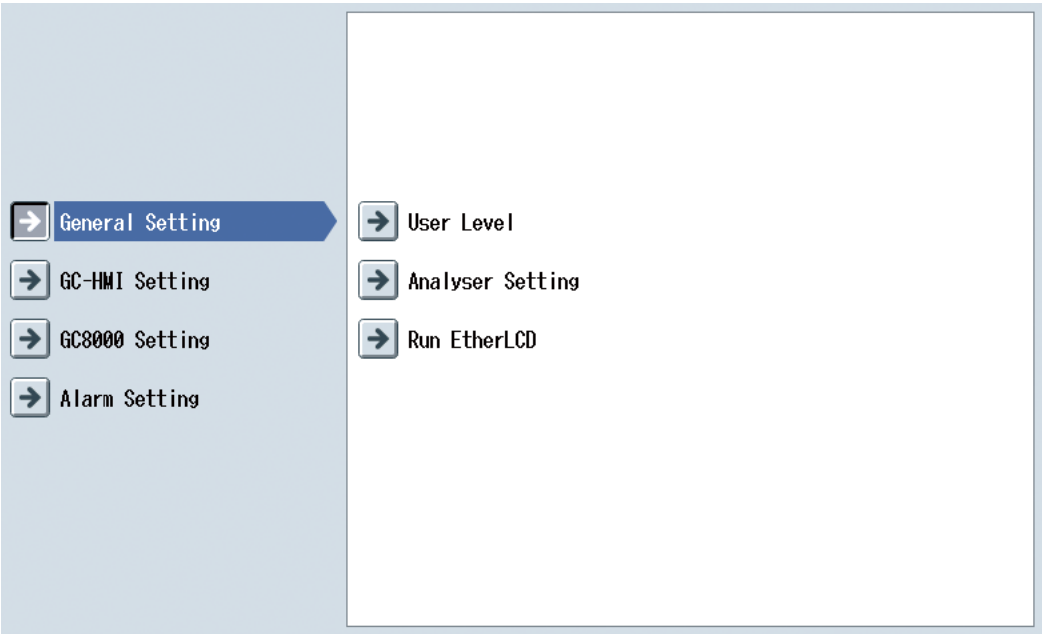

Figure 4.5 **General Setting**

■ User Level Setting

User levels are set to define the scope of operations allowed for each user.

The default setting is user level A, which only allows the user to view screens.

The user levels for analyzer operation data display and EtherLCD are independent from each other, and they must be set separately.

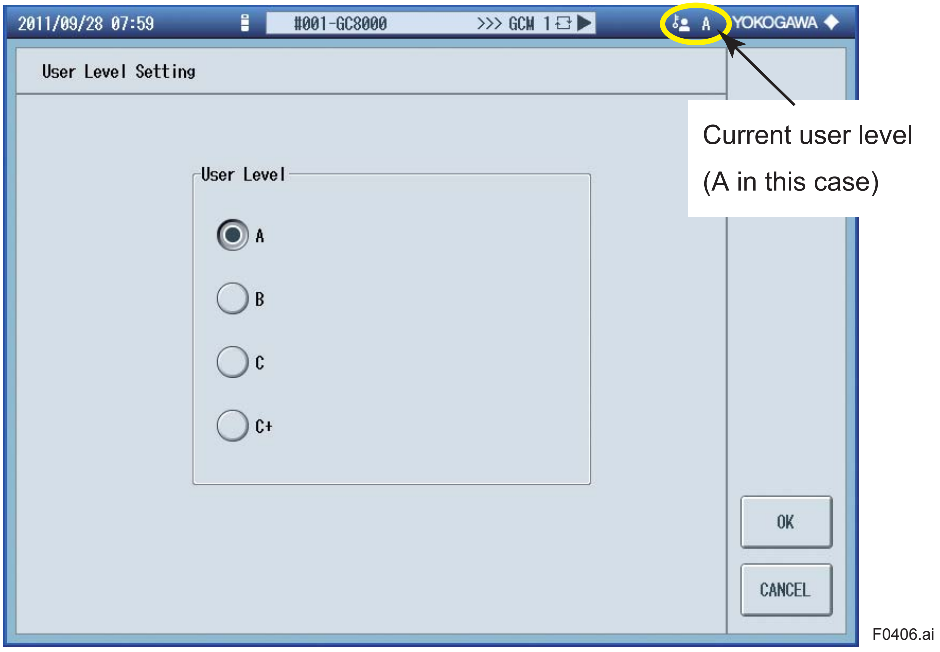

Figure 4.6 **User Level**

There are four user levels: A, B, C, and C+. A password must be entered to change to any user levels other than A.

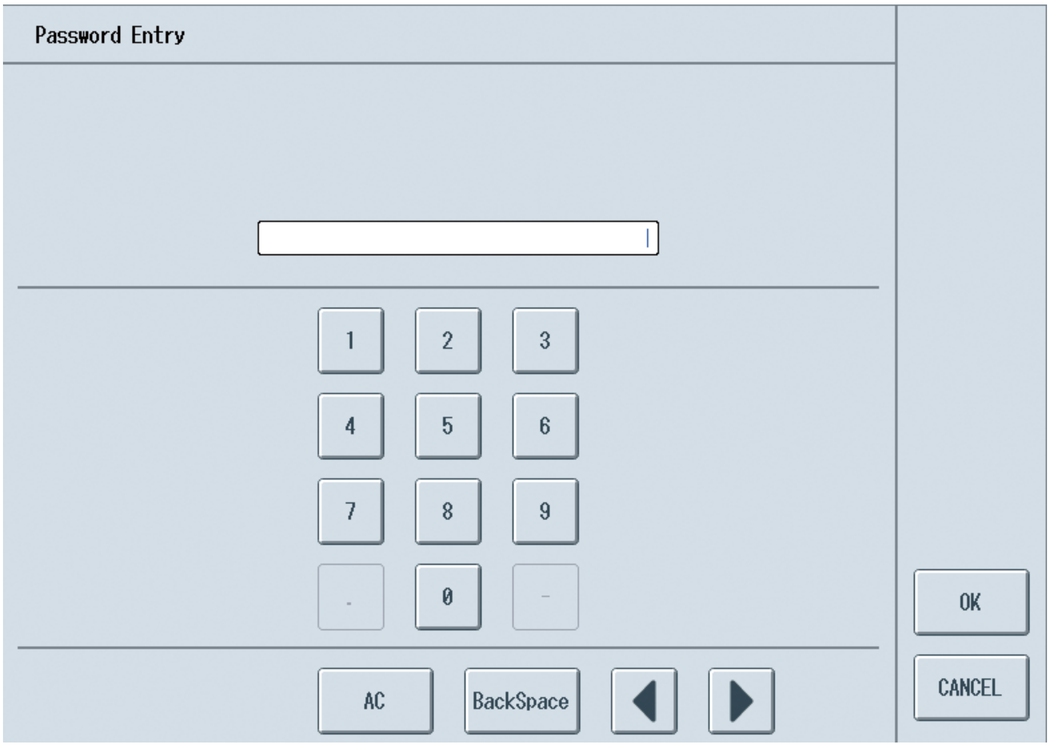

Figure 4.7 **Password Entry**

See Table 4.4 User Level and Permission for the scopes of operations permitted to different user levels for analyzer operation data display.

Table 4.4 User Level and Permission

User level	Permissions	Password
A	Only viewing operating status and analysis results. Analyzer operations are not permitted.	Not required (default)
B	Limited analyzer operations: changing operating modes, changing measurement status (except for cancelling specified measurement), and changing the range.	1192
C	Viewing and setting all analyzer operations. Reanalysis of chromatogram is not permitted.	1603
C+	Permissions granted to C, plus reanalysis of chromatogram.	1702

● Changing a user level

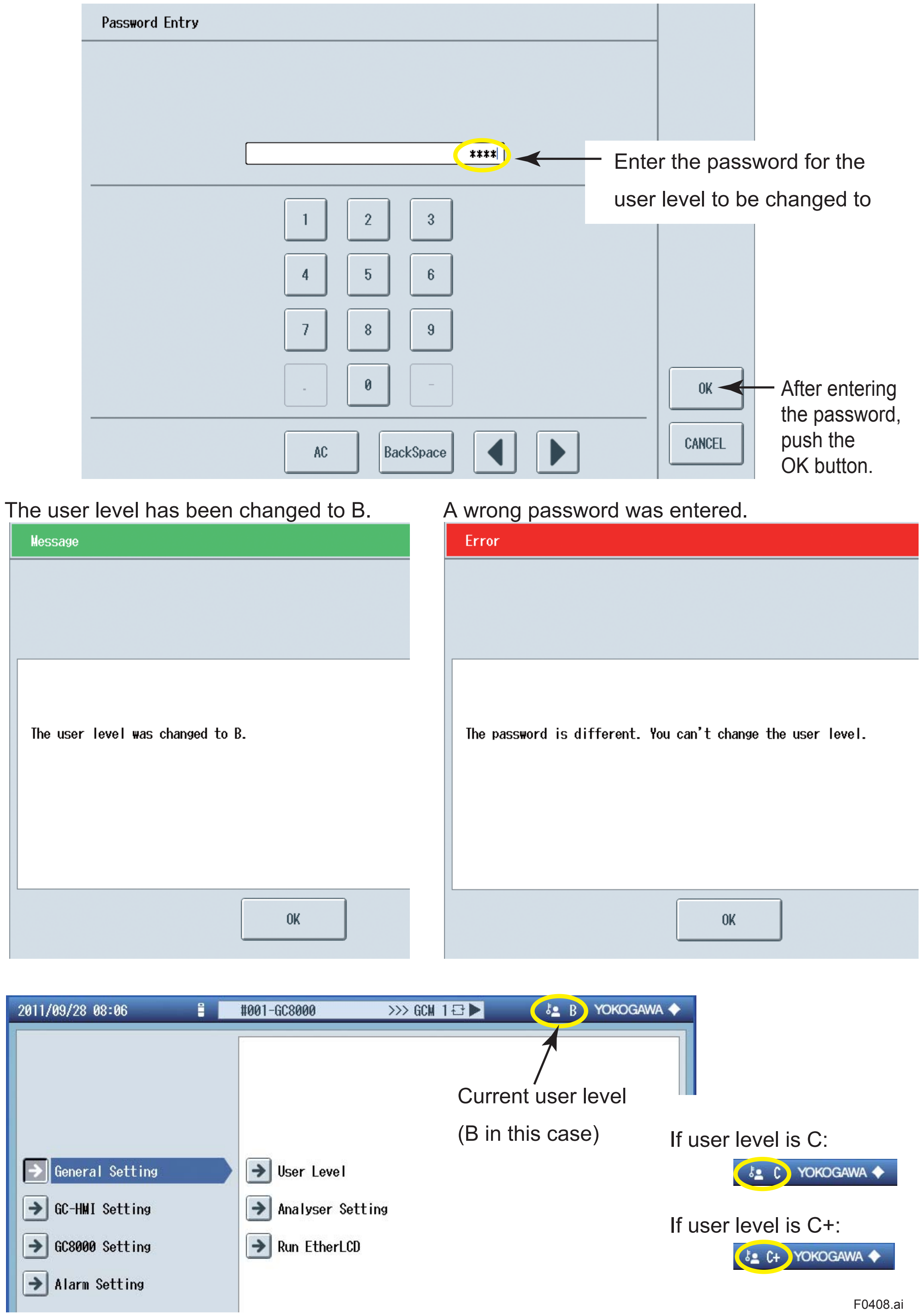

Figure 4.8 Example of Changing a User Level

■ Selecting an Analyzer

In the Analyzer Setting dialog, select the GC8000 you want to connect, and then establish a connection or forced connection.

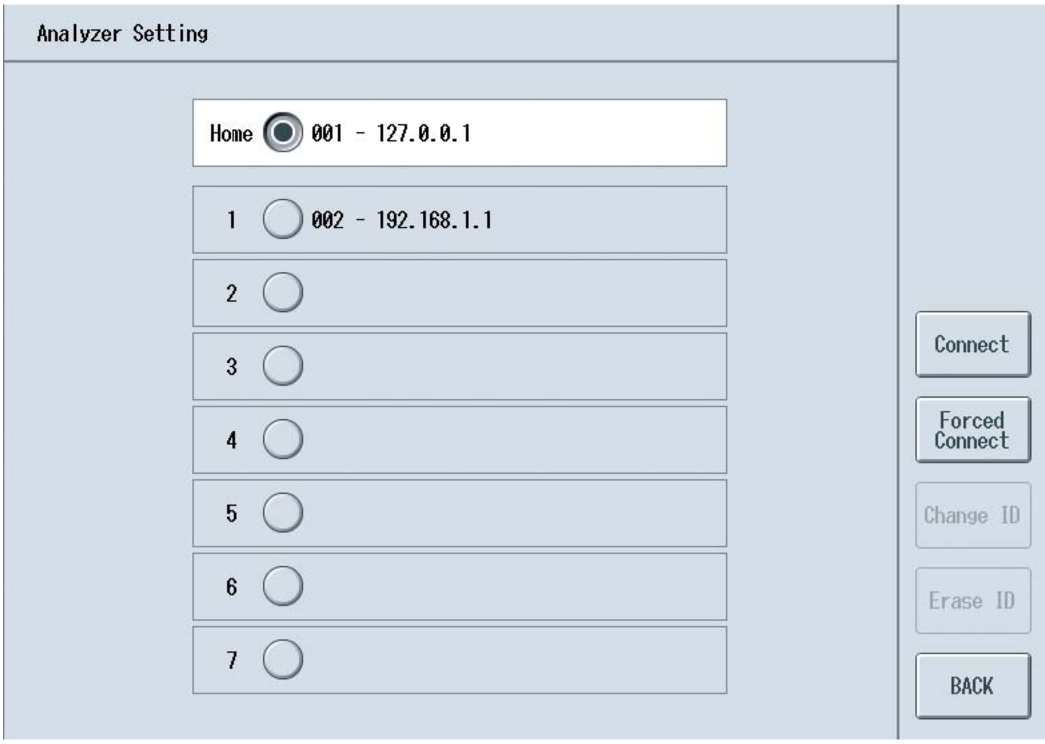

Figure 4.9 Example of Analyzer Setting Screen

Connect:

This option makes a communication connection with the analyzer selected by the Analyzer Setting function.

A communication connection attempt fails if the target analyzer is already connected with a PC or any other GC-HMI.

Forced Connect:

Even if the target analyzer is already connected with a PC or any other GC-HMI, this option breaks that connection and forces a connection with the analyzer.

To register an analyzer, add, change, or delete its analyzer ID and IP address.

Analyzer ID: Set the ID for the analyzer (GC8000) to be connected to.

Setting conditions:

- Up to eight analyzers (GC8000s) can be set: one analyzer (GC8000) equipped with GC-HMI, plus seven external analyzers (GC8000s).

  The analyzer (GC8000) equipped with GC-HMI cannot be left unset.

  Setting range: 001 to 240, and unset

  Default settings: The analyzer (GC8000) equipped with GC-HMI is defaulted to 001, and external analyzers (GC8000s) are defaulted unset.

IP address: Set the IP address corresponding to the analyzer ID.

Setting conditions:

- Up to eight analyzers (GC8000s) can be set: one analyzer (GC8000) equipped with GC-HMI, plus seven external analyzers (GC8000s).

Setting range: 0.0.0.0 to 255.255.255.254 (where 0.0.0.0 indicates unset state).

Default settings: The analyzer (GC8000) equipped with GC-HMI is defaulted to 192.168.1.1, and external analyzers (GC8000s) are defaulted to 0.0.0.0 (unset).

■ EtherLCD

This option displays the EtherLCD screen. See Chapter 5 for a description of EtherLCD.

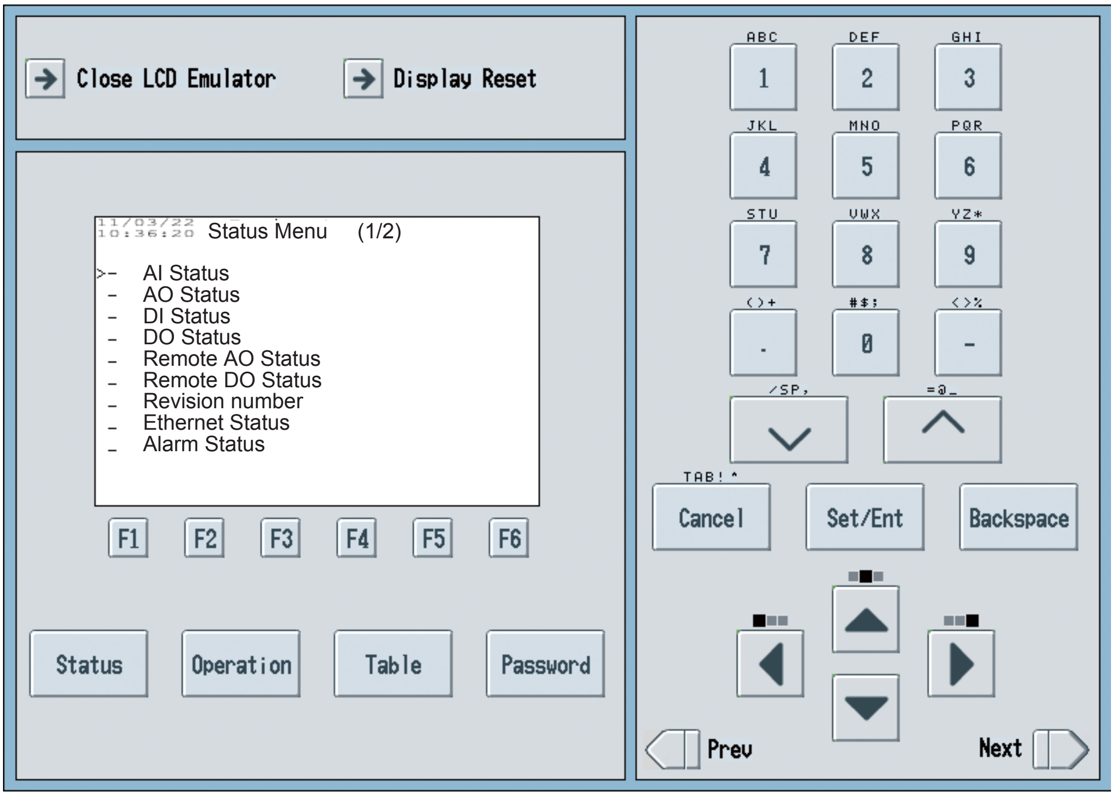

Figure 4.10 Example of EtherLCD Screen

4.1.2 GC-HMI Setting

This section describes the GC-HMI Setting of the setting screen.

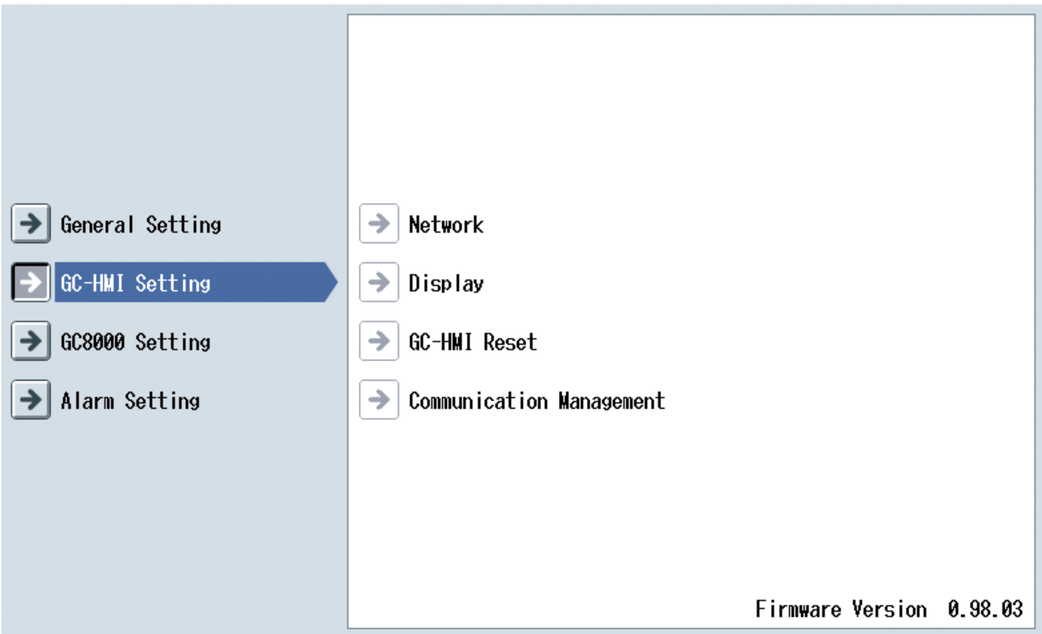

Figure 4.11 GC-HMI Setting

■ Network Settings

This option sets the IP address and subnet mask of the GC-HMI.

TIP

Restart the GC-HMI after finishing the setting. Without restarting the GC-HMI, data will not be displayed correctly.
Network setting can made with user level C or higher.

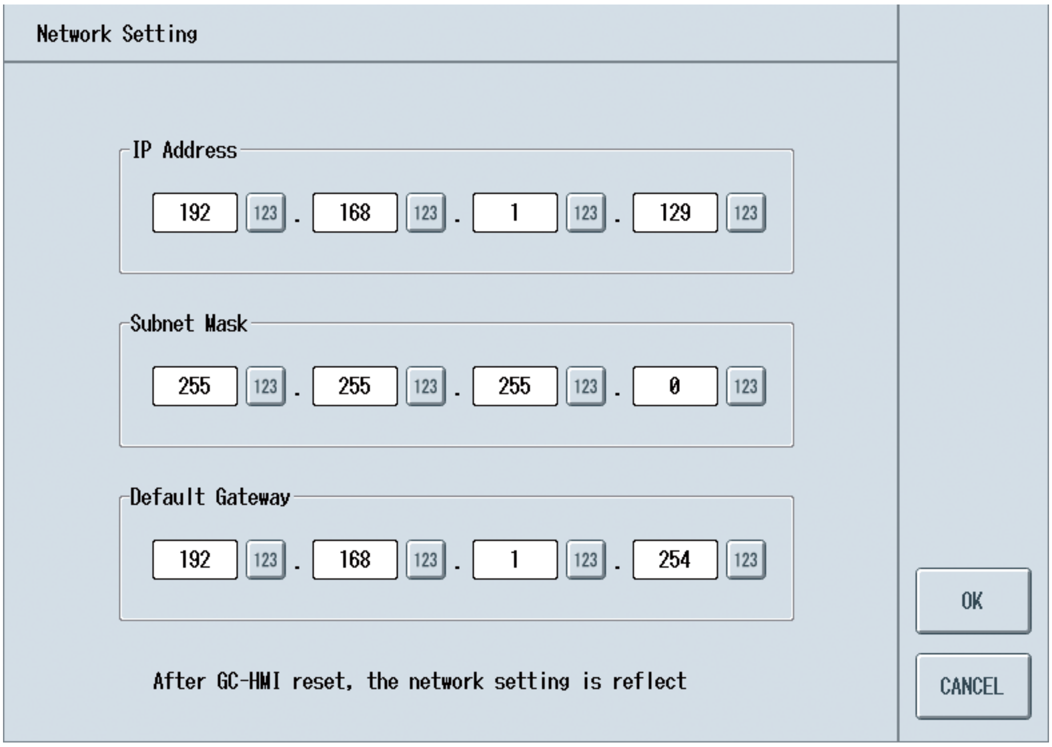

Figure 4.12 Example Network Settings

IP address:
- Setting range: 0.0.0.1 to 255.255.255.254
- Default setting: 192.168.1.65

Subnet mask:
- Setting range: 0.0.0.0 to 255.255.255.255
- Default setting: 255.255.255.0

Default gateway:
- Setting range: 0.0.0.1 to 255.255.255.254
- Default setting: 192.168.1.254

■ Display Settings

This option sets the screen brightness and backlight saver functions.

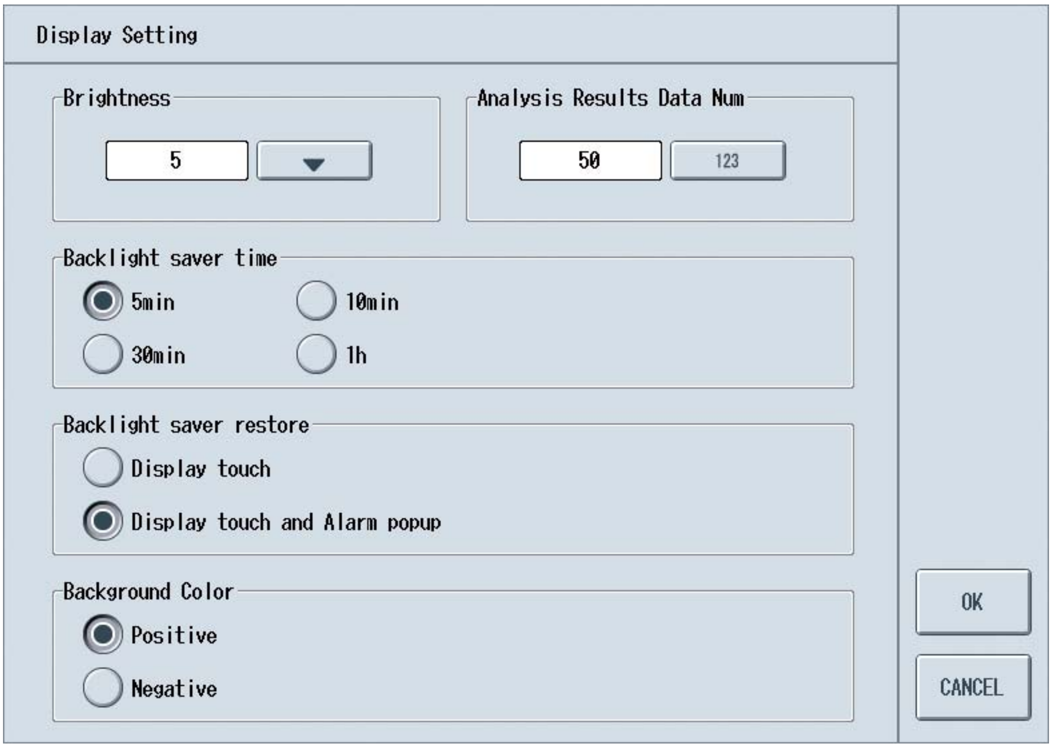

Figure 4.13 Example of Display Settings

Brightness: Set the backlight brightness.

Setting range: 1 (darkest) to 10 (brightest)

Default setting: 5

TIP

This parameter is available if the user level is set to B or higher.

Backlight saver time: Set the transit time to backlight saver mode. The touch panel transits to the backlight saver mode if this transit time elapses since the last screen operation (or alarm popup).

Select from 5 min, 10 min, 30 min, and 1 h. The default is 5 min. To recover from the power saving mode, touch the screen.

TIP

This parameter is available if the user level is set to B or higher.

Backlight saver restore: Determine how to restore from the backlight saver mode.

Select Display touch or Display touch and Alarm popup. The default is Display touch and Alarm popup.

TIP

Even if the screen turns on with an alarm popup, it transits to the backlight saver mode after the transit time elapses again.

SEE ALSO

The alarm levels to be displayed in the alarm popup are set as described in ## Alarm Popup Restriction in 4.1.4 Alarm Setting.

TIP

This parameter is available if the user level is set to B or higher.

Background Color: Set the background color.
Setting range: Select Positive or Negative.
Default setting: Positive

TIP

This parameter is available if the user level is set to B or higher.

■ GC-HMI Reset

This option resets the GC-HMI. Selecting the GC-HMI Reset option displays a confirmation screen.

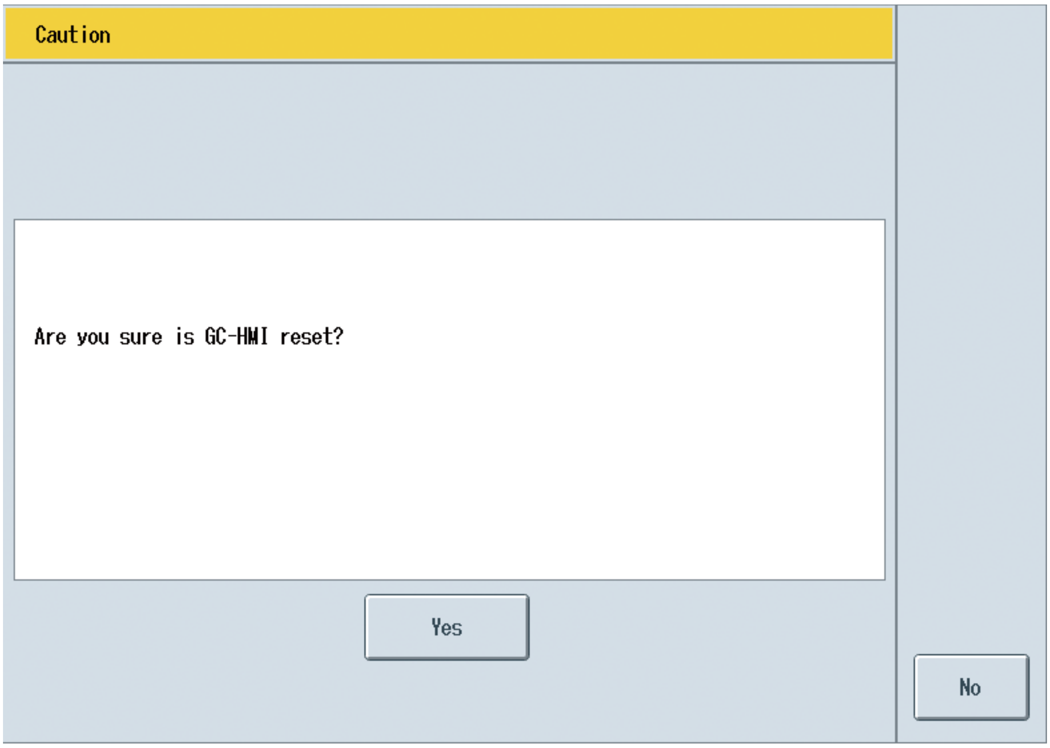

Figure 4.14 GC-HMI Reset

The GC-HMI behaves as follows:

(1) Disconnects communication with the GC8000.
(2) Restarts the GC-HMI.
(3) Attempts an analyzer operation data display connection to the analyzer (GC8000) which was connected before the GC-HMI resetting.
The user levels for the GC-HMI is changed to level A automatically.

4.1.3 GC8000 Setting

This section describes the GC8000 Setting of the setting screen.

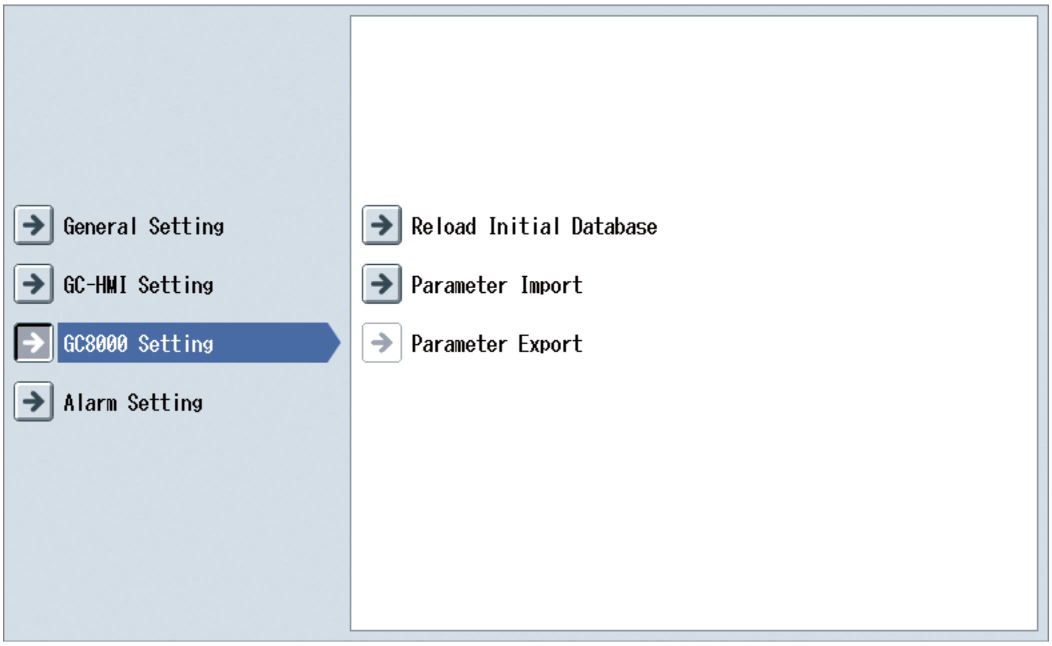

Figure 4.15 GC8000 Setting

■ Reload Initial Database

When the parameter settings is changed at the EtherLCD, the icon mean DB changed blinks on the caption banner. This is when this option reloads the initial database and matches the setting information of GC-HMI to the setting information of the GC8000.

TIP

This option is available if the user level is set to B or higher.

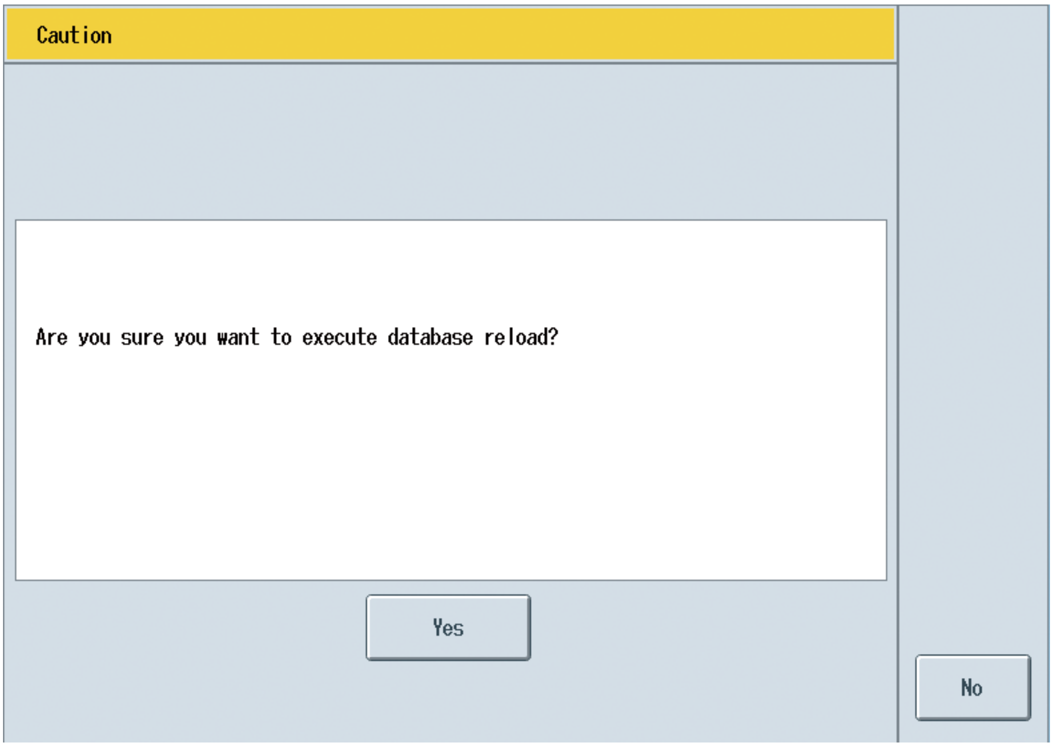

Figure 4.16 Reload Initial Database

■ Parameter Import

This option stores parameter settings in the internal memory of HMI, in order to make a backup of all parameter settings of GC8000.

TIP

This option is available if the user level is set to C.

Selecting the Parameter Import option displays a confirmation screen.

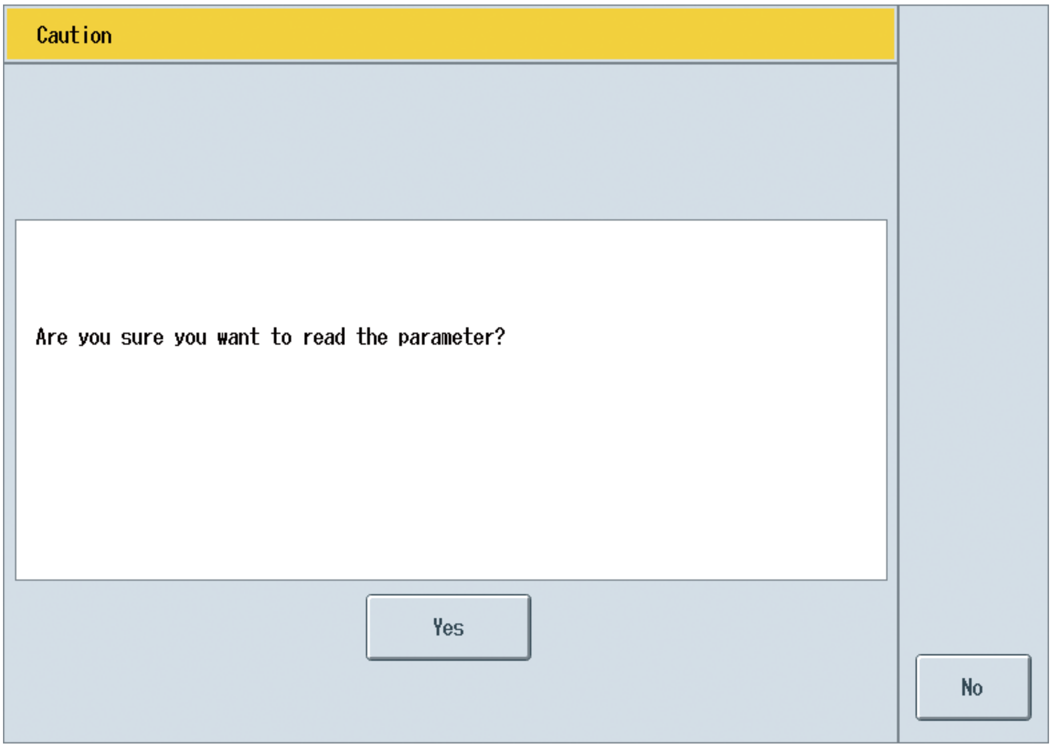

Figure 4.17 Parameter Import

4.1.4 Alarm Setting

Figure 4.18 Alarm Setting

■ Clear Alarm Status

This option clears the alarm status.

If ALL GCMs are selected for alarm status display, the alarm status for all GCMs is cleared.

If a particular GCM (one of GCM1 to GCM6) is selected, the alarm status for that GCM is cleared.

TIP

This option is available if the user level is set to C+ or higher.

Selecting the Clear Alarm Status option displays a confirmation screen.

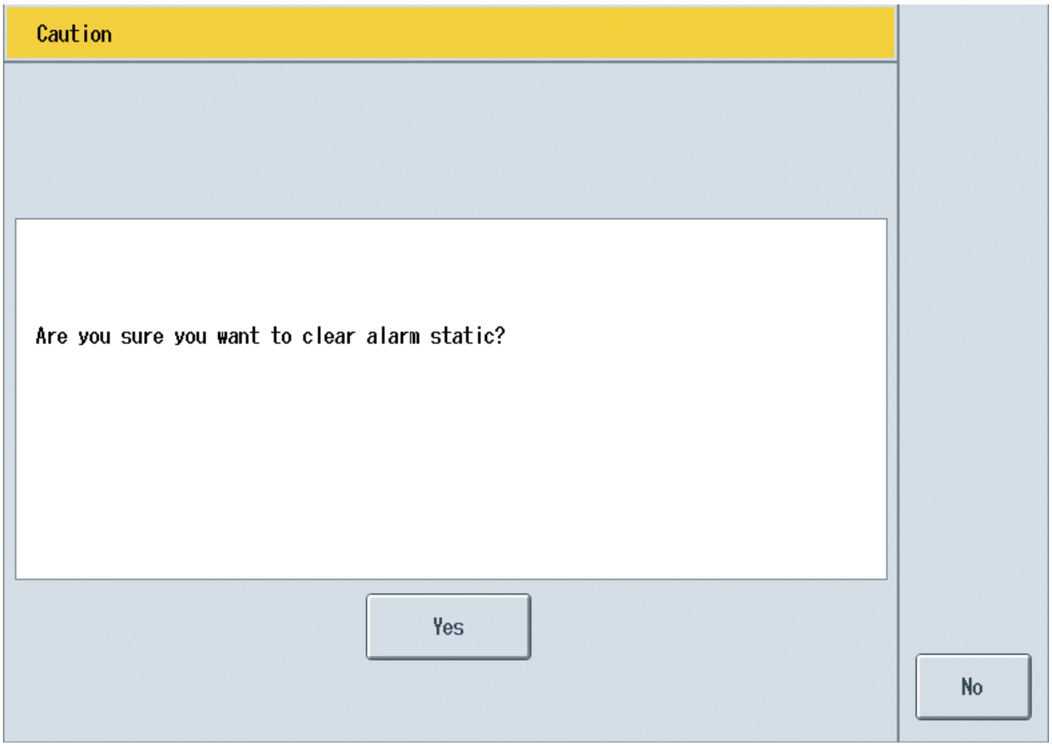

Figure 4.19 Clear Alarm Setting

■ Alarm Popup Restriction

Select the desired restriction for alarm popup display.

Only the alarms defined here will be popped up.

TIP

This option is available if the user level is set to C or higher.

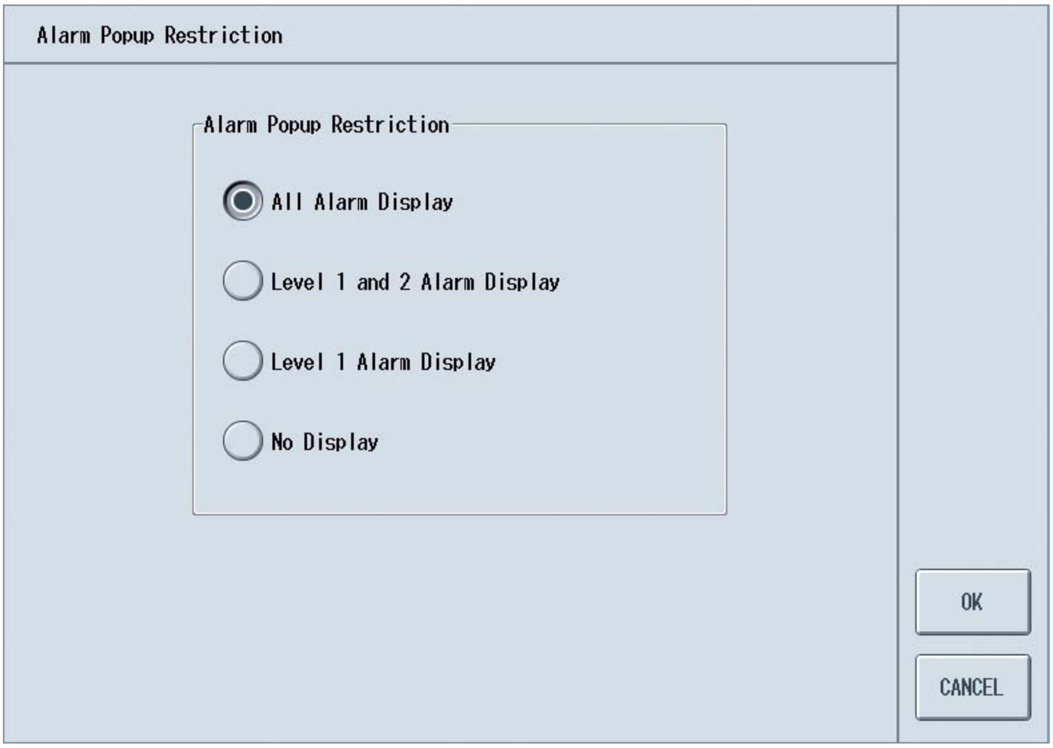

Figure 4.20 Alarm Popup Restriction

Display all alarms:	Displays an alarm popup whenever any alarm occurs. This is the default setting.
Display level 1 or 2:	Displays an alarm popup when an alarm of level 1 or 2 occurs.
Display level 1 only:	Displays an alarm popup when an alarm of level 1 occurs.
No display:	Displays no alarm popup.

4.2 Analyzer Overview Screen

The overview screen displays the status of GCMs (GCM modules) of the currently connected GC8000, allowing to control their operation.

Press the  on the navigation bar to display the overview screen (the same default screen as appears upon startup).

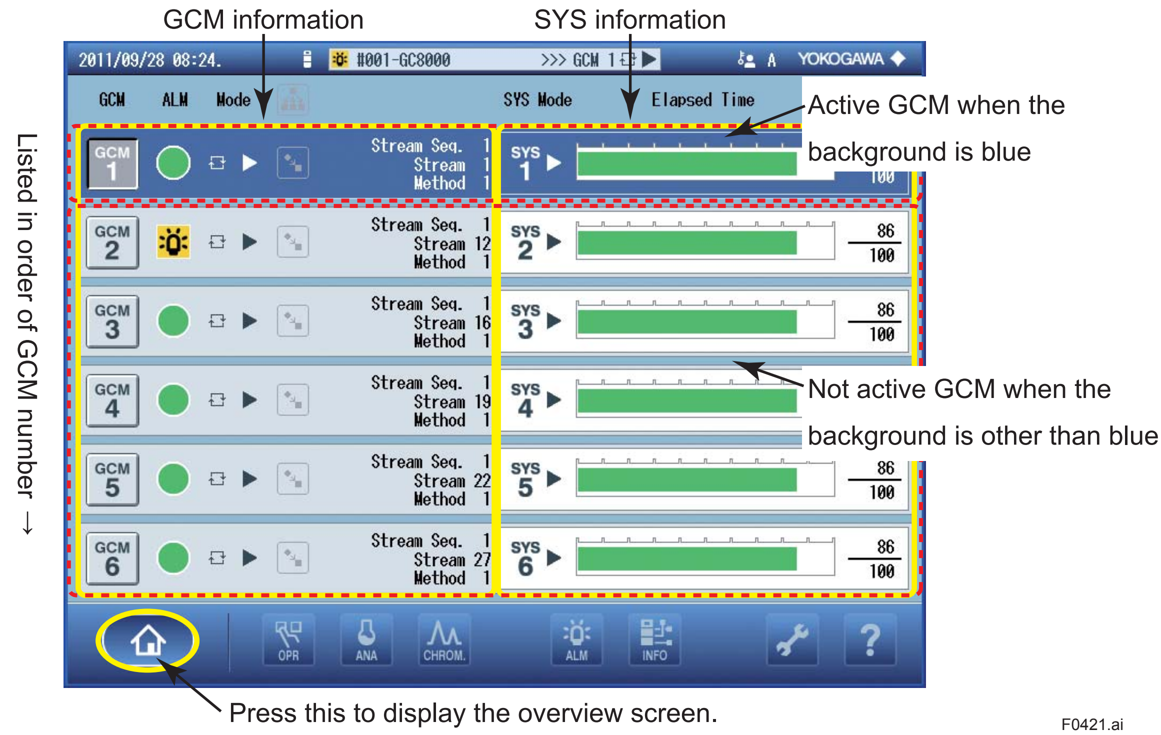

Figure 4.21　Example of Overview Screen

■ Description of icons and buttons

The icons and buttons provided on the overview screen are as described below.

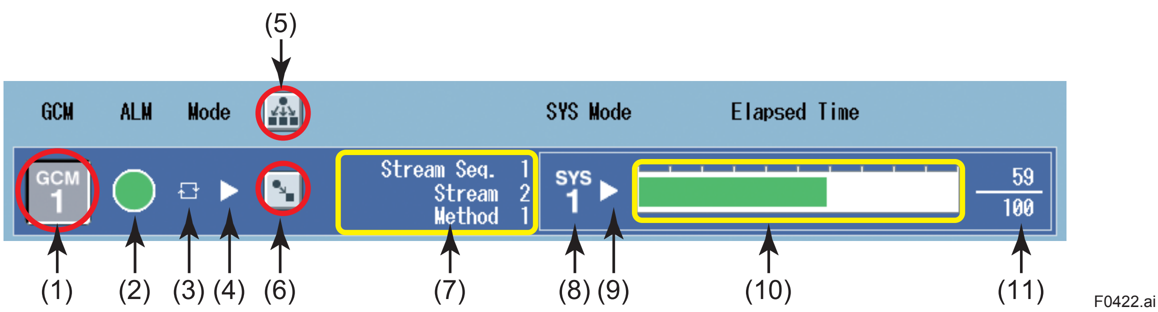

Figure 4.22　Overview Screen Display Elements

Table 4.5 Description of Overview Screen Display Elements

Symbol	Item	Description
(1)	Active GCM change button	Indicates the GCM number. Also used to set the GCM as an active GCM.
(2)	GCM alarm indicator	Indicates the alarm status of the GCM. No alarm Level-1 alarm generated (blinking) Level-2 alarm generated (blinking)
(3)	GCM operating status indicator	Indicates the operating status of the GCM. Manual Process
(4)	GCM operating mode indicator	Indicates the operating mode of the GCM. Run Pause Stop
(5)	Operating status change button for all GCMs	Changes the operating status of GCMs. All GCMs
(6)	GCM operating status change button	Each GCM
(7)	Indicators of GCM measurement status, stream number, and method number.	Indicates the stream sequence, stream number, and method number of the GCM.
(8)	SYS number indicator	Indicates the SYS number (1 to 6) assigned to the GCM.
(9)	SYS operating status indicator	Indicates the operating mode of the SYS. Run Pause Stop
(10)	Elapsed time bar graph	Indicates the elapsed time on a bar graph.
(11)	Elapsed time/SYS analysis	Indicates the elapsed time per interval as a numerical value.

■ Changing the Active GCM

Example: To make GCM2 active, follow this procedure:

(1) Press the GCM change button GCM 2 of GCM2, which is not currently active.

(2) When a confirmation screen appears, press Yes.

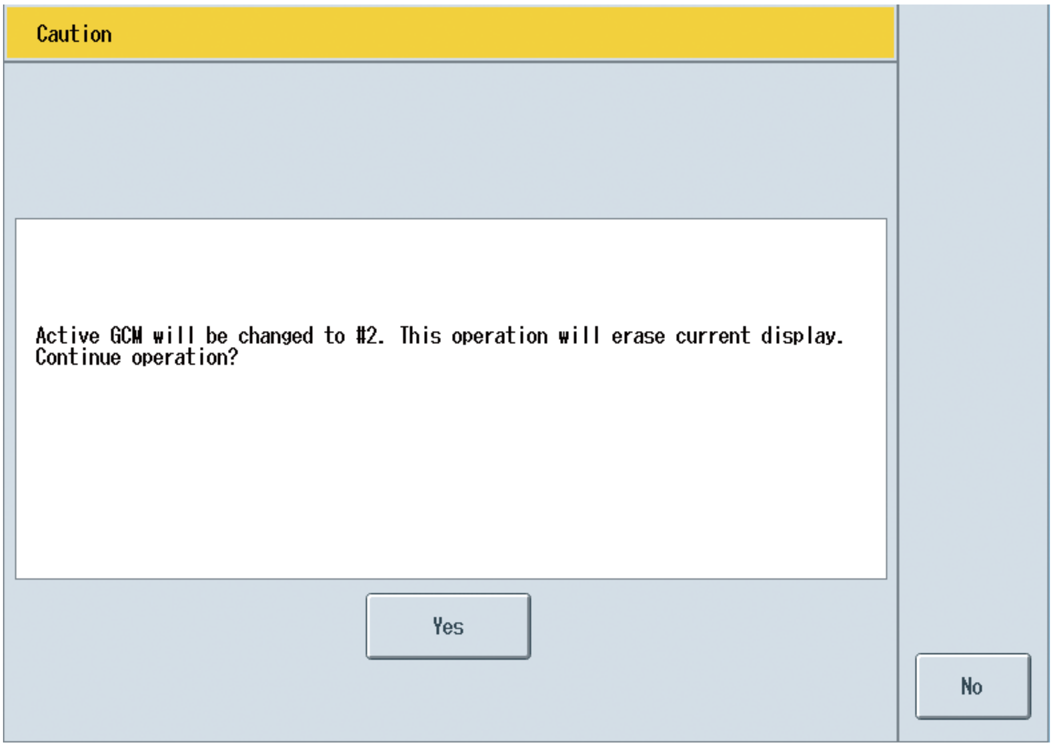

Figure 4.23 Changing the Active GCM

(3) GCM2 has been made active. This is indicated as the background of the GCM2 line turns blue and the active GCM number on the caption banner shows GCM2.

■ Changing the operating mode

TIP

This operation is available if the user level is set to B or higher. The forced stop function is enabled only for user level C+.

The operating mode can be changed separately for each GCM, or for all GCMs at once.

● To change the operating mode of each GCM

Press the operating status change button  for the desired GCM.

The screen displays the operating status change dialog for GCM1.

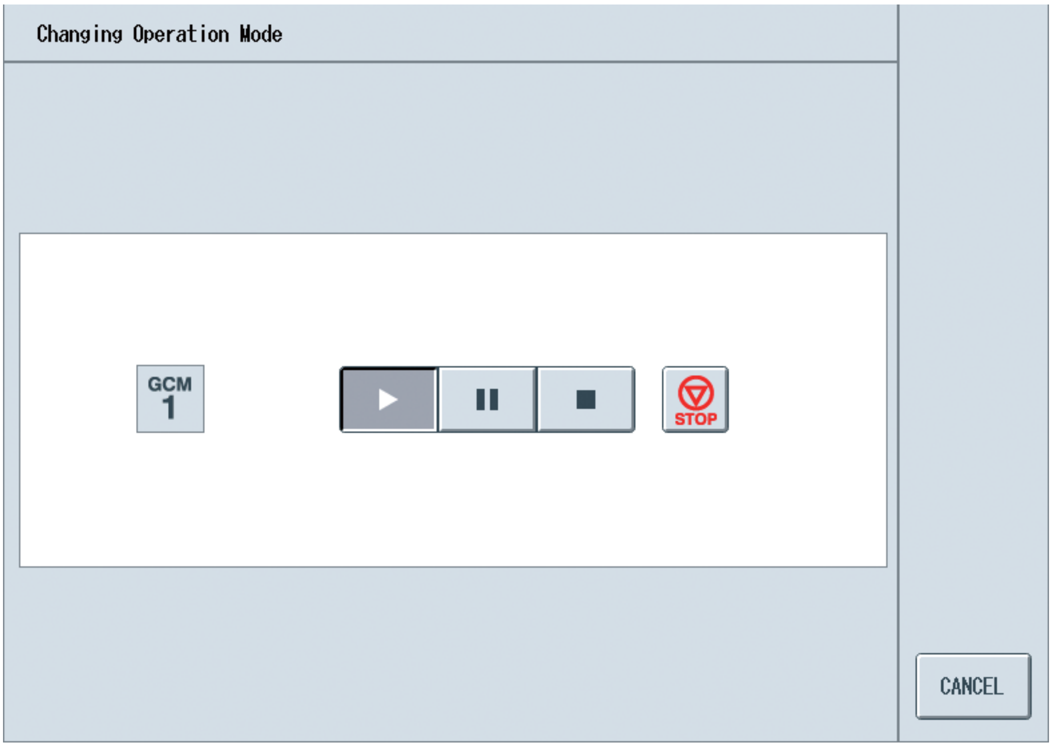

Figure 4.24 Example of Changing the GCM Operating Mode (for GCM1)

● To change the operating mode of all GCMs

Press the operating status change button for all GCMs .

The screen displays the operating status change dialog for all GCMs.

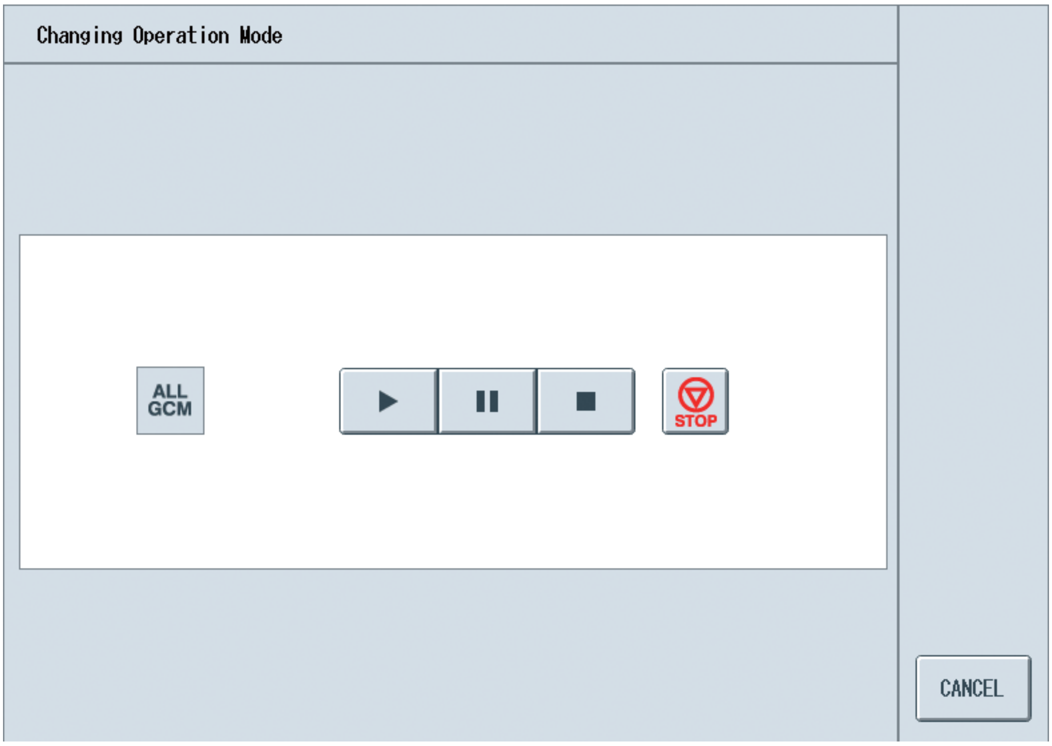

Figure 4.25 Changing the Operating Mode of All GCMs

SEE ALSO

For operating modes, see ## Operating Mode on page 4-28.

4.3 Analyzer Map Screen

The analyzer map screen displays the GCM/SYS/stream configuration in GC8000, as well as the status of valves and detectors.

This analyzer map screen consists of two tabs: GCM Map tab and Stream Map tab.

Press the  on the navigation bar to display the analyzer map screen.

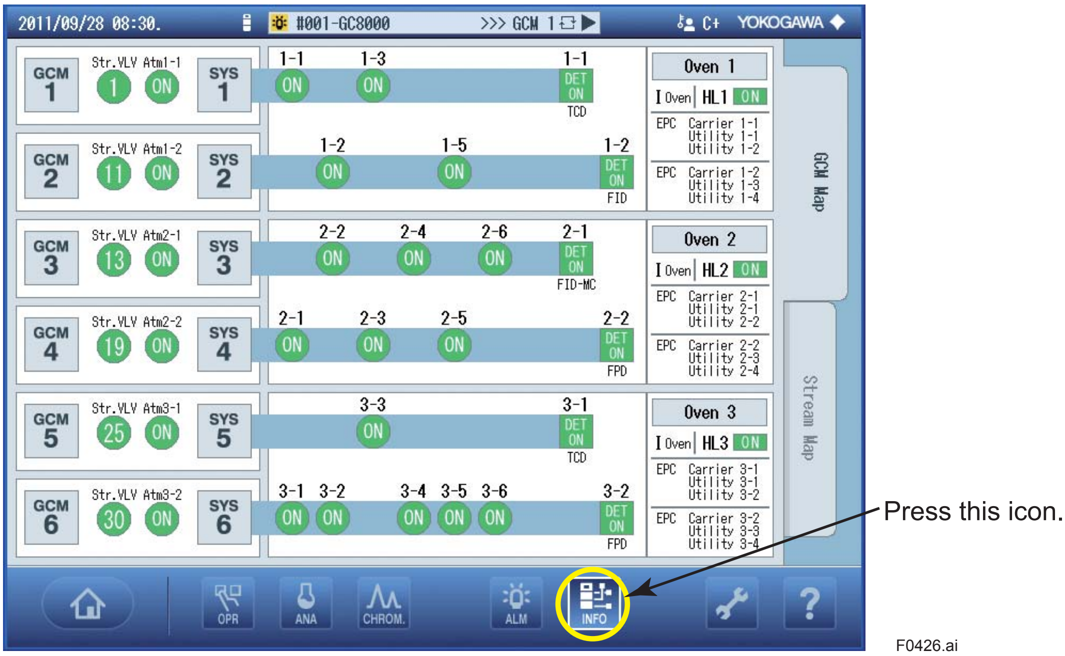

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Figure 4.26 Analyzer Map Screen

4.3.1 GCM Map Tab

The GCM map tab displays the following information.

- List of valves and detectors assigned to GCM-SYS.
- List of valves and detectors associated with each oven.
- Type of oven: I for isothermal oven, or P for programmed temperature oven
- Status of stream valves: Streams 1 to 31, or OFF
- Presence and status of atmospheric pressure balancing valve
- Presence of EPC: Carrier n-1 to n-2, and Utility n-1 to n-4 (where n is oven number)
- Types of detectors: TCD, FID, FID-MC, FPD
- Presence and status of hydrogen limiting units: HLn (where n is oven number)

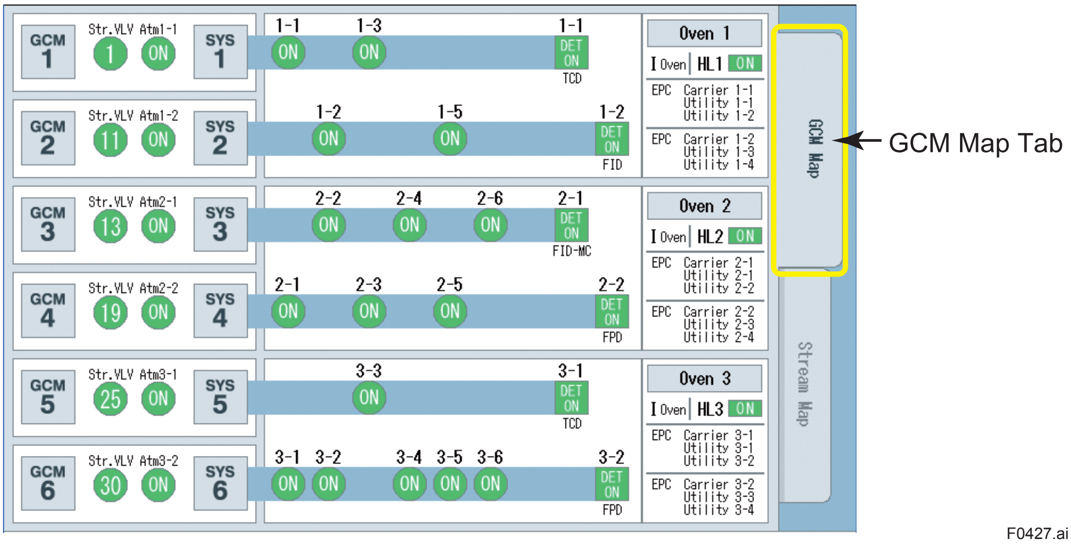


Figure 4.27 Example of GCM Map Tab

4.3.2 Stream Map Tab

The stream map tab identifies the stream numbers (1 to 31) assigned to GCMs.

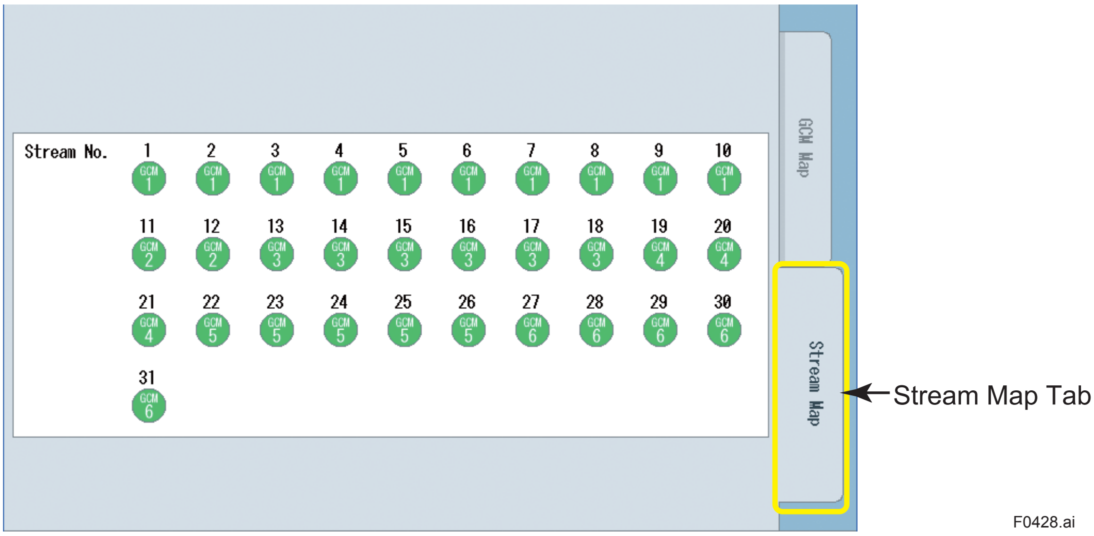


Figure 4.28 Example of Stream Map Tab

4.4 Analyzer Operation Screen

The analyzer operation screen is used to view and operate on each GCM and SYS of connected analyzers. This screen consists of the active GCM tab and its subordinate SYS tab (oven tab).

The information displayed here is updated every second.

Press the  on the navigation bar to display the analyzer operation screen.

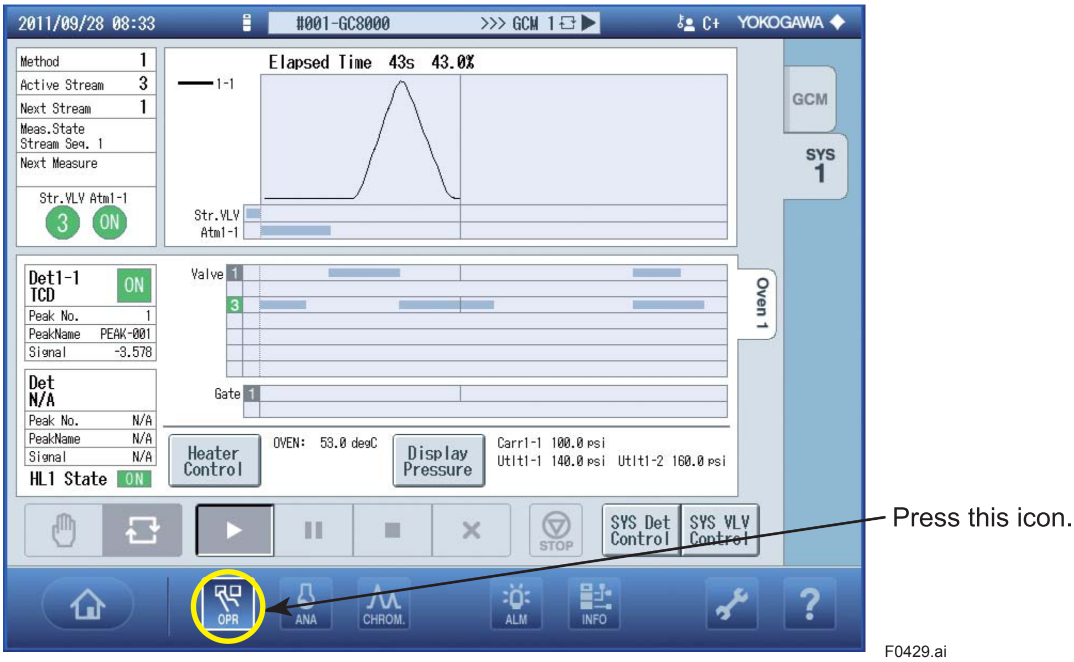


Figure 4.29 Example of Analyzer Operation Screen

4.4.1 GCM Tab

The GCM tab displays information about the active GCM.

Screen components are as shown below.

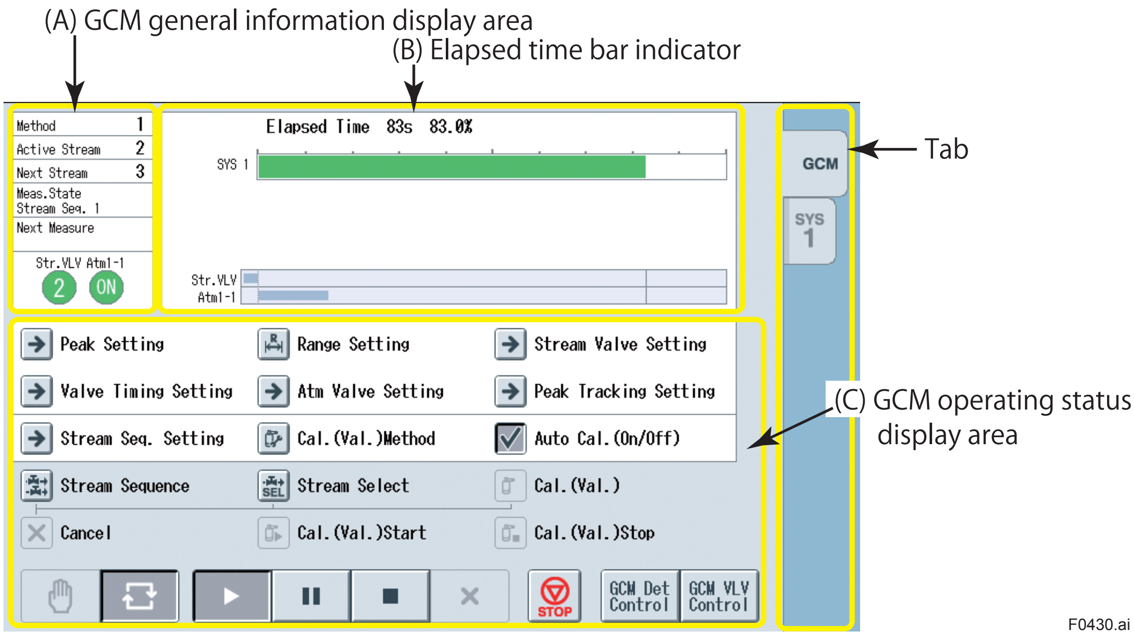


Figure 4.30 GCM Tab Layout

(A) GCM general information display area

This area displays general information about GCM.

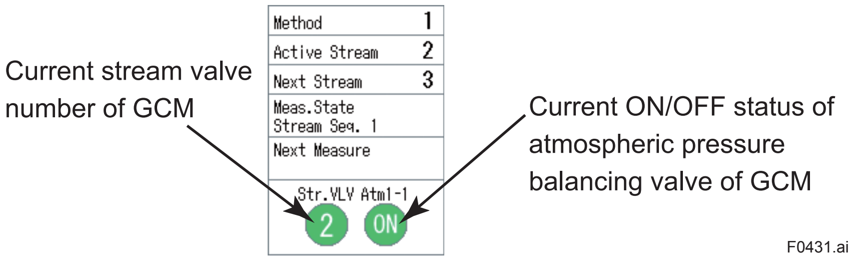


Figure 4.31 Example of GCM General Information Display Area

● Method number indicator

Indicates the method number (1 to 6).

The indication is blank when the GCM is in manual or process - stop state.

● Stream valve indicator

Indicates the stream valve status, either in terms of stream valve number or OFF.

● Atmospheric balanced valve indicator

Indicates the status (ON or OFF) of the atmospheric pressure balancing valve. This indication is hidden if an atmospheric pressure balancing valve not available.

(B) Elapsed time bar indicator

This area indicates the elapsed time of GSM and its subordinate SYS, as well as the ON/OFF timings of stream valve and atmospheric pressure balancing valve.

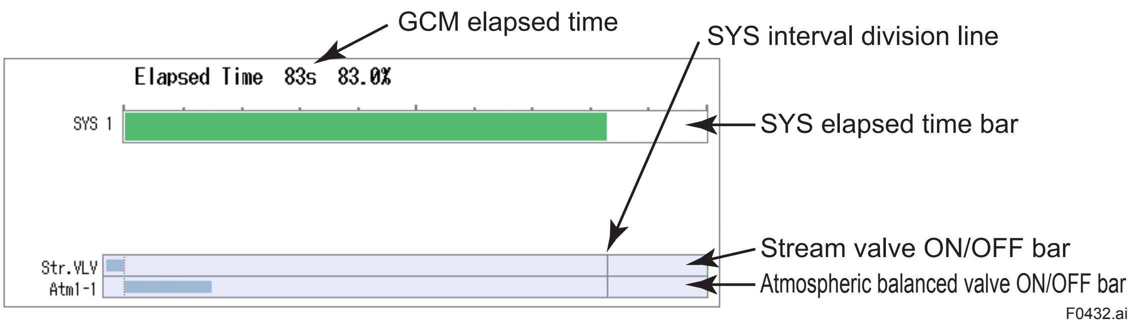


Figure 4.32 Display Example of Elapsed Time Bar

The GCM elapsed time is indicated in terms of the elapsed time (in seconds) since the beginning of analysis, and the ratio (percentage) of elapsed time to the analysis interval.

When the GCM is in manual mode, the time axis is automatically adjusted, so that the elapsed time is indicated in terms of the ratio (percentage) to the full scale.

(C) GCM operating status display area

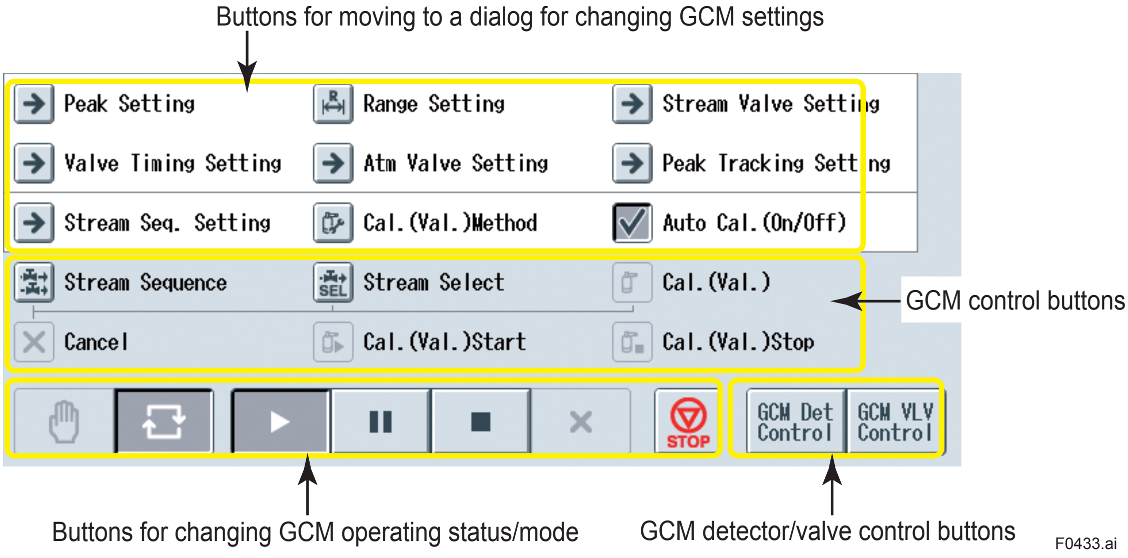


Figure 4.33 Example of GCM Operating Status Display Area

(1)Changing the operating status

This section describes how to change the operating status (GCM status/operating mode/ measurement status) of the active GCM or of each SYS.

● GCM status

Select the GCM status Process or Manual.

Process: Status for performing measurement and calibration.
Manual: Status for performing manual operation.

TIP

This operation is available if the user level is set to C or higher.
Status change is only possible when the operating mode is Stop.

● Operating mode

Select the desired operating mode of the active GCM or of each SYS from the following:

Run: Runs measurement.
Pause: Pauses the run.
Stop: Stops the run.
Cancel command: Cancels the operating mode command.
Forced stop: Forces operating mode to stop.

TIP

- The Run, Pause, Stop, and Cancel command actions are enabled for user level B or higher.
- The Forced stop action is enabled for user level C+.
- The Pause action is enabled only for the active GCM. It is disabled for each SYS.
- The operating mode can be set on the analyzer overview screen and the analyzer operation screen. The Forced stop action can only be executed on the analyzer operation screen.

● Measurement status

Select the desired measurement status of the active GCM from the following:

Stream sequence: Measurement will be executed in the order of stream sequence specified here. After the selection, set the sequence number (1 to 8).

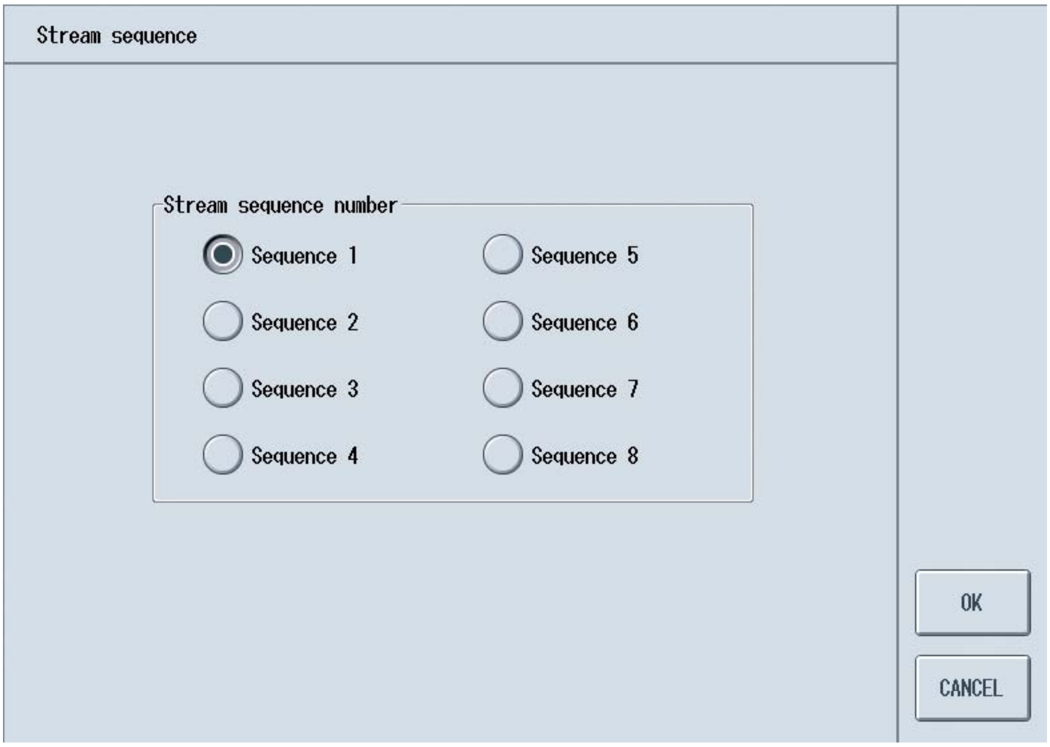


Figure 4.34

Specify str: The stream specified here will be measurement. After the selection, set the stream number (1 to 31) and the number of repetitions (0 for continuous, or 1 to 9999).

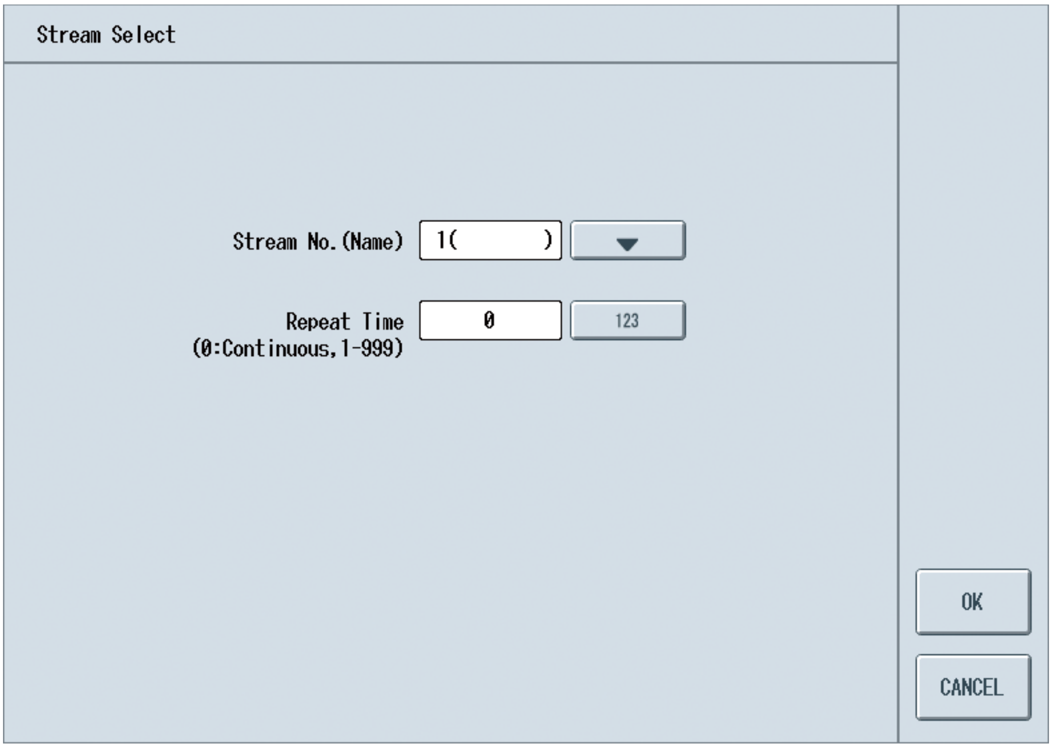


Figure 4.35

Cal (Val):	Executes calibration or validation of the specified number. After the selection, set the calibration (validation) number (1 to 3 for calibration, or 1 to 3 for validation). Ensure that the calibration (validation) number is the stream number.
Start cal (val):	Starts the calibration (validation).
Finish cal (val):	Finishes the calibration or validation.
Cancel spec.:	Cancels the parameter settings for changing the measurement status.
Cal (val) method:	Set the desired mode of calibration or validation: manual, semi-auto, or auto.

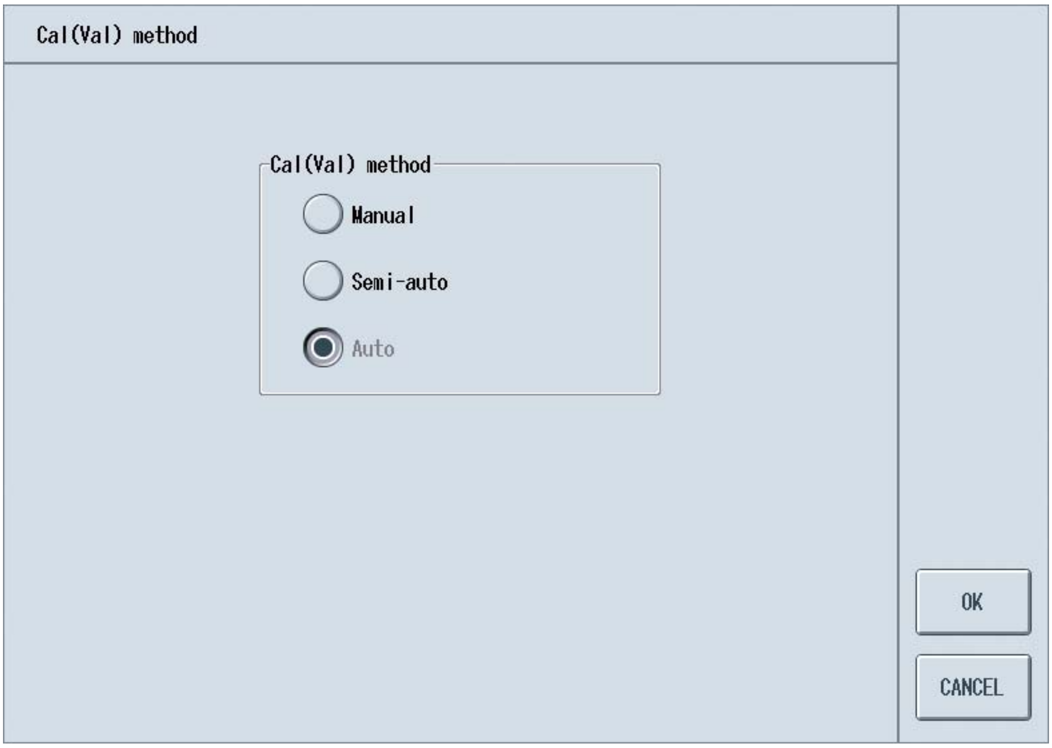


Figure 4.36

Auto:	Calibration or validation is executed automatically according to the set values of start time and time interval.
Semi-auto:	When a calibration or validation number is specified, the stream valve on the calibration or validation stream automatically opens, followed by calibration or validation.
Manual:	When a calibration or validation number is specified, all stream valves close, allowing a standard sample to flow. Then, calibration or validation can be performed manually.
Start/stop auto cal:	Starts/stops automatic calibration.

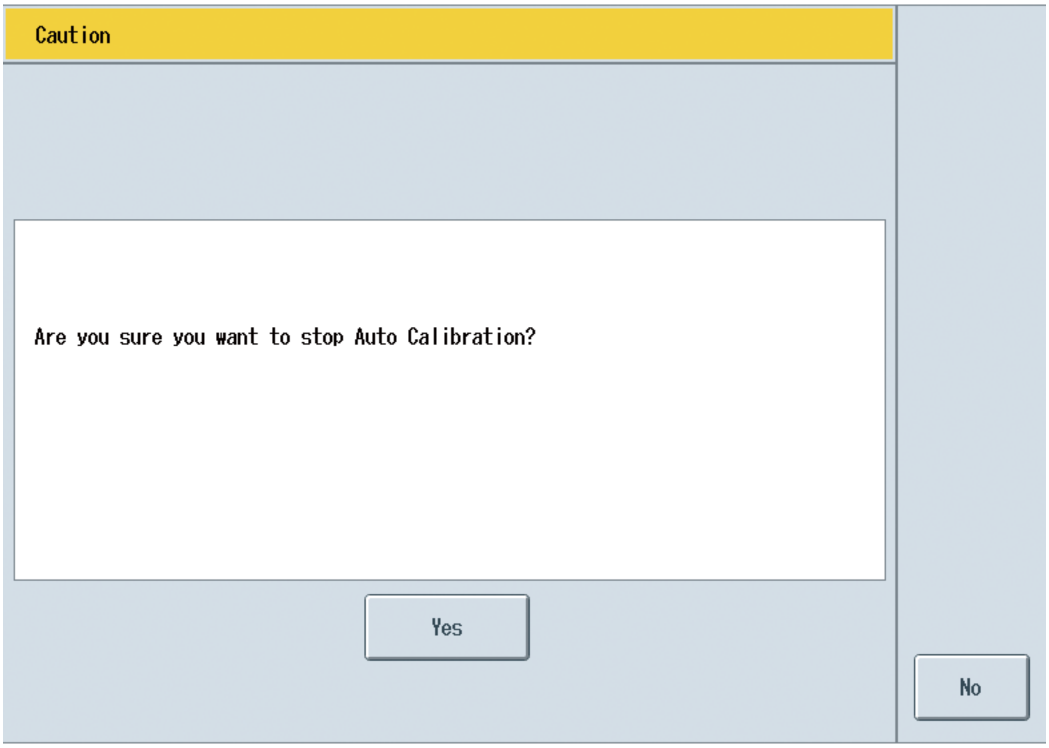


Figure 4.37

TIP

- The selections Str. Sequence, Specify str., Cal (Val), Start cal (val), and Finish cal (val) are enabled for user level B or higher.
- The selections Cancel spec., Cal (val) method, and Start/stop auto cal are enabled for user level C or higher.
- If Cal (Val) method is set to Manual or Semi-auto for all calibration/validation numbers, the Start/stop auto cal parameter cannot be set.

(2)Changing GCM settings

a. Peak Setting

Set parameters related to peak recognition.

TIP

- This operation is available if the user level is set to C or higher.
- The stream number, SYS number, and peak number assigned to the active GCM are selectable here.

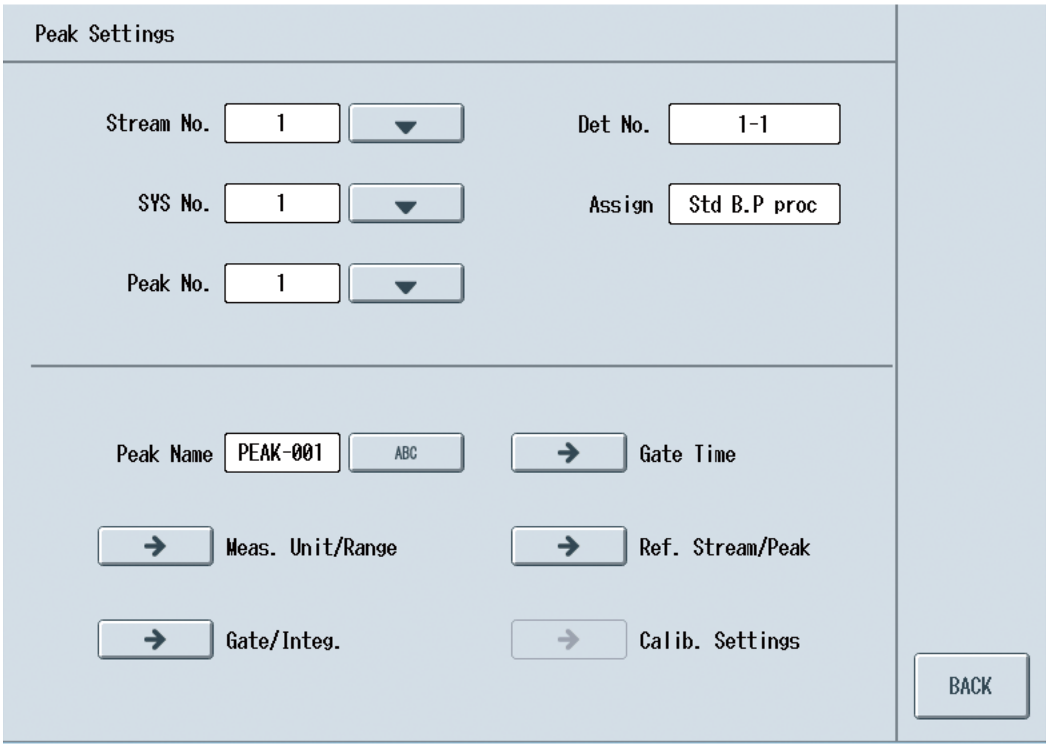


Figure 4.38 Peak Settings

● Peak Name

Set the name for the peak of the specified stream number, SYS number, and peak number. The name can be entered using up to eight ASCII alphanumeric characters.

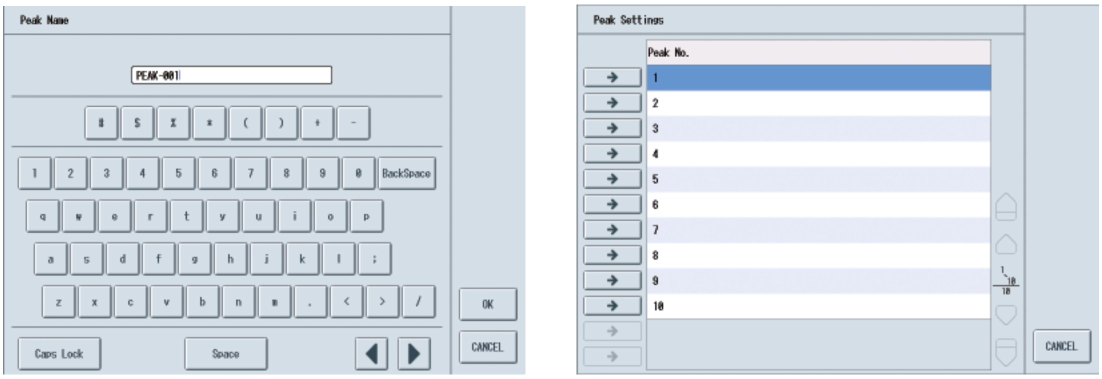


Figure 4.39

● Peak std time/Gate times

Set the gate ON time, gate OFF time, and peak standard time for the peak of the specified stream number, SYS number, and peak number. The setting ranges are each 0.0 to 99999.9 seconds. The actual upper limit is time of its cycle time.

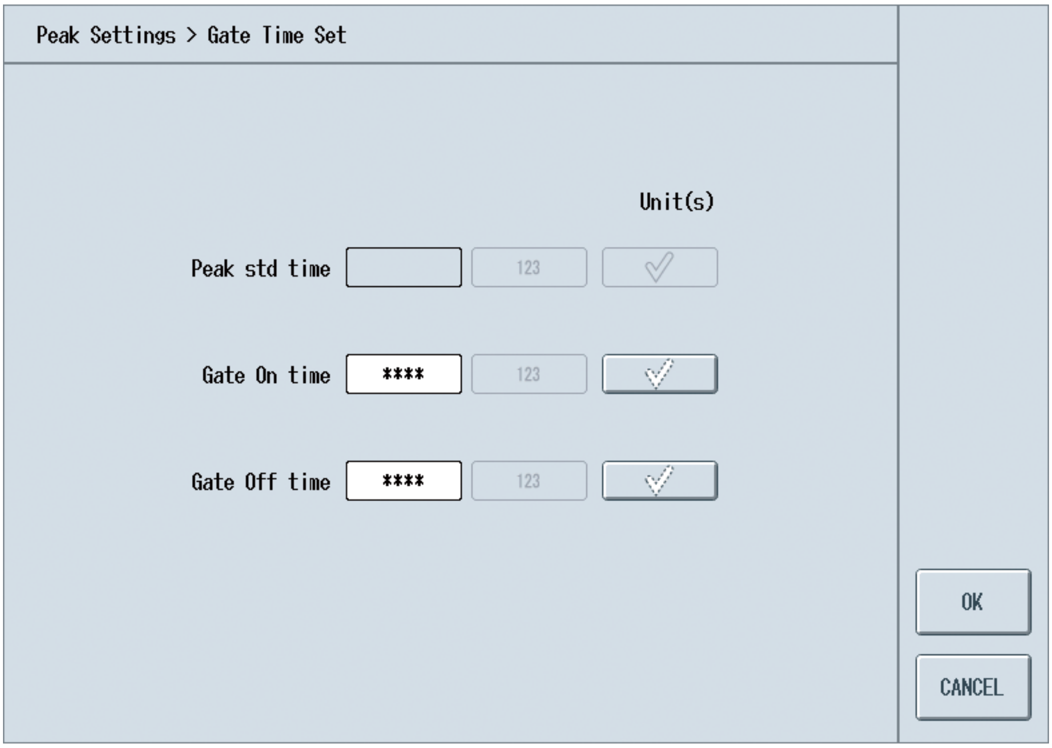


Figure 4.40

● Measuring unit/Measuring range

Set the measuring unit and measuring range for the peak of the specified stream number, SYS number, and peak number.

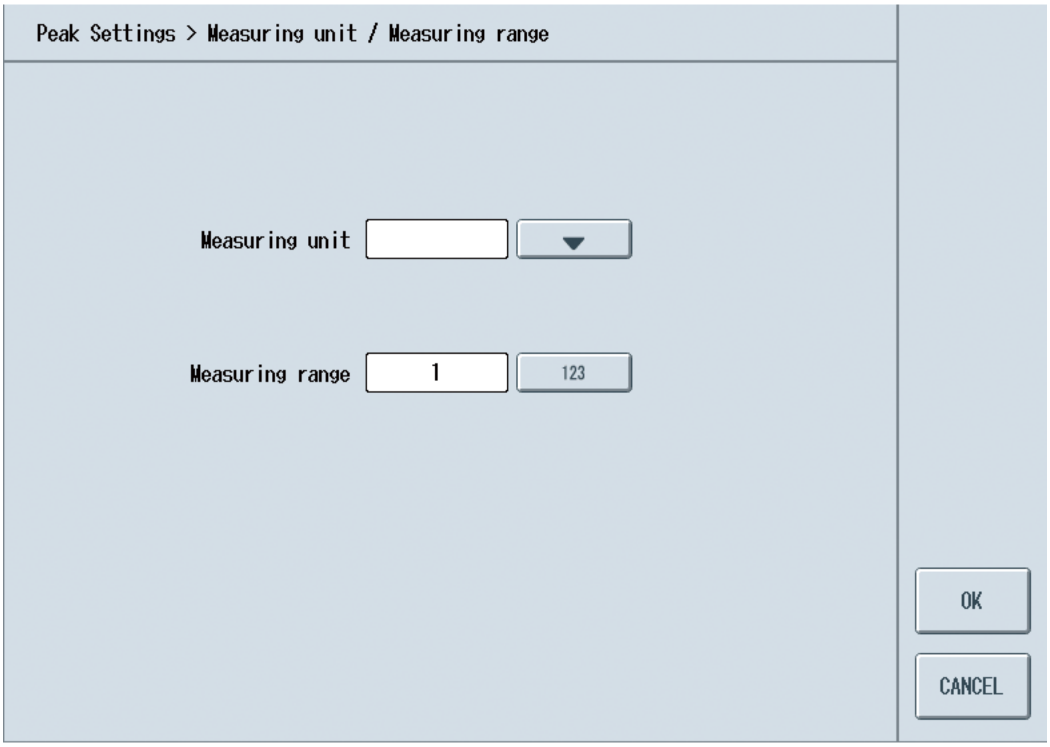


Figure 4.41

Measuring range:

Measuring unit: Select No unit, %, or PPM.

Measuring range: 0.000 to 9999.999.

● Ref stream/Peak set

Set the reference stream number and reference peak number for the peak of the specified stream number, SYS number, and peak number.

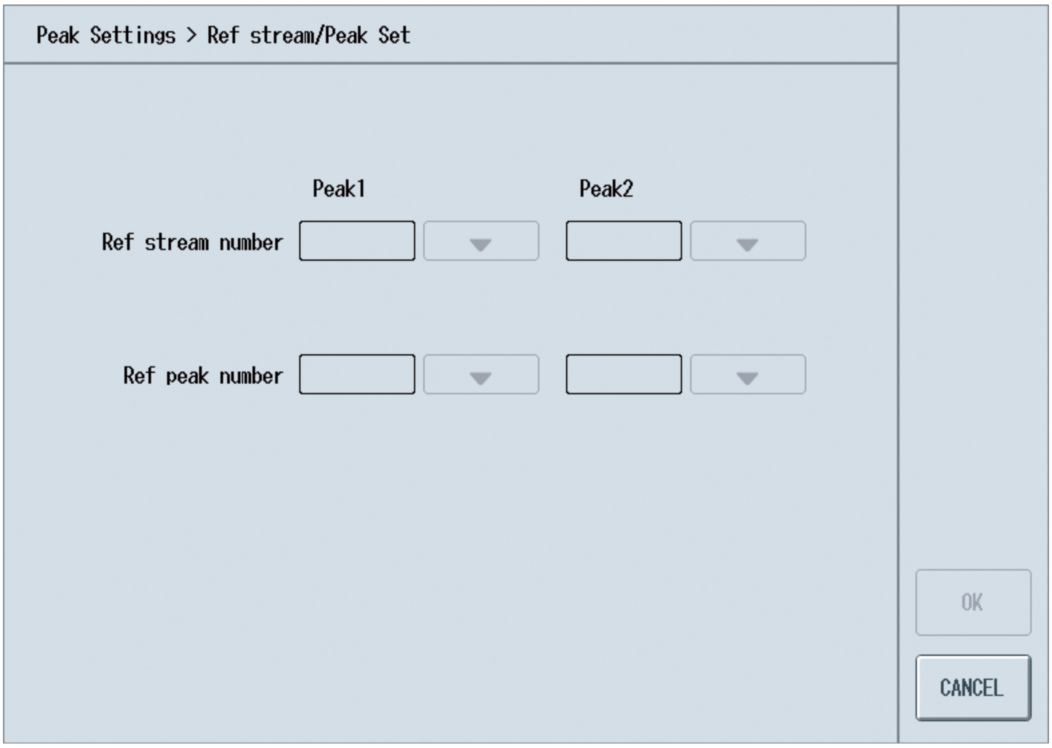


Figure 4.42

Specific items to be set (peak 1 - ref stream number/peak 2 - ref stream number /peak 1 - ref peak number/peak 2 - ref peak number) depend on the process assignment defined by stream number/peak number.

Process assignment is external cubic: Peak 1 only
Process assignment is external linear: Peaks 1 and 2
Otherwise: No peak

Setting range:

Peak 1 - Ref. stream number: 1 to 31
Peak 2 - Ref. stream number: 1 to 31
Peak 1 - Ref. peak number: 1 to 999 (only the peak number assigned to the reference stream number can be selected)
Peak 2 - Ref. peak number: 1 to 999 (only the peak number assigned to the reference stream number can be selected)

● Gate /Integ. Set

Set the gate cut method and integration method for the peak of the specified stream number, SYS number, and peak number.

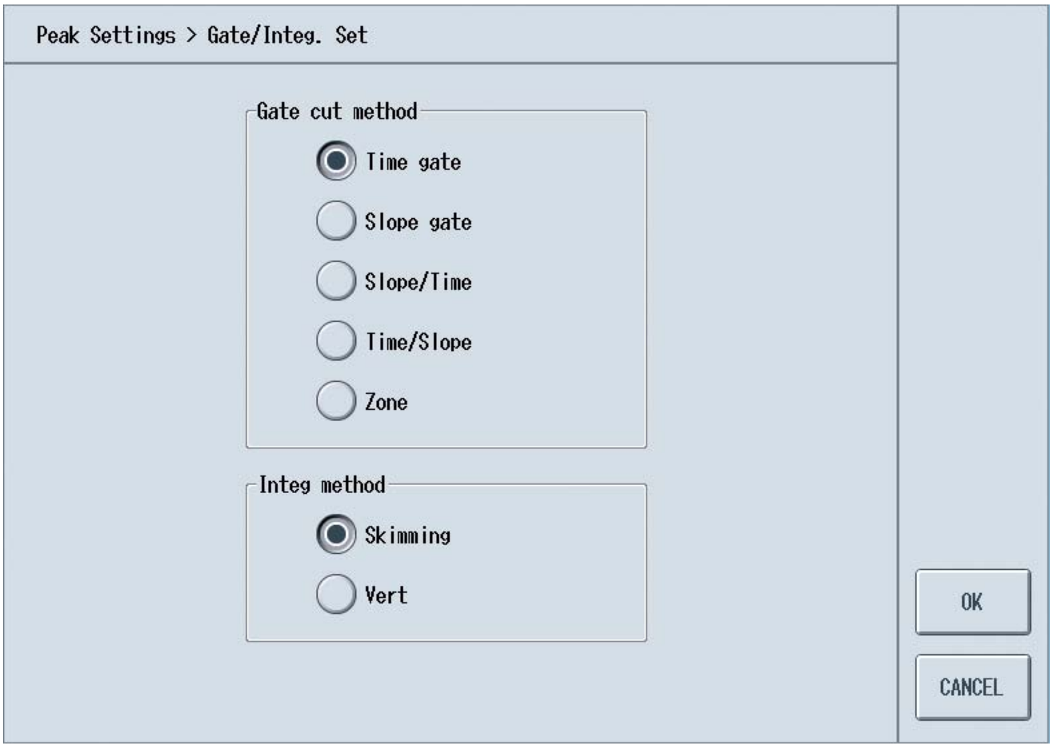


Figure 4.43

Setting range:

Gate cut method: Select Time gate, Slope gate, Slope/Time, Time/Slope, or Zone.

Integ method: Select Skimming or Vert.

● Calib Settings

Set the standard concentration, standard area, and calibration factor for the peak of the specified stream number, SYS number, and peak number. These settings apply only to the calibration stream.

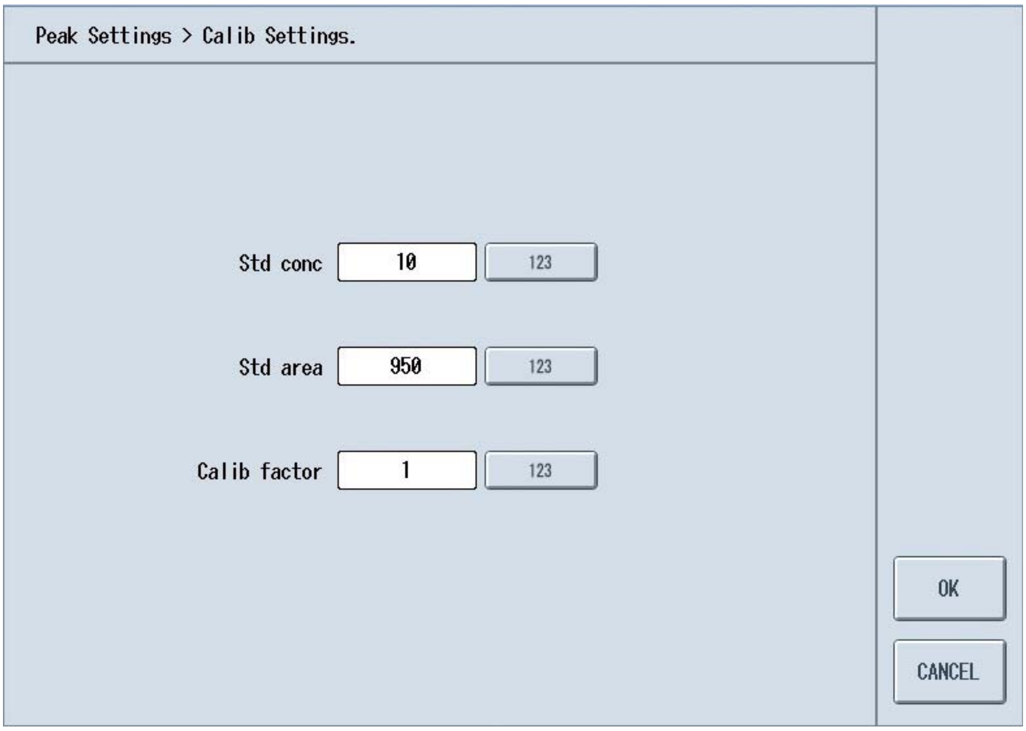


Figure 4.44

Setting range:

Std conc:	0.000 to 9999.999
Std area:	0.000 to 9999.999
Calib factor:	0.000 to 9999.999

b. Range Settings

Set the range for the peak of the specified stream number, SYS number, and peak number. The setting range can be selected from the range of 1 to 31.

TIP

- This operation is available if the user level is set to B or higher.
- The stream number, SYS number, and peak number assigned to the active GCM are selectable here.

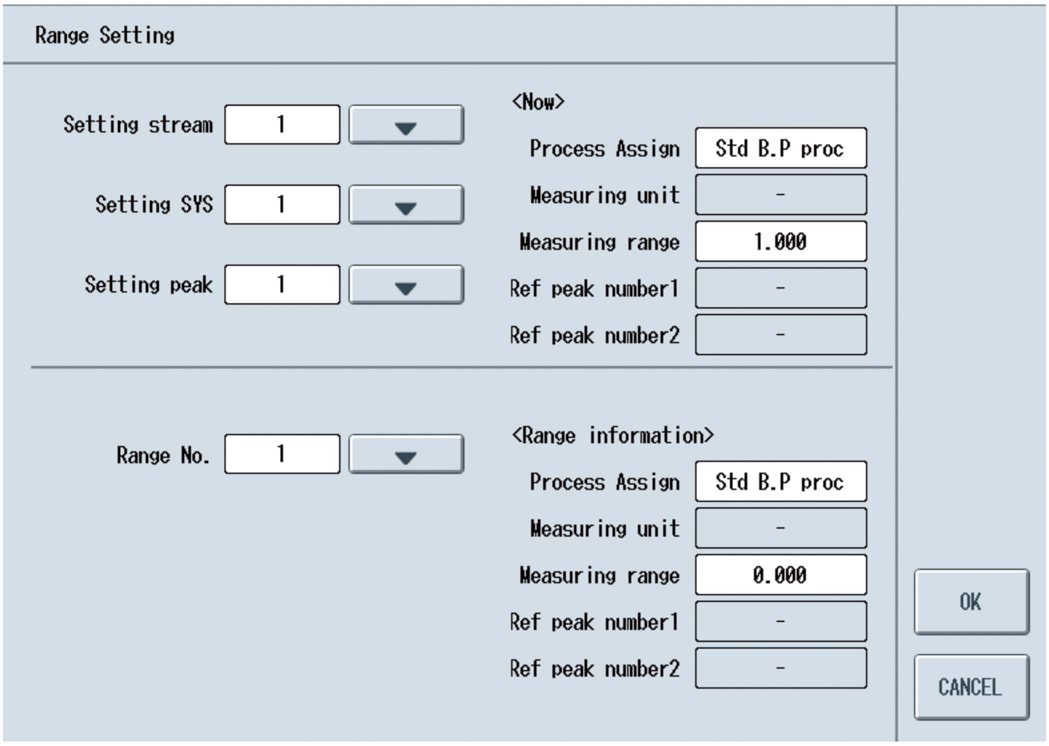


Figure 4.45

c. Stream Valve ON/OFF setting

Set the status (ON/OFF timing) of the stream valve.

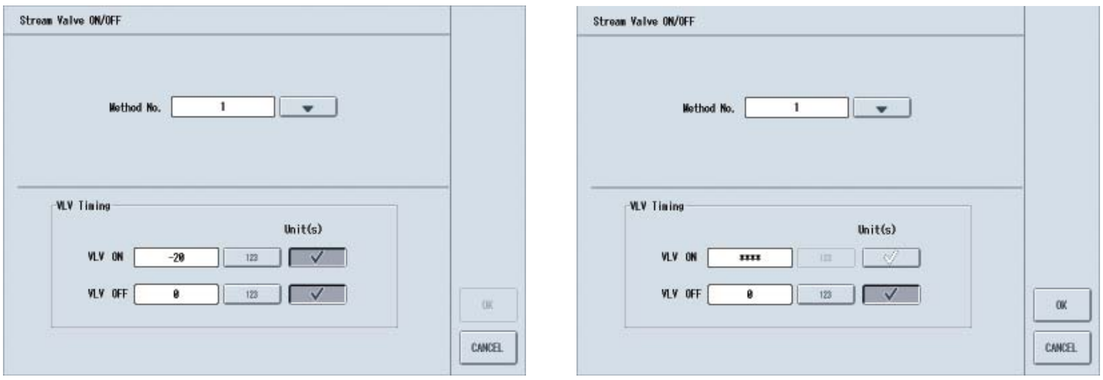


Figure 4.46

Setting range:

Select ON or OFF. The stream valve number is in the range of 1 to 31.

TIP

- This operation is available if the user level is set to C or higher.
- Set the GCM status to manual.
- Only the stream valve number assigned to the active GCM is selectable.

d. Valve ON/OFF setting

Select the valve setting: ON/OFF timing.

TIP

- This operation is available if the user level is set to C or higher.
- Set the GCM status to manual.
- Only the valve assigned to the specified SYS can be set here.

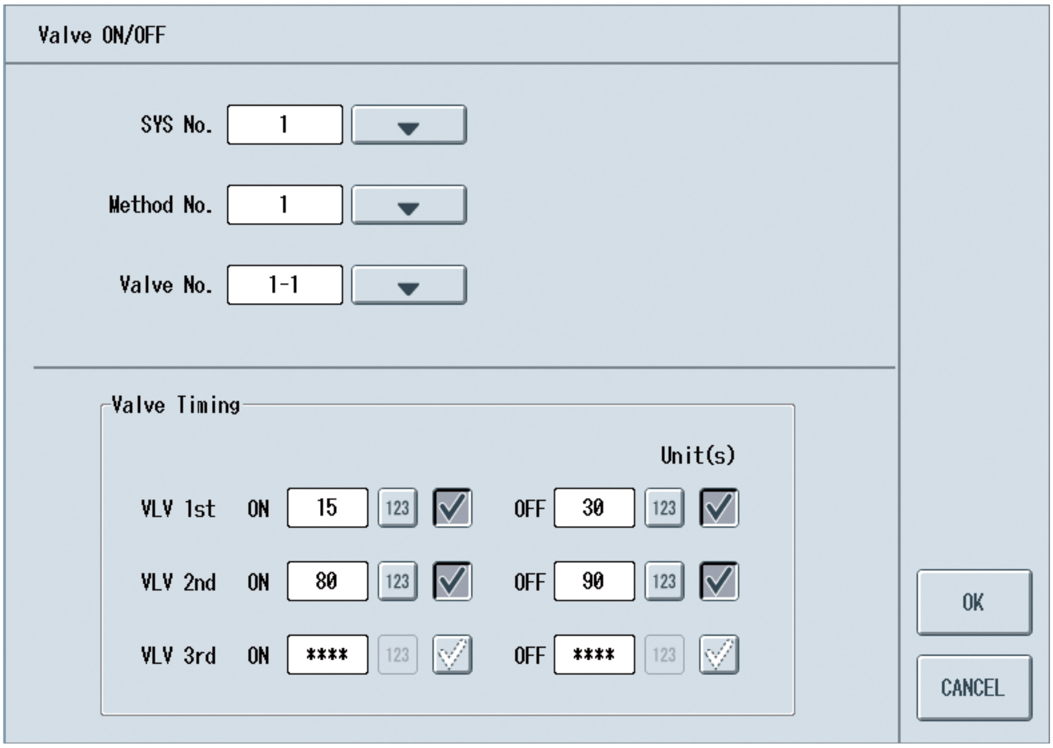


Figure 4.47

e. ATM balanced Valve ON/OFF setting

Select the status of atmospheric pressure balancing valve from ON or OFF.

TIP

- This operation is available if the user level is set to C or higher.
- Set the GCM status to manual.
- Only the atmospheric pressure balancing valve assigned to the active GCM is selectable.

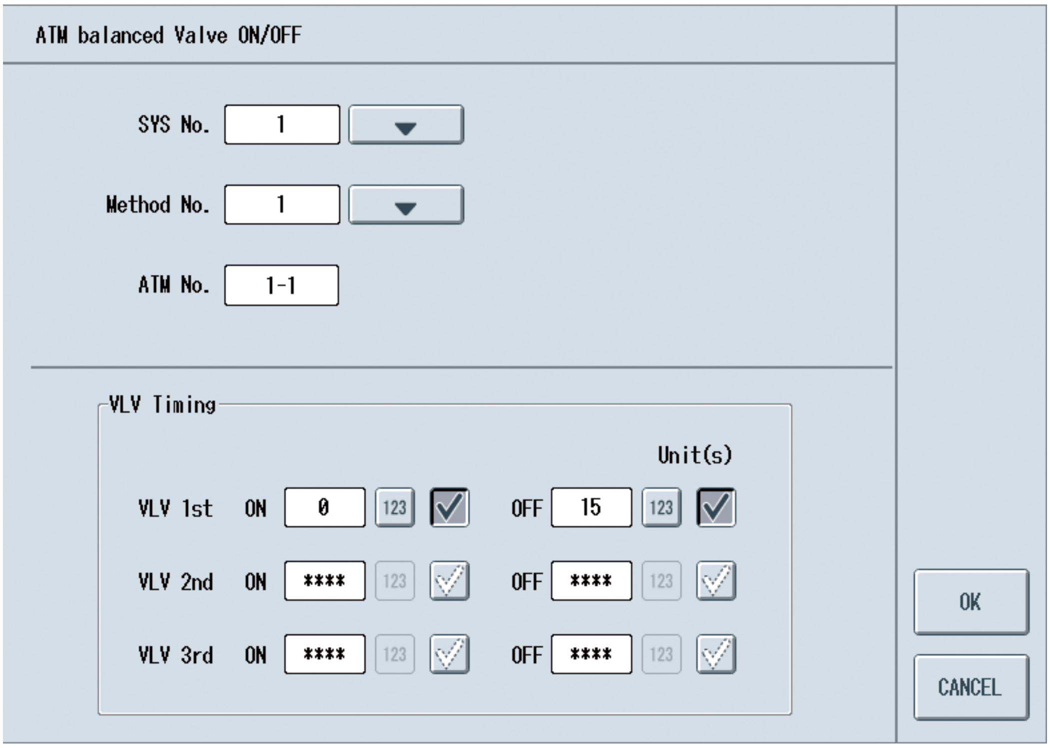


Figure 4.48

f. Peak Tracking

Enable or disable peak tracking for the SYS assigned to the active GCM. Do this by selecting ON or OFF.

TIP

- This operation is available if the user level is set to C or higher.
- Only the SYS number assigned to the active GCM is selectable.

Figure 4.49

g. Str. Sequence Set

Configure the stream sequence for each stream sequence number.

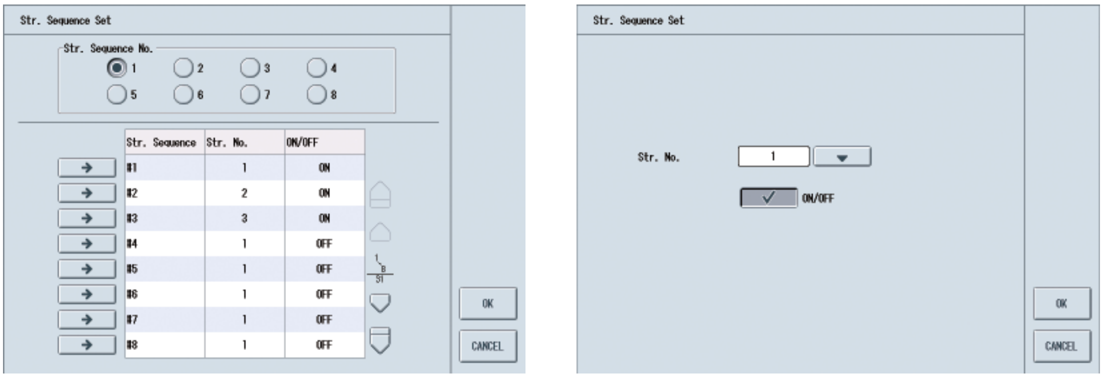


Figure 4.50

Setting range:

Str. Sequence No.: 1 to 8

Str. Sequence: #1 to #31

Setting range:

Str. No.: Select either the stream number assigned to the GCM, or 0 (no stream).

ON/OFF: Select ON or OFF.

TIP

This operation is available if the user level is set to C or higher.

4.4.2 SYS Tab

The SYS tab displays information about the SYS assigned to the active GCM.

Screen components are as shown below.

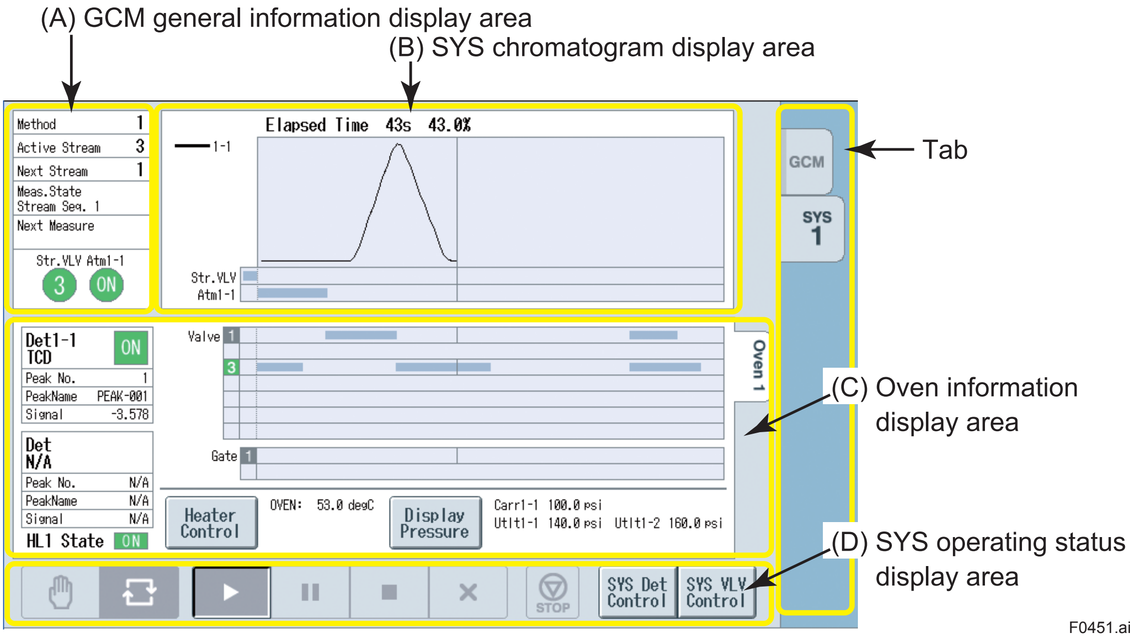


Figure 4.51 **SYS Tab Layout**

(A) GCM general information display area

This is identical to the GCM general information display area described in Section 4.4.1.

(B) SYS chromatogram display area

This area displays the elapsed time of the SYS selected on the SYS tab, as well as the chromatogram, and the ON/OFF timings of stream valve and atmospheric pressure balancing valve of the GCM.

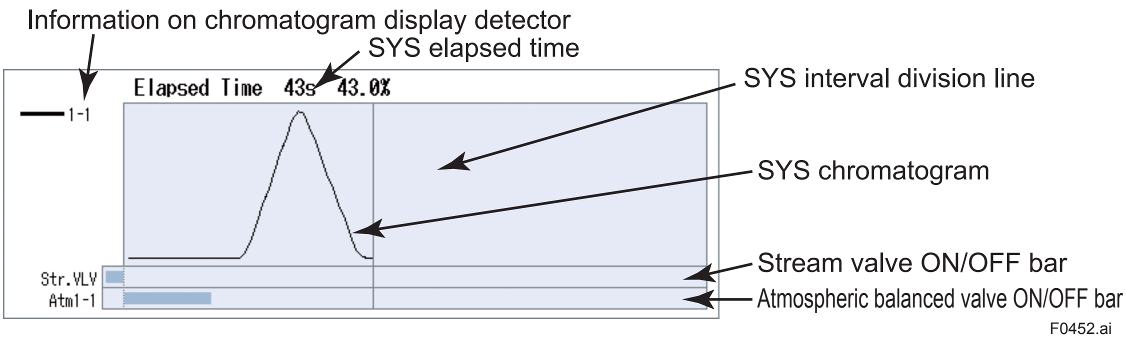


Figure 4.52 Example of SYS Chromatogram Display Area

(C) Oven information display area

This area displays information about the oven used by the SYS selected on the tab.

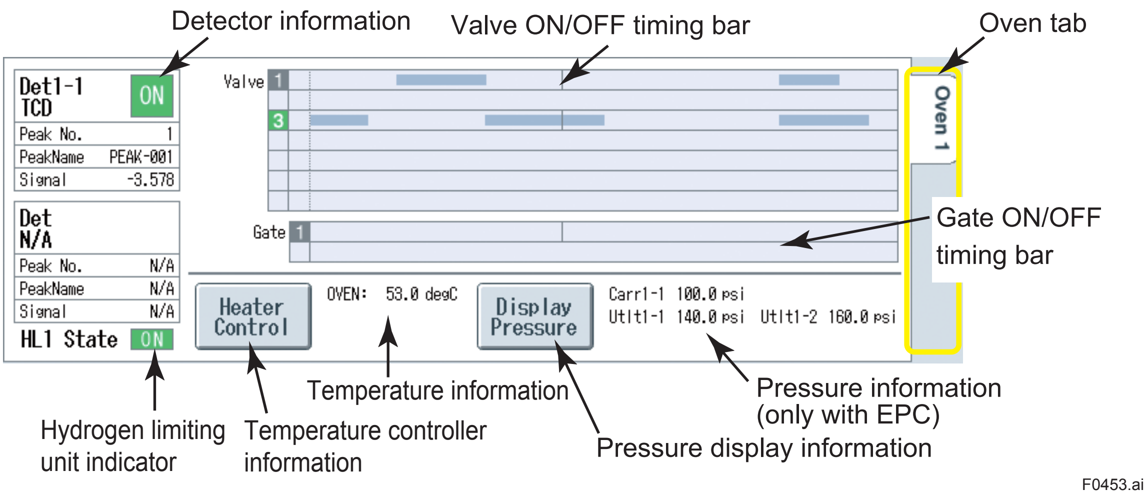


Figure 4.53 Example of Oven Information Display Area

Valve ON/OFF timing bar

Indicates the status (ON or OFF) of valves as a bar graph.

Hydrogen limiting unit indicator

Indicates the status (ON or OFF) of the hydrogen limiting unit. This indication is hidden if a hydrogen limiting unit is not available.

Detector information

Displays information about the detector.

Type:	TCD, FID, FID-MC (FID with methanizer), FPD, None
ON/OFF:	ON/OFF status of detector
Peak No.:	Number of the currently detected peak
Peak Name:	Name of the currently detected peak

Signal: Detector signal in mV.

Pressing the SYS Det Control displays the following information:

Input signal: The analog signal from the detector, which has been sampled every 40 msec, converted to digital values, and then averaged by the given sample rate

Filtered signal: Input signal, which has been filtered using the filter constant set as a detector signal parameter

Standard deviation of signal: Standard deviation of input signal for the past 20 inputs

Applied voltage: Bridge voltage of TCD (for TCD only)

Current: Bridge current of TCD (for TCD only)

Flame detection level: Set value of flame detection level (FID, FID-MC, FPD)

Thermocouple signal: Thermocouple signal (FID, FID-MC, FPD)

Flame detection status: Flame detection status (now burning/burning stopped) (FID, FID-MC, FPD)

Methanizer voltage: Voltage of methanizer (for FID-MC only)

Temperature information

Indicates the oven temperature information (OVEN, LSV, FPD) of the selected SYS.

Unit: deg C and deg F.

Temperature controller information

Indicates the SV value, PV value, and ON/OFF status for the isothermal oven, programmed temperature oven, LSV, and FPD, of the selected SYS.

Press Heater Control.

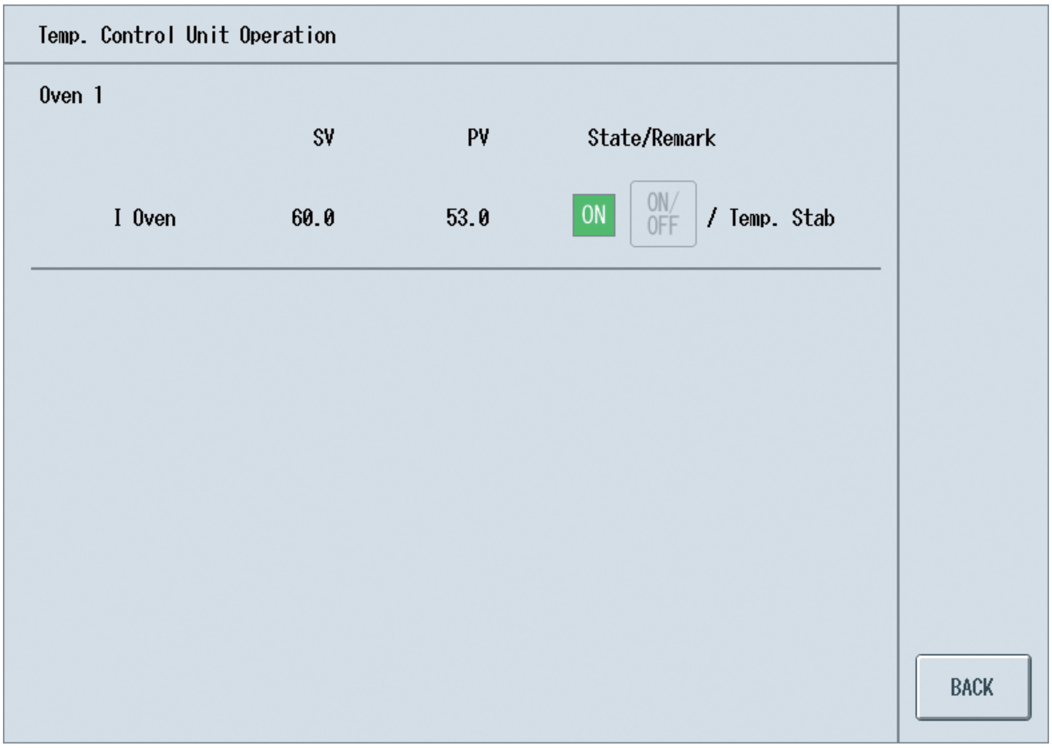


Figure 4.54

Pressure information

Displays pressure information of EPC (Carrier n-1 to n-2, and Utility n-1 to n-4 (where n is oven number)) inthe selected oven.

Pressure display information

Displays the SV value, PV value, and ON/OFF status, for Carrier n-1 to n-2 and Utility n-1 to n-4, of the selected oven.

Press [Display Pressure].

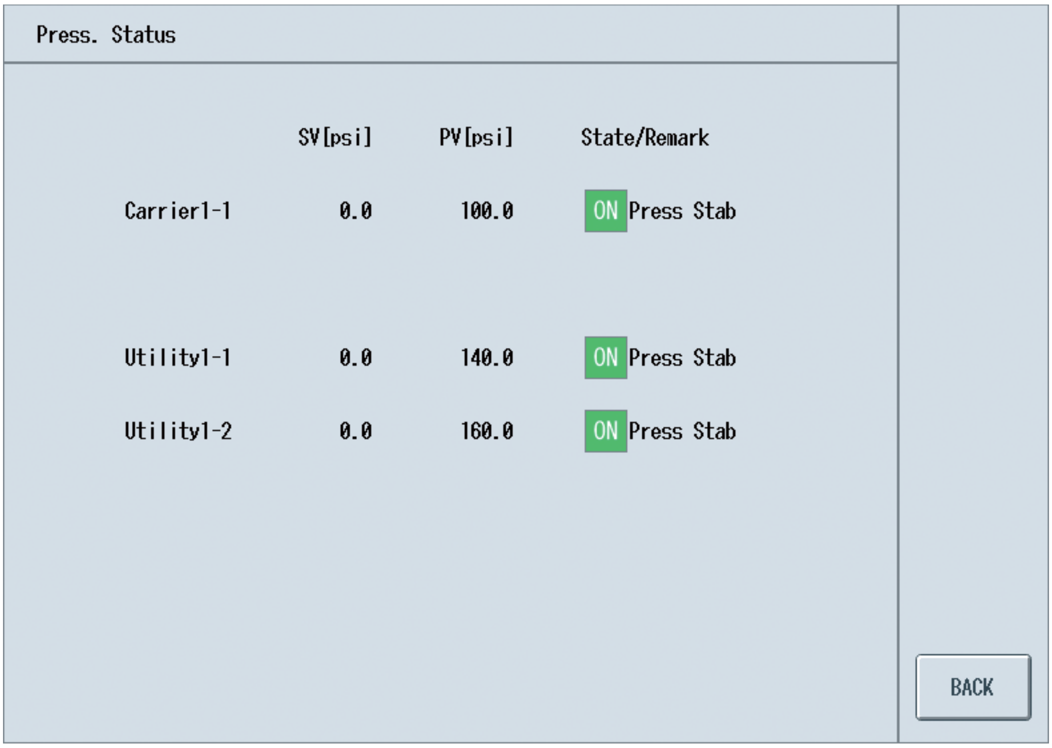


Figure 4.55

(D) SYS operating status display area

This area displays SYS operating mode and operating status. It also displays, and allows operation of, the detector and valve of SYS.

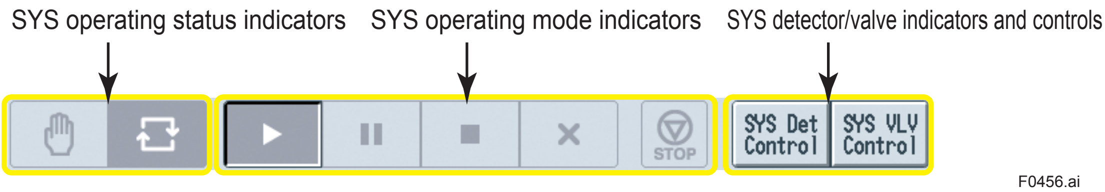


Figure 4.56 Example of SYS Operating Status Display Area

4.5 Chromatogram Screen

This screen displays a chromatogram of the data which is being measured or have been measured by the GC8000. A chromatogram stored in a file can be analyzed to recalculate concentration values. The result of this reanalysis can be transferred to CG8000s and applied to subsequent measurements.

Press the [CHROM] on the navigation bar to display the chromatogram screen.

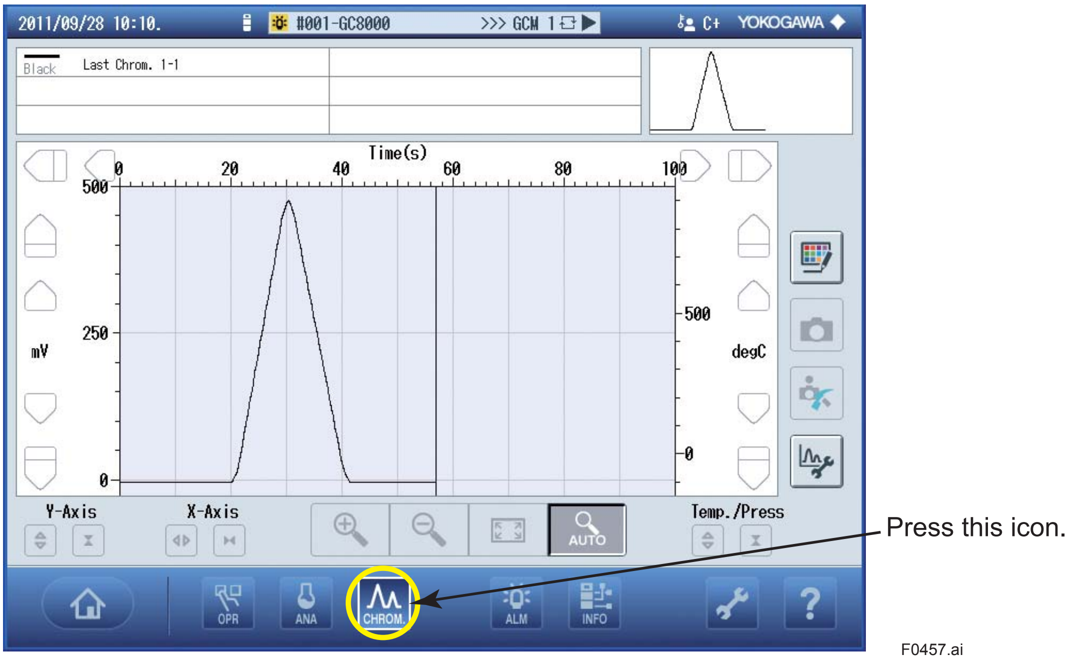


Figure 4.57 **Example of Chromatogram Screen**

■ Screen description

Screen components are as shown below.

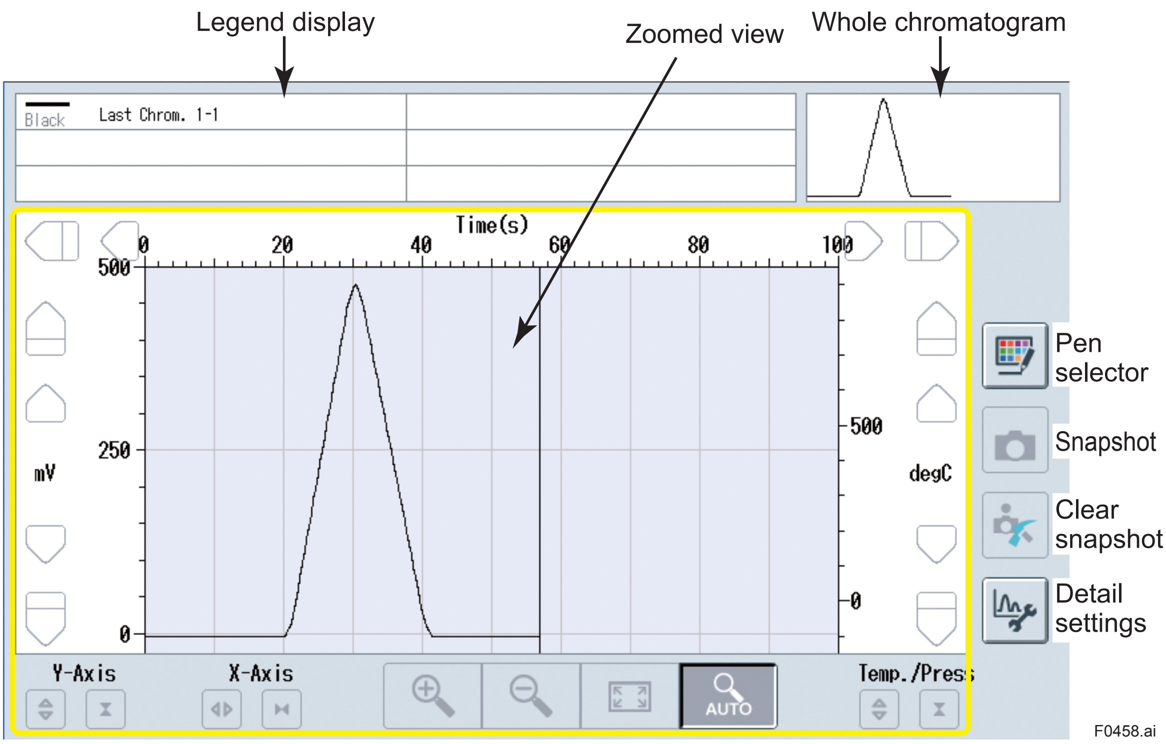


Figure 4.58 **Chromatogram Screen Layout**

Legend display: Indicates pen color, chromatogram type, and detector number.

Whole chromatogram display area:

Displays the whole chromatogram, including portions which are not shown in the zoomed view.

Pen selector: Configures the graph to be displayed. See 4.5.1 Pen Selector.

Snapshot:	Records the magnification and position of zoomed view. See 4.5.2 Snapshot.
Detail settings:	Provides detail settings of the chromatogram screen. See 4.5.3 Detail Settings.
Zoomed view area:	Displays a zoomed view of a selected part of the chromatogram. The chromatogram includes gate mark, peak mark, peak number, as well as the temperature and pressure data for the chromatogram. See 4.5.4 Zoomed View.

4.5.1 Pen Selector

(1) Press the pen selector button ##.

(2) A dialog opens for assigning a graph to a pen.

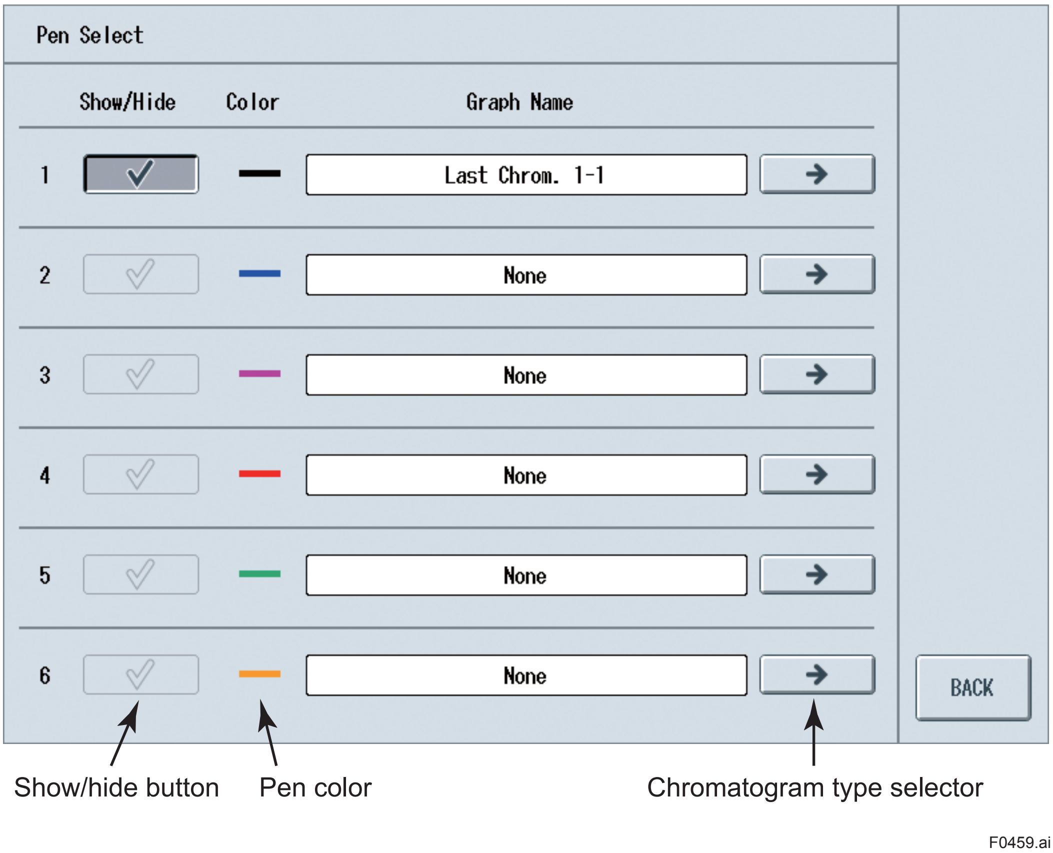


Figure 4.59 Example of Pen settings

(3) Enable the show/hide button to show the chromatogram. Alternatively, disable the button to hide the chromatogram.

(4) Use the chromatogram type selector to select the type of data to be displayed. Clicking the detail selection button displays a diagram that selects information to be displayed for each chromatogram.

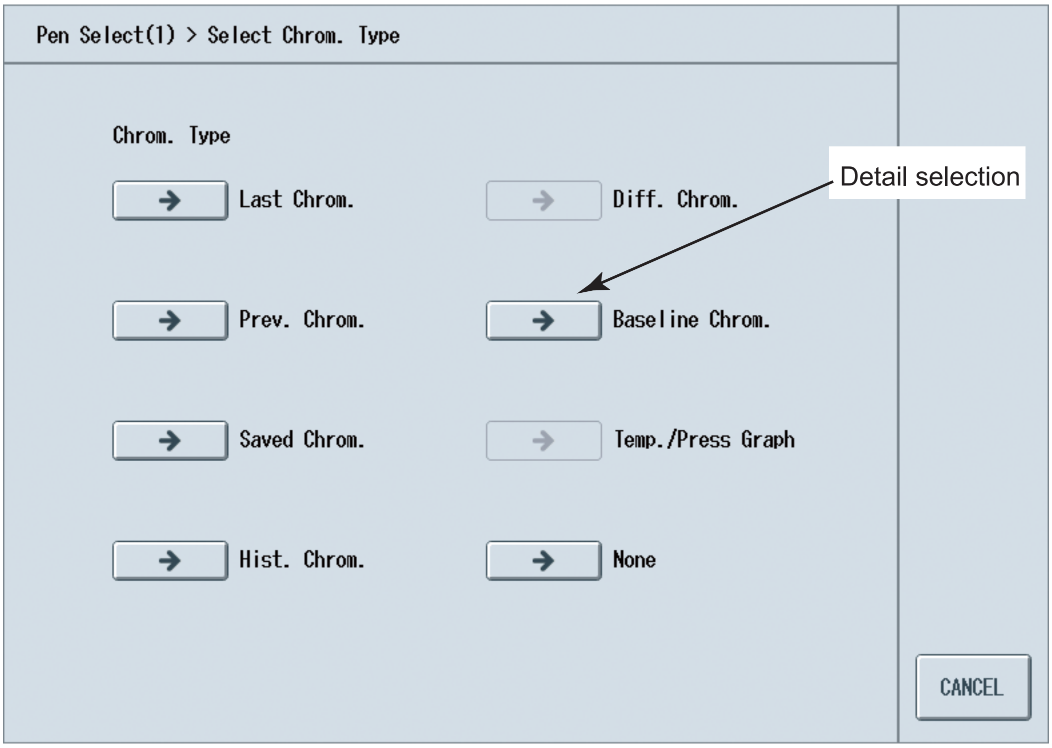


Figure 4.60 Example of Chromatogram Selector Options

Listed below are the chromatograms that can be displayed.

Last Chrom.:	The chromatogram for the current measurement.
Prev. Chrom.:	The chromatogram for the previous analysis.
Saved Chrom.:	A chromatogram which a user saved in the GC8000.
Hist. Chrom.:	A chromatogram which was automatically saved in the GC8000.
Diff. Chrom.:	A chromatogram representing differences between two chromatograms. A differential chromatogram itself cannot be selected as a differentiation object.
Baseline Chrom.:	A chromatogram which a user saved as a baseline chromatogram in the GC8000 unit.

Temp./Press Graph:

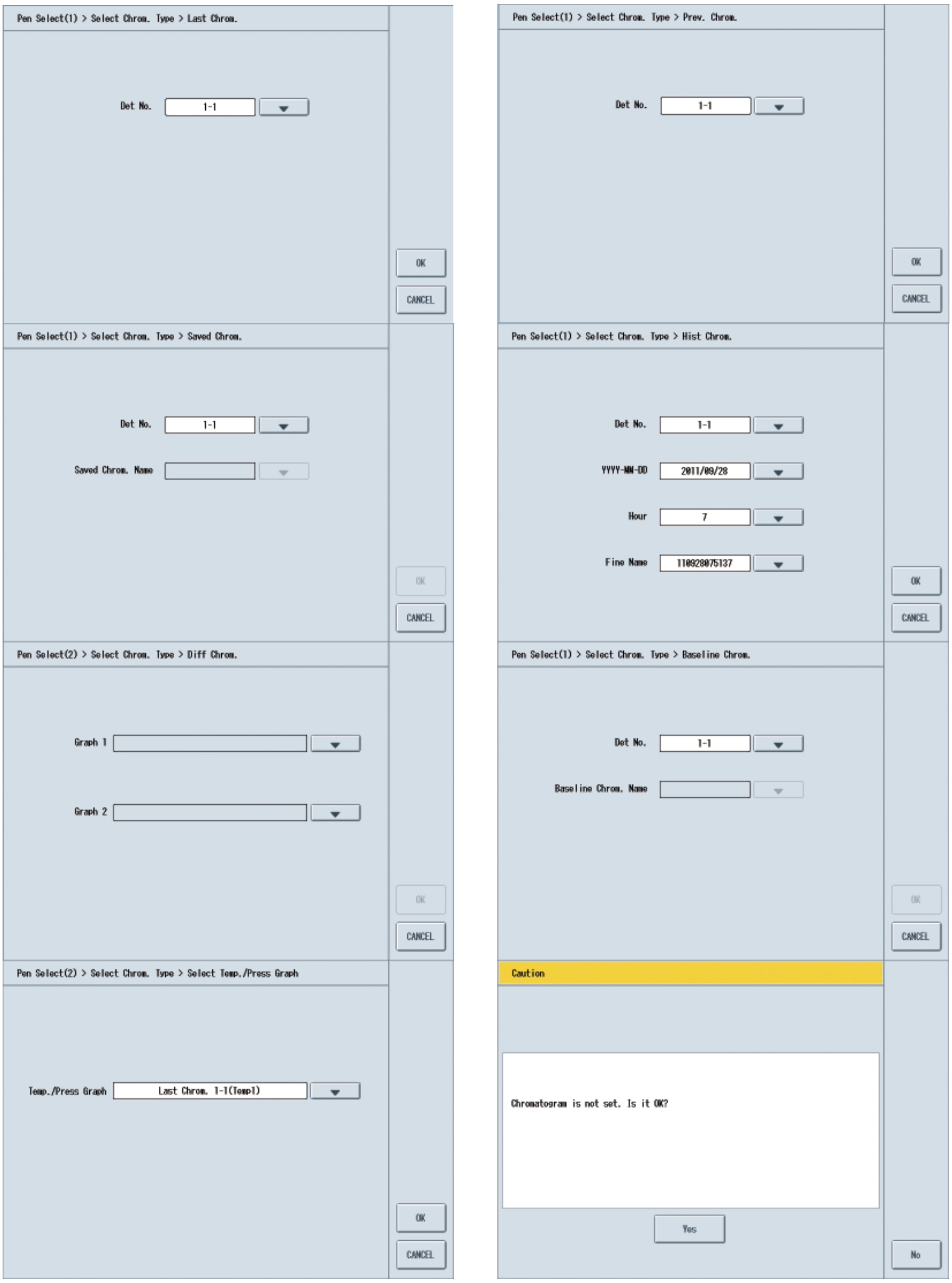


Figure 4.61

4.5.2 Snapshot

The snapshot function records the magnification and position of a zoomed view and displays its result on the screen.

Press the snapshot button once to record the magnification and position. Press it again to display the recorded magnification and position.

 Snapshot (before recording)  Snapshot (after recording)

To clear the recorded magnification and position, press the clear snapshot button .

4

4.5.3 Detail Settings

(1) Press the detail settings button .

(2) A dialog opens for changing detail settings of the screen.

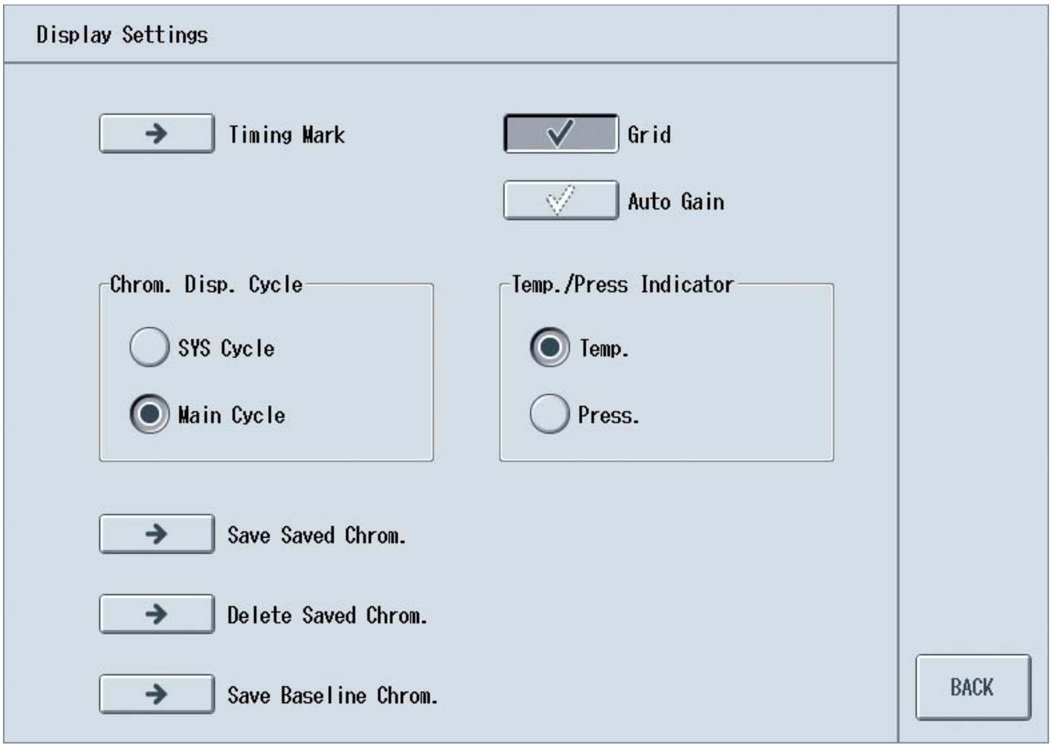


Figure 4.62

Timing Mark

(1) Press the Timing Mark button.

(2) A dialog opens for showing/hiding mark information and additional information in each chromatogram.

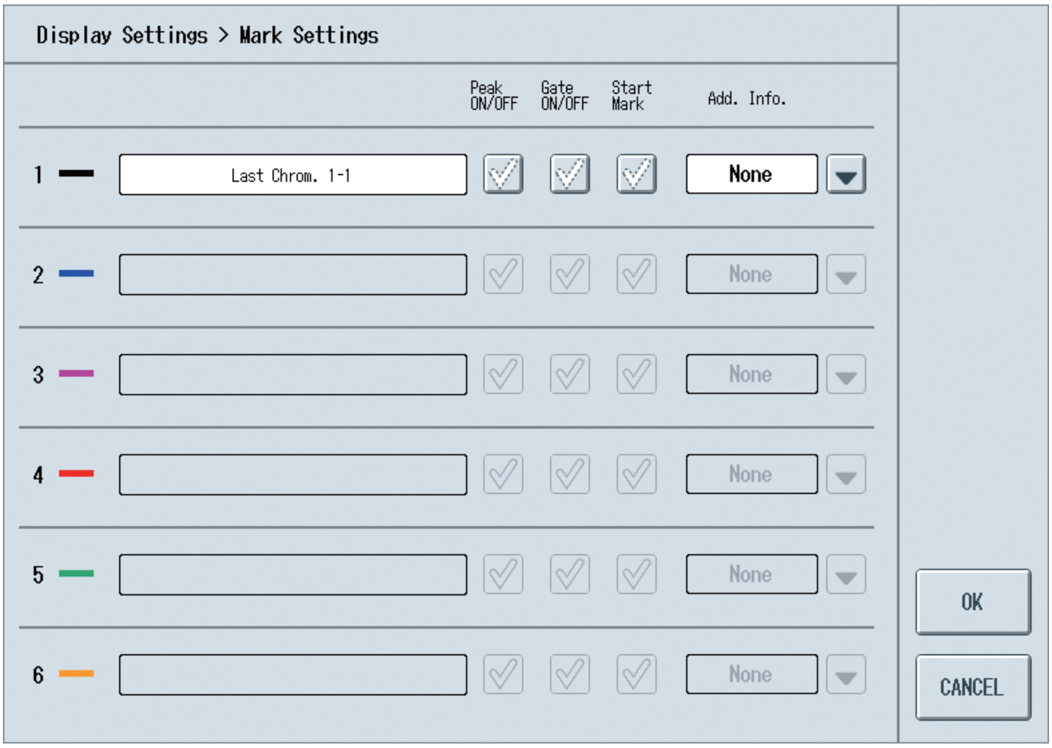


Figure 4.63

(3) The mark settings include those listed below, which can be set for each graph to be displayed.
Peak ON/OFF: Enable or disable the check mark to show or hide, respectively, the mark.
Gate ON/OFF: Enable or disable the check mark to show or hide, respectively, the mark.
Start Mark: Enable or disable the check mark to show or hide, respectively, the mark.

(4) Items that can be displayed as additional information include those listed below, which can be set for each graph to be displayed.
None, Component name, Gain, Range, Std. Conc., and (Relative) Peak No.

TIP

The mark settings are not available if Temperature or Pressure is selected from the pen selector.

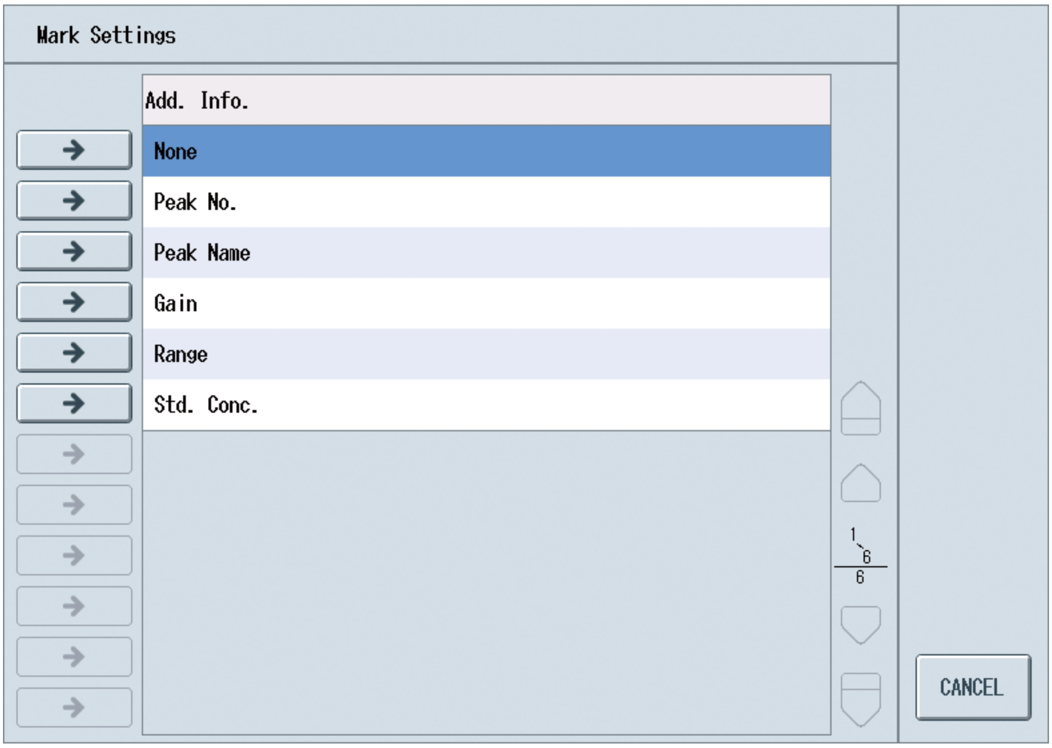


Figure 4.64

Grid display

Show or hide the grid in the zoomed view area by enabling or disabling, respectively, the check mark.

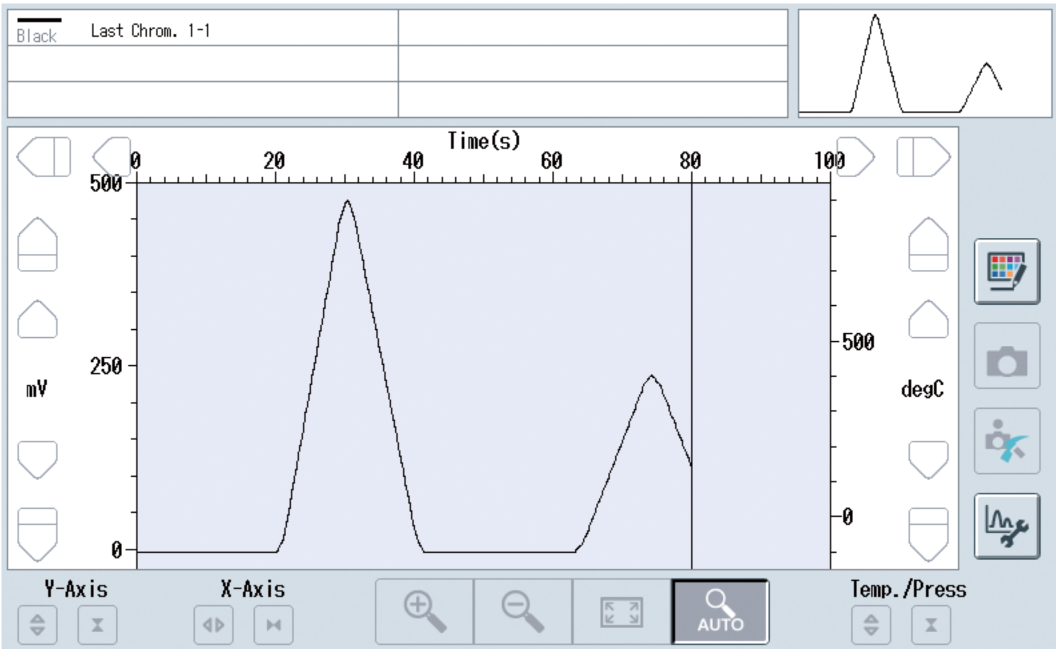


Figure 4.65

Auto gain display

Turn on or off the auto gain display by enabling or disabling, respectively, the check mark. When the auto gain display is turned on, the chromatogram provides a magnified display of voltage values based on the gain settings of each peak.

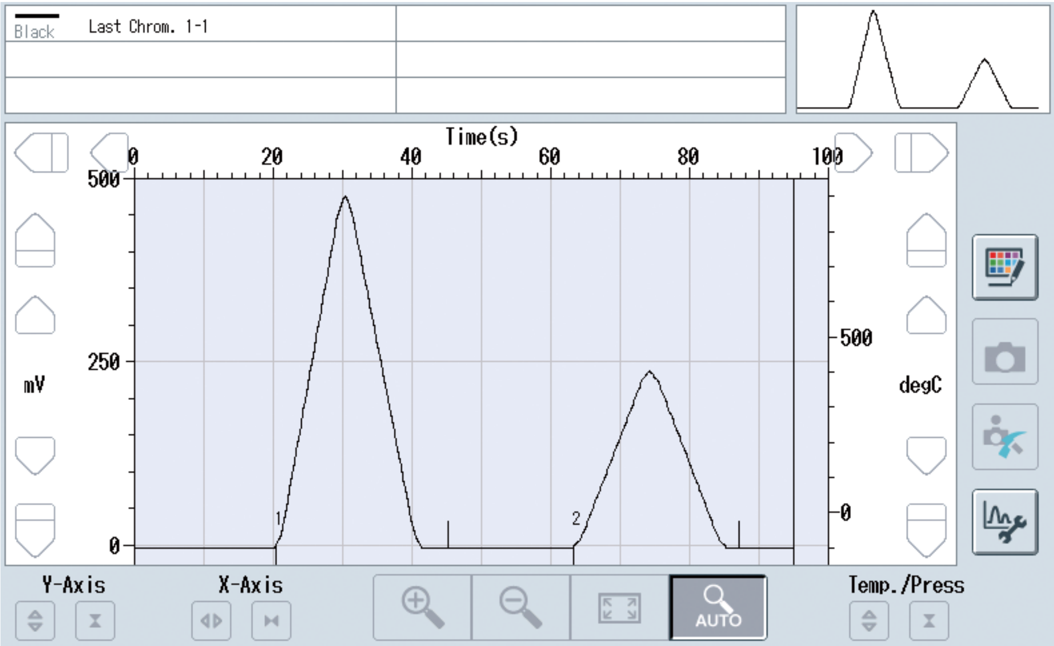


Figure 4.66

Multiple-chromatogram display

Select the Single display or Side-by-side display radio button.

Single display: Displays a single chromatogram for each analysis interval which is defined as a parameter of the SYS method.

Side-by-side display: Displays as many chromatograms side by side as the GCM method analysis intervals which are defined as a parameter of the SYS method.

TIP

- This settings is common to all chromatograms. It cannot be set separately for each chromatogram.
- The single display/side-by-side display function supports the last chromatograms, previous chromatograms, and history chromatograms. It does not support the saved chromatograms. The differential chromatograms are supported if chromatograms displayed side-by-side are selected.
- The Temp./Pressure function supports the single display/side-by-side display of last chromatograms, previous chromatograms, and history chromatograms.

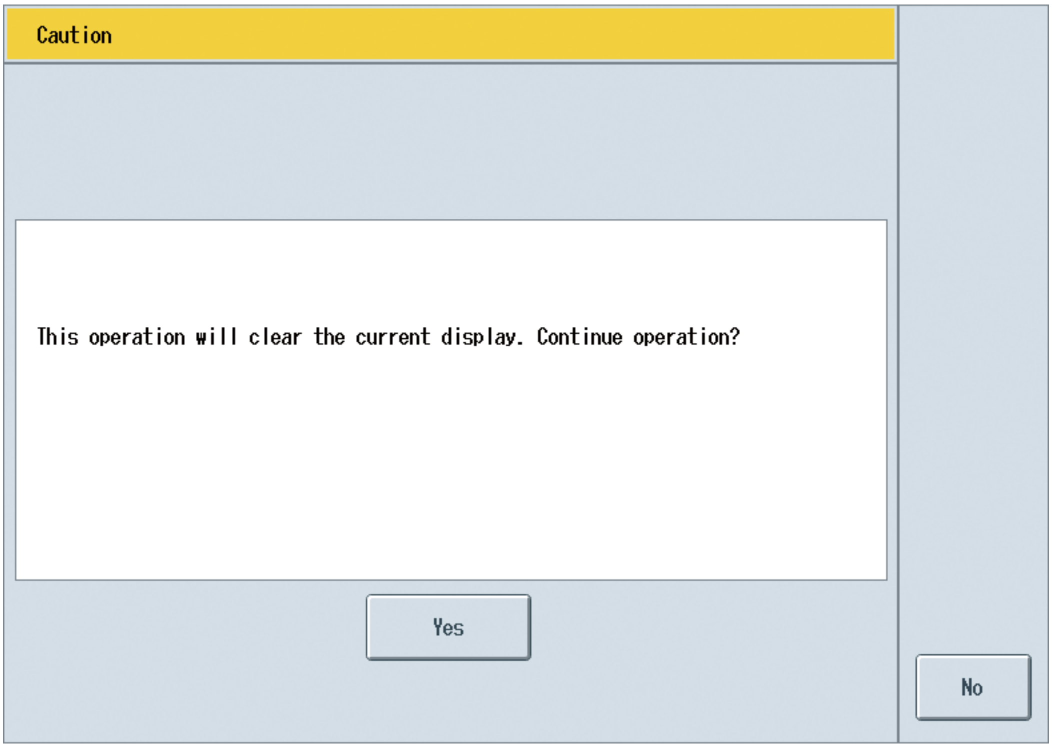


Figure 4.67

Temperature/pressure axis scales

Select the temperature or pressure axis scale by selecting the Temperature axis scale or Pressure axis scale radio button.

Saving chromatograms

Save the currently displayed chromatograms in the GC8000.

- File names are automatically generated.
- Last chromatogram, previous chromatogram, history chromatogram, and baseline chromatogram: Select a pen number.
- All SYS1 Chrom. to All SYS6 Chrom.: Select the SYS number assigned to the active GCM.
- For side-by-side display, only All GCM Chrom., and All SYS1 Chrom. to All SYS6 Chrom. can be selected. Selection by pen number is not possible.

TIP

This operation is enabled for user level B or higher.

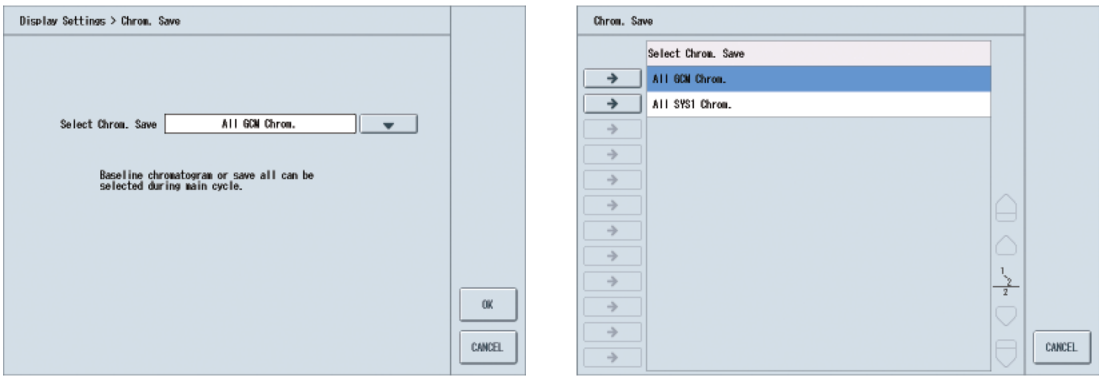


Figure 4.68

Deleting saved chromatograms

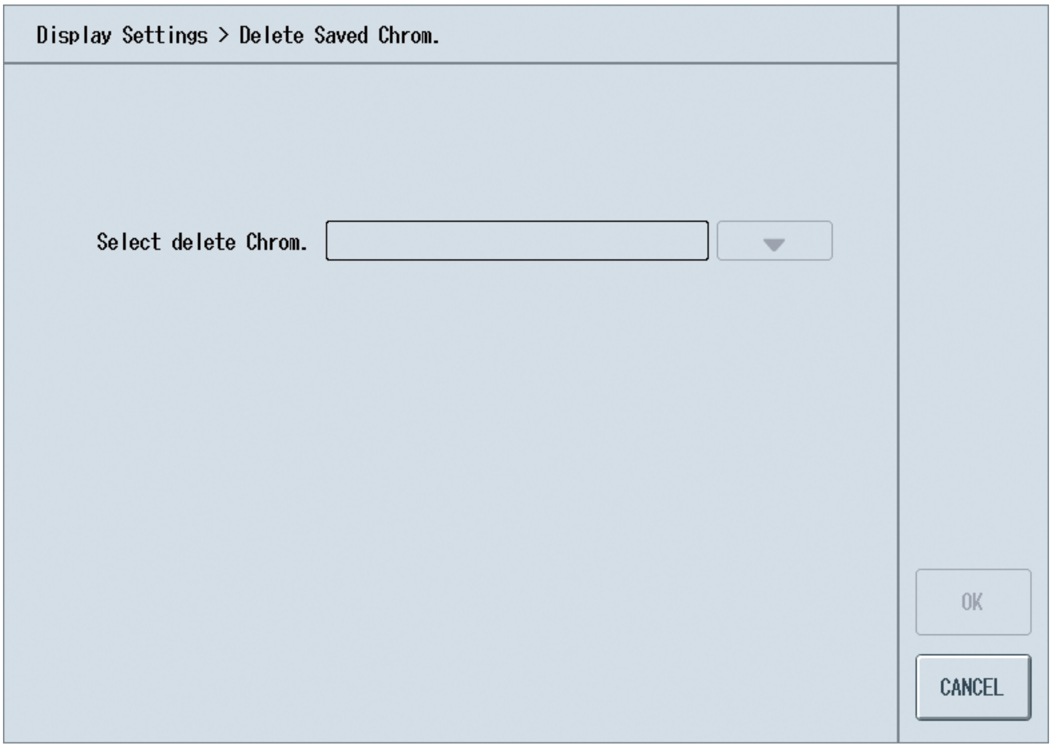


Figure 4.69

TIP

This operation is enabled for user level C or higher.

Saving baseline chromatograms

Save the currently displayed chromatograms in the GC8000.

- File names are automatically generated.
- Last chromatogram, previous chromatogram, history chromatogram, and baseline chromatogram: Select a pen number.
- All SYS1 Chrom. to All SYS6 Chrom.: Select the SYS number assigned to the active GCM.
- For side-by-side display, only All GCM Chrom., and All SYS1 Chrom. to All SYS6 Chrom. can be selected. Selection by pen number is not possible.

TIP

This operation is enabled for user level C or higher.

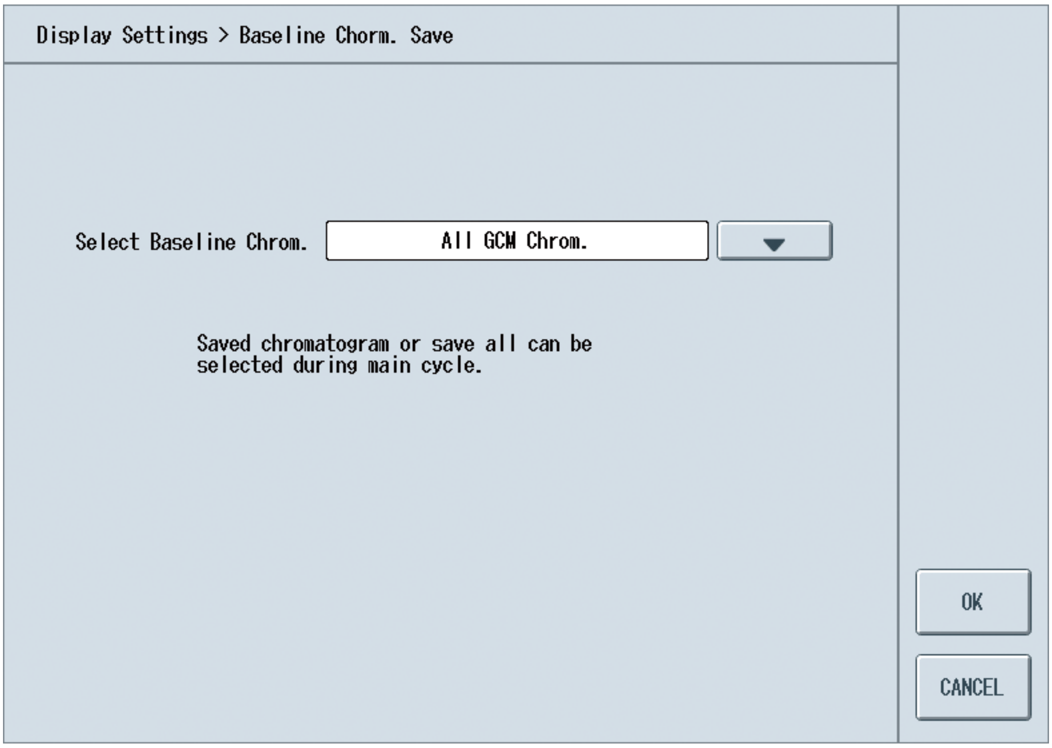


Figure 4.70

4.5.4 Zoomed View

Screen components are as shown below.

The latest chromatogram is updated every second. Differential chromatograms are not updated even if the Update the latest chromatogram subject to differentiation parameter is enabled.

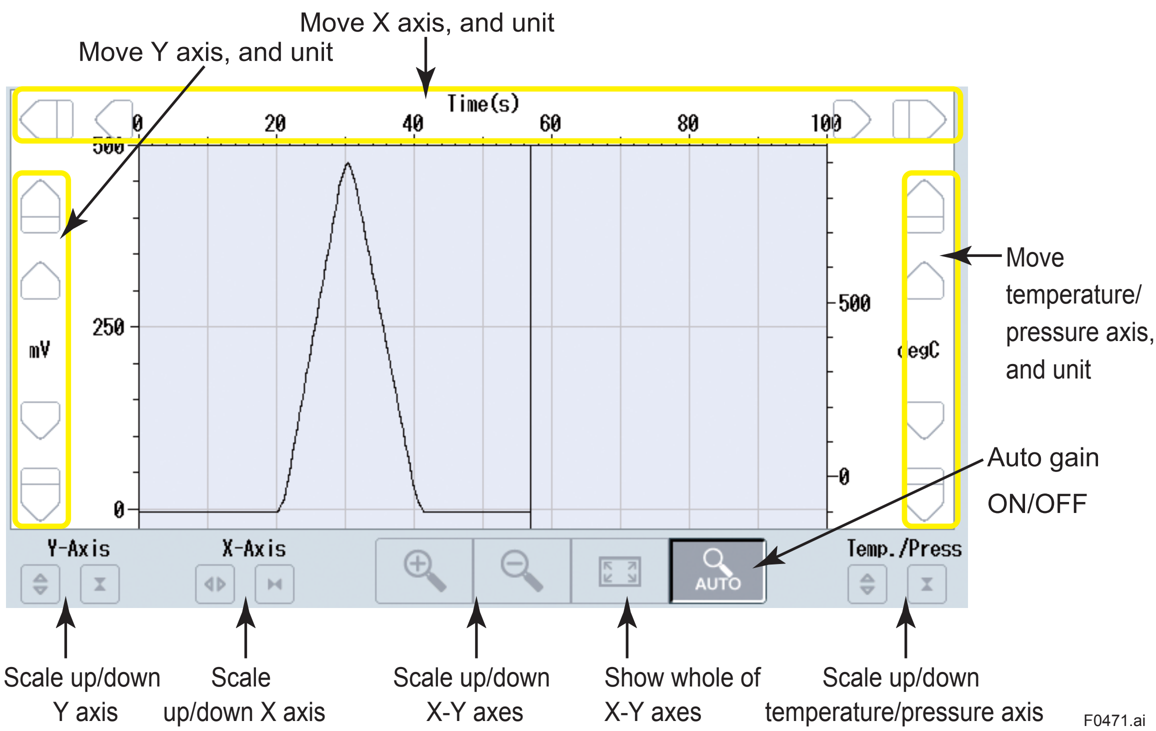


Figure 4.71 Example of Zoomed View

X axis scale: Represents the elapsed time of chromatogram. Unit: seconds.

Y axis scale: Represents the electromotive force of chromatogram. Unit: mV for mV representation, or magnification for gain representation.

Temperature/pressure axis scale:
Temperature data is in units of deg C and deg F.
Pressure data is in units of kPa and psi.

Scale up/down X axis buttons, scale up/down Y axis buttons:
These buttons scale up /down the X and Y axes, respectively.

Scale up/down X-Y axis buttons:
Scales up/down the X and Y axes simultaneously.

Show whole button: Displays the whole of the chromatogram.

Auto scale button: Turns on/off the auto scale function. When this function is turned on, scale up/down settings do not work.

4.6 Analysis Result Screen

This screen displays the measurement results (in graph form, when you select) taken with the active GCM. Press the  on the navigation bar to display the analysis result screen.

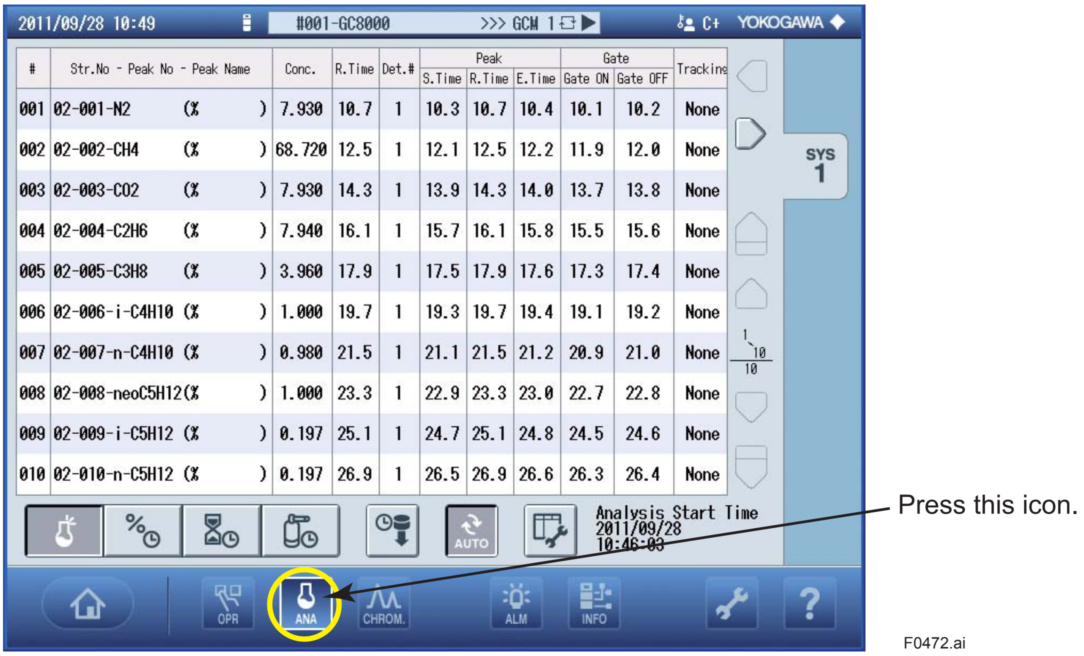


Figure 4.72 Example of Analysis Result Screen

The display screen consists of the following screens:

Analysis result screen
Concentration analysis history screen
Retention time history screen
Calibration factor history screen

The above screens are displayed by pressing the corresponding buttons located in the lower left of the screen:

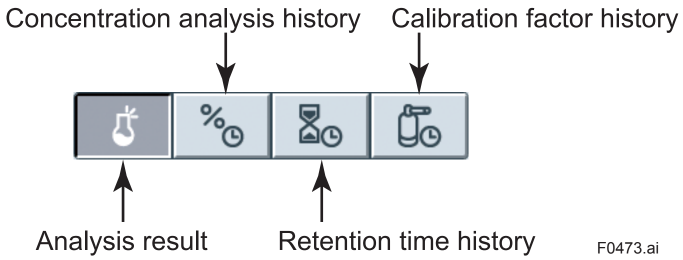


Figure 4.73 Buttons for Analysis Result Screens

4

4.6.1 Analysis Result Screen

Screen components are as shown below.

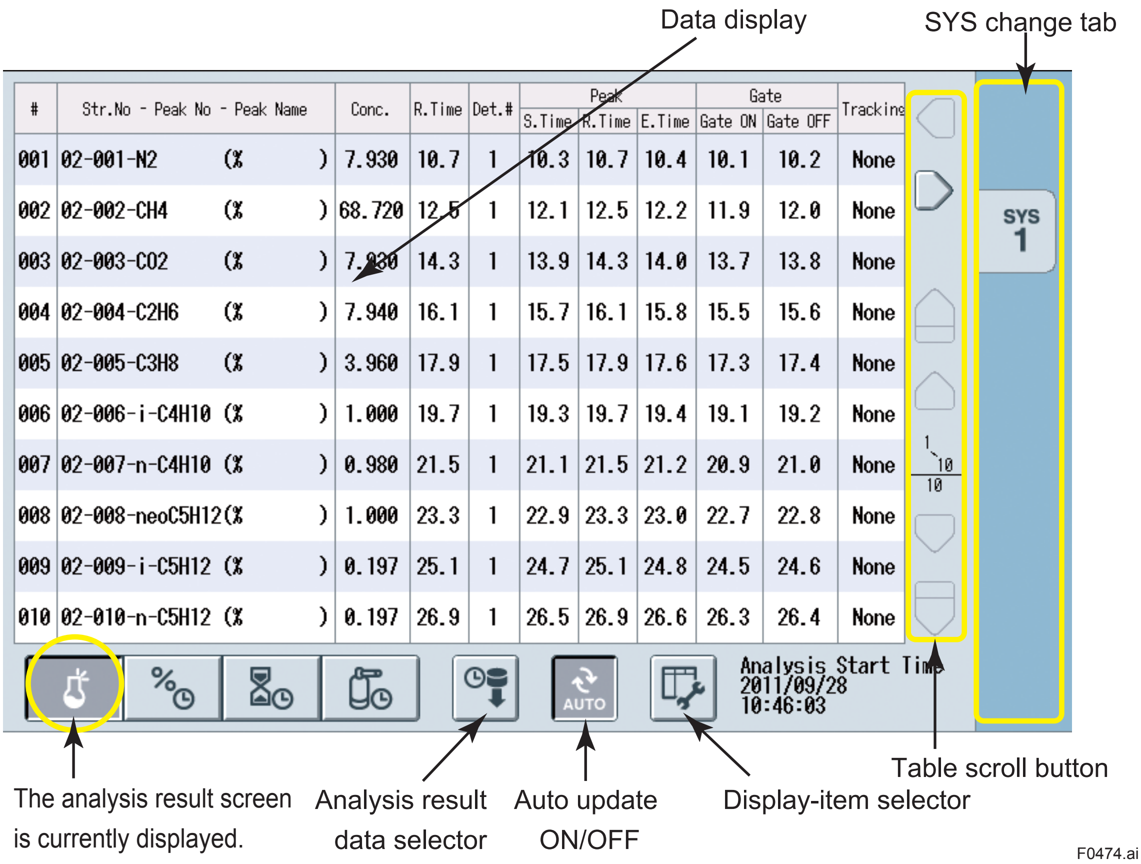


Figure 4.74 Analysis Result Screen Layout

SYS change tab: Selects the SYS assigned to the active GCM and displays the analysis results on the SYS tab.

Table scroll button: Scrolls through the display area.

Auto update ON/OFF: When the auto update function is ON, the on-screen data is automatically updated with the latest data when the measurement finishes. When the auto update function is OFF, data update does not occur.

Analysis result data selector: Allows for displaying past data. A dialog appears for selecting the start time of the analysis to be displayed. See (A) Selecting analysis result data.

Display-item selector: A dialog appears, allowing to select which items to display in the data columns. See (B) Selecting display items.

(A) Selecting analysis result data

To select the data to be displayed, select the year/month/day, hour, and time from the dialog below.

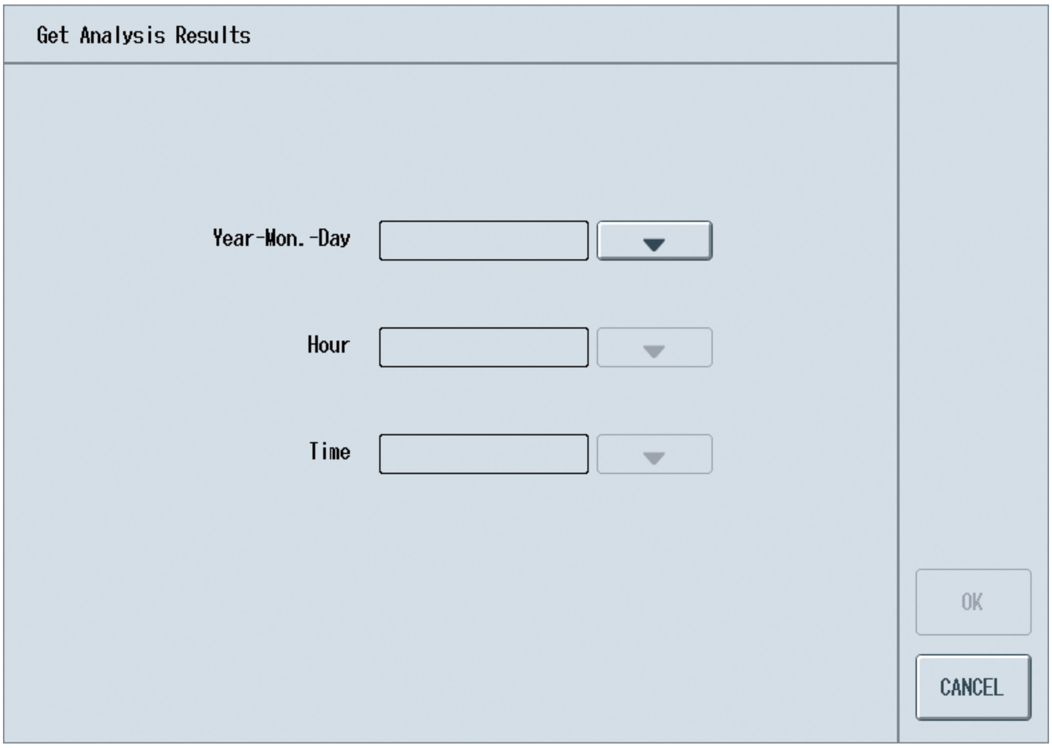


Figure 4.75

(B) Selecting display items

In the dialog below, select the items to be displayed as analysis result data, by adding a check mark.

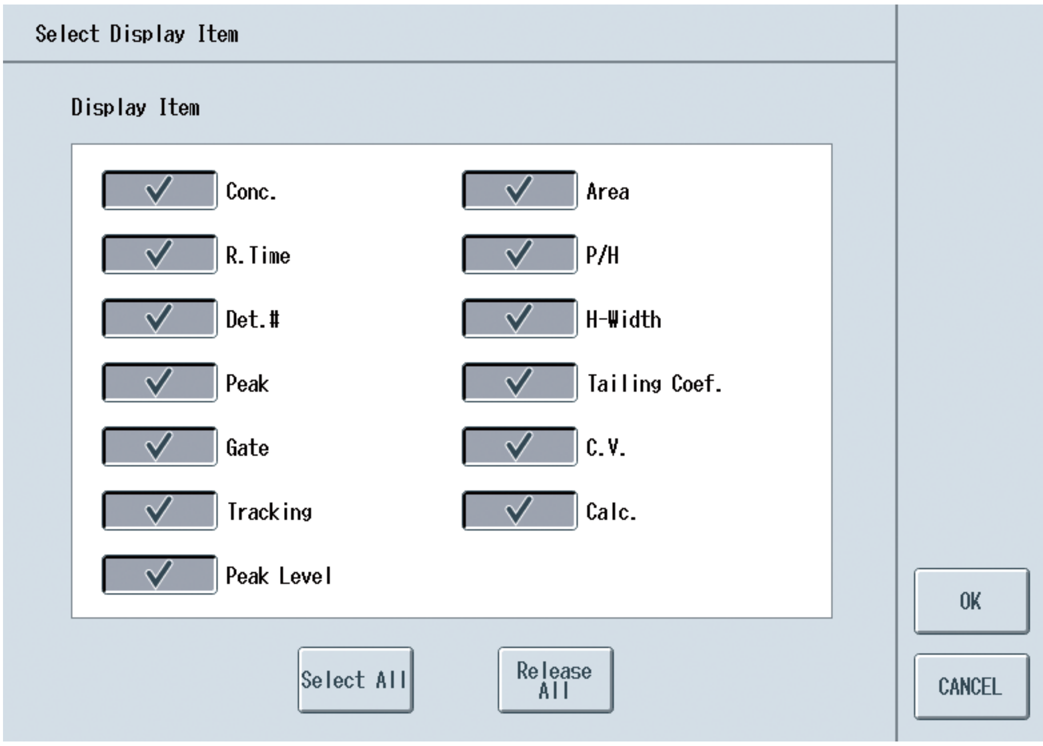


Figure 4.76

4.6.2 Concentration Analysis History Screen, Retention Time History Screen, and Calibration Factor History Screen

A common screen layout is used for the concentration analysis history screen, retention time history screen, and calibration factor history screen.

These screens display the changes over time of concentration analysis data, retention time data, and calibration factor data, respectively, as measured by the active GCM.

Each screen can contain up to 999 peaks. The maximum displayable number of analysis clock times is limited to 250 for concentration analysis history and retention time history, and to 100 for calibration factor history.

Screen components are as shown below.

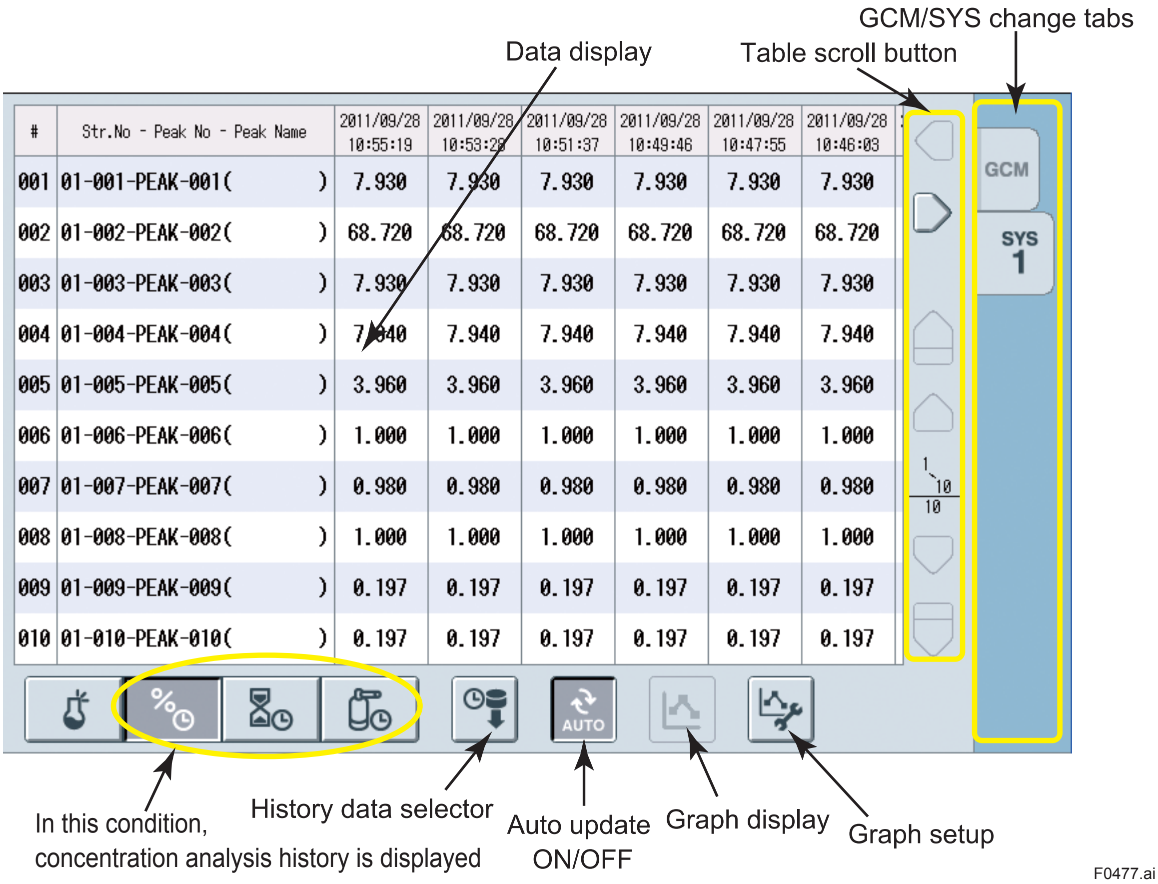


Figure 4.77 History Screen Layout

GCM/SYS change tabs:	Either the whole of active GCM, or the SYS assigned to the active GCM, can be selected, so that the history data is displayed on the SYS tab.
Table scroll button:	Scrolls through the display area.
Auto update ON/OFF:	When auto update is ON, the on-screen data is automatically updated with the latest data when the measurement finishes. When auto update is OFF, data update does not occur.
Graph setup:	Sets up a graph of the data to be displayed.
Graph display:	Displays the graph configured with the graph setup function.

(A) Graph setup

Press .

Set up a graph as desired. The dialog consists of two pages.

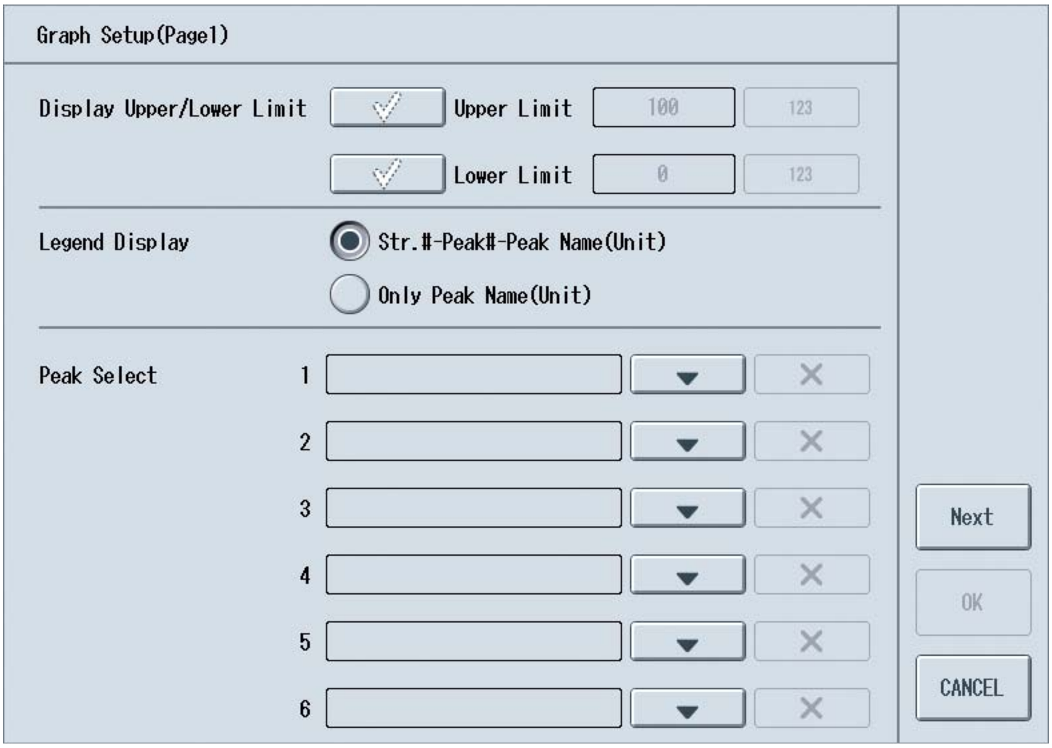


Figure 4.78 Page 1

(1) Display Upper/Lower Limit

Show or hide the upper limit and lower limit by enabling or disabling, respectively, their check marks.

(2) Upper/lower limit settings

Set the values of upper limit and lower limit. The setting ranges are as follows:

Upper limit: 0 to 12000 Lower limit: 0 to 10000

TIP

The upper limit must be greater than the lower limit.

(3) Legend Display

Define what information to include in legends, by selecting Str.#-Peak#-Peak Name (Unit) or Only Peak Name (Unit).

(4) Peak Select

Up to six peaks can be displayed. At least one peak must be selected.

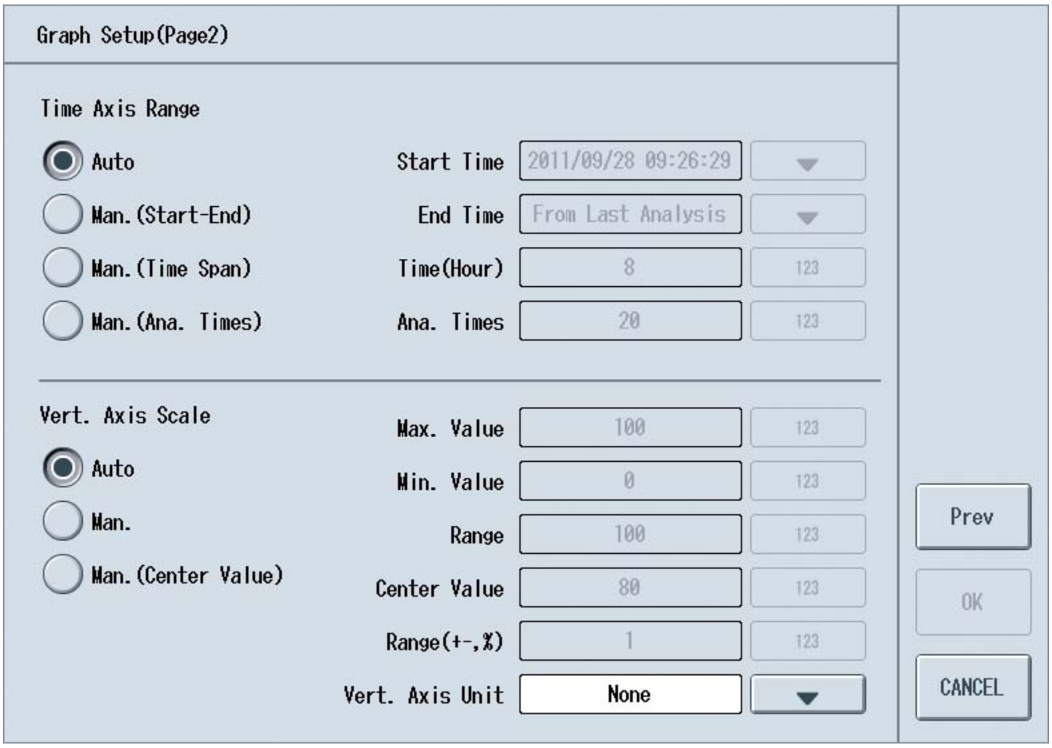


Figure 4.79 Page 2

(1) Time Axis Range

Select the horizontal axis (i.e., time axis) of the graph from the radio buttons: Auto, Man. (Start-End), Man. (Time Span), or Man. (Ana. Times).

- Man. (Start-End)

  Start Time: Press the ## button and select the analysis start time (the time to start drawing a graph) from the displayed values.

  End Time: Press the ## button and select the analysis end time (the time to end drawing a graph) from the displayed values.

  Note: The start time must be earlier than the end time.

- Man. (Time Span)

  End Time: Press the ## button and select the analysis end time (the time to end drawing a graph) from the displayed values.

  Time (Hour): Press the ## button and select from the range of 1 to 72 (hours).

- Man. (Ana. Times)

  End Time: Press the ## button and select the analysis end time (the time to end drawing a graph) from the displayed values.

  Ana. Times Press the ## button and select from the range of 1 to 250 (analysis times).

(2) Vert. Axis Scale

Select the vertical scale from the radio buttons: Auto, Man., or Man. (Center Value).

- Man:

  Set the Max. Value and Min. Value.

  The setting ranges are as follows:

  Max. Value: 0 to 12000, Min. Value: –2000 to 10000

TIP

The upper limit must be greater than the lower limit.

- Man. (Center Value)
  Set the Range, Center Value, and Range (+–,%).
  The setting ranges are as follows:
  Range: 0.001 to 9999.999
  Center Value: 0.001 to 9999.999
  Range (+–,%): 0.01 to 50.00
  Vert. Axis Unit:

(B) Graph display

The graph is displayed based on the setup made in (A) Graph setup on page 4-57??.

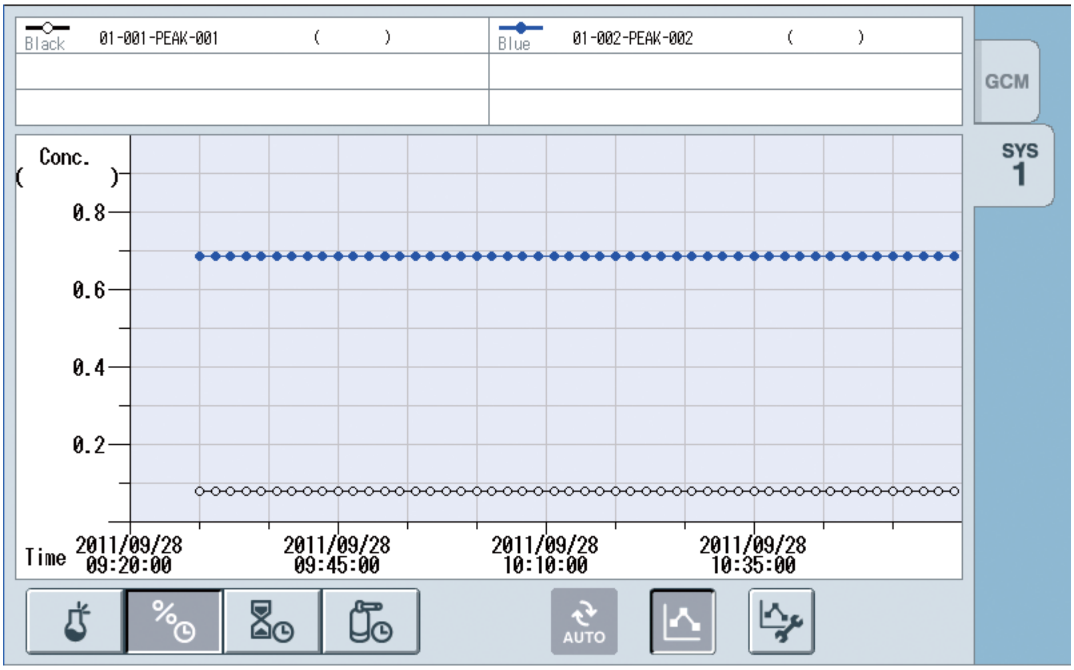
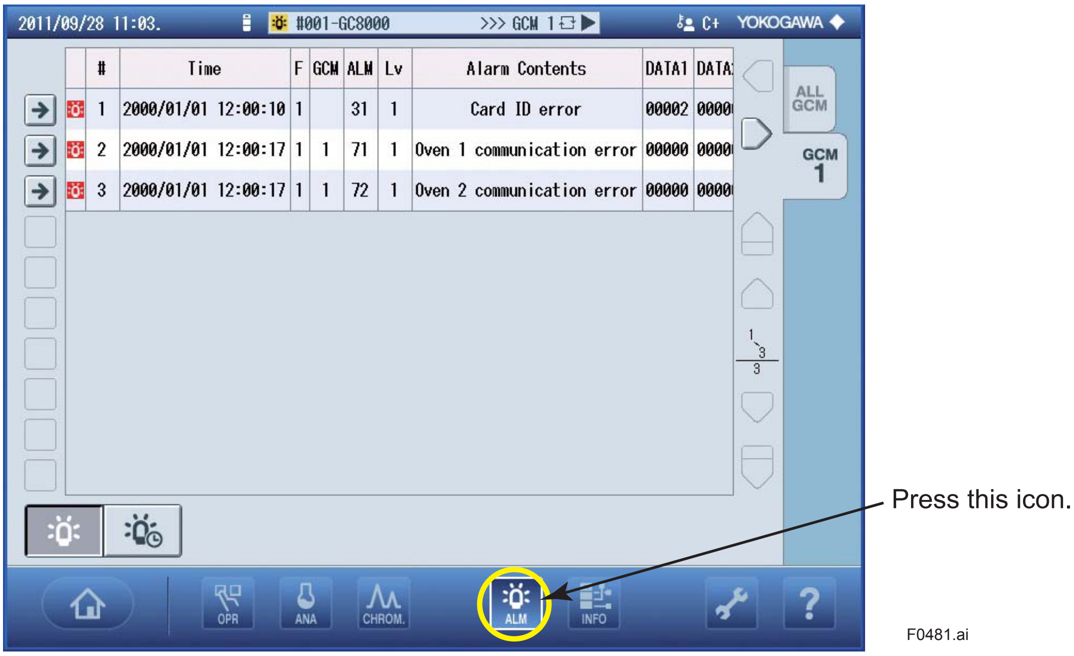


Figure 4.80

4.7 Alarm Screen

This screen displays information about the alarms that occurred with the GC8000.

Press the  on the navigation bar to display the alarm screen.



#	Time	F	GCM	ALM	Lv	Alarm Contents	DATA1	DATA
1	2000/01/01 12:00:10	1		31	1	Card ID error	00002	0000
2	2000/01/01 12:00:17	1	1	71	1	Oven 1 communication error	00000	0000
3	2000/01/01 12:00:17	1	1	72	1	Oven 2 communication error	00000	0000

Figure 4.81 Example of Alarm Screen

The alarm screen consists of the following screens:

Alarm status screen
Alarm history screen
Alarm details screen

4.7.1 Alarm Status Screen

Screen components are as shown below.

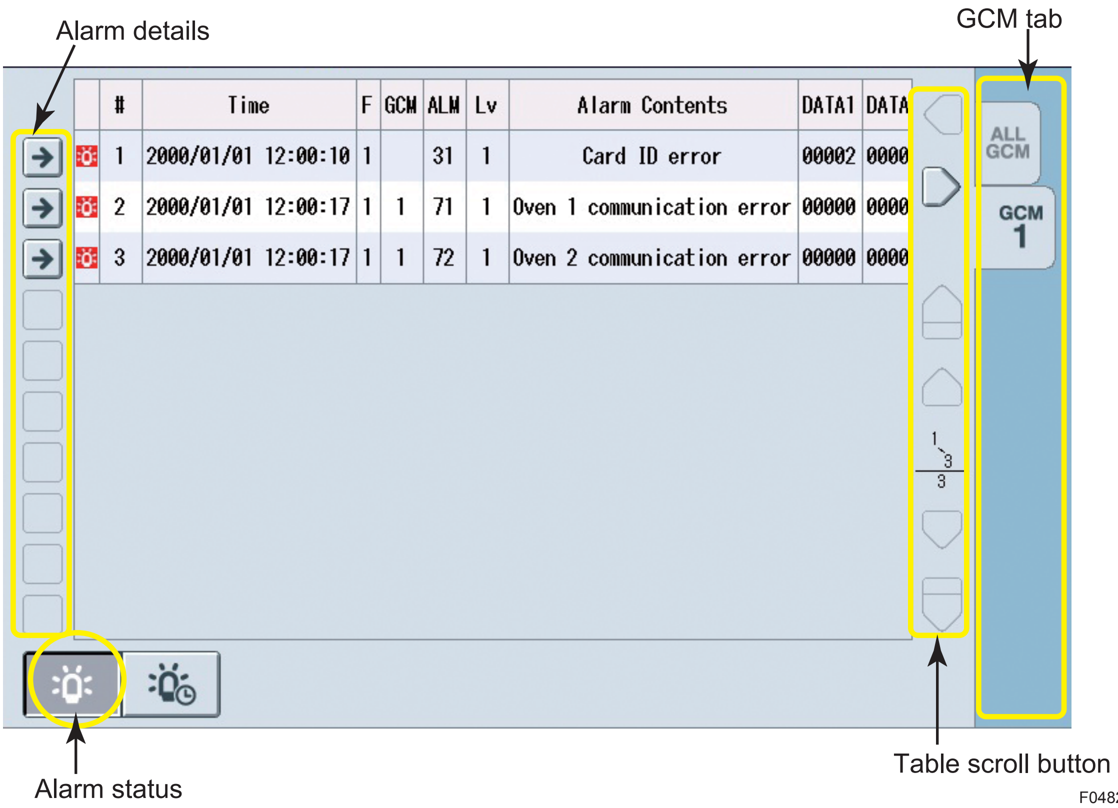


Figure 4.82

Pressing the alarm status button on the lower left of the screen causes a transition to the alarm status screen.

This screen displays the alarms which are current with the GC8000, either for all GCMs or for each GCM.

Pressing the table scroll button causes scrolling through the table display area.

Pressing the alarm details button displays the alarm details screen. See 4.7.3 Alarm Details.

4.7.2 Alarm History Screen

Screen components are as shown below.

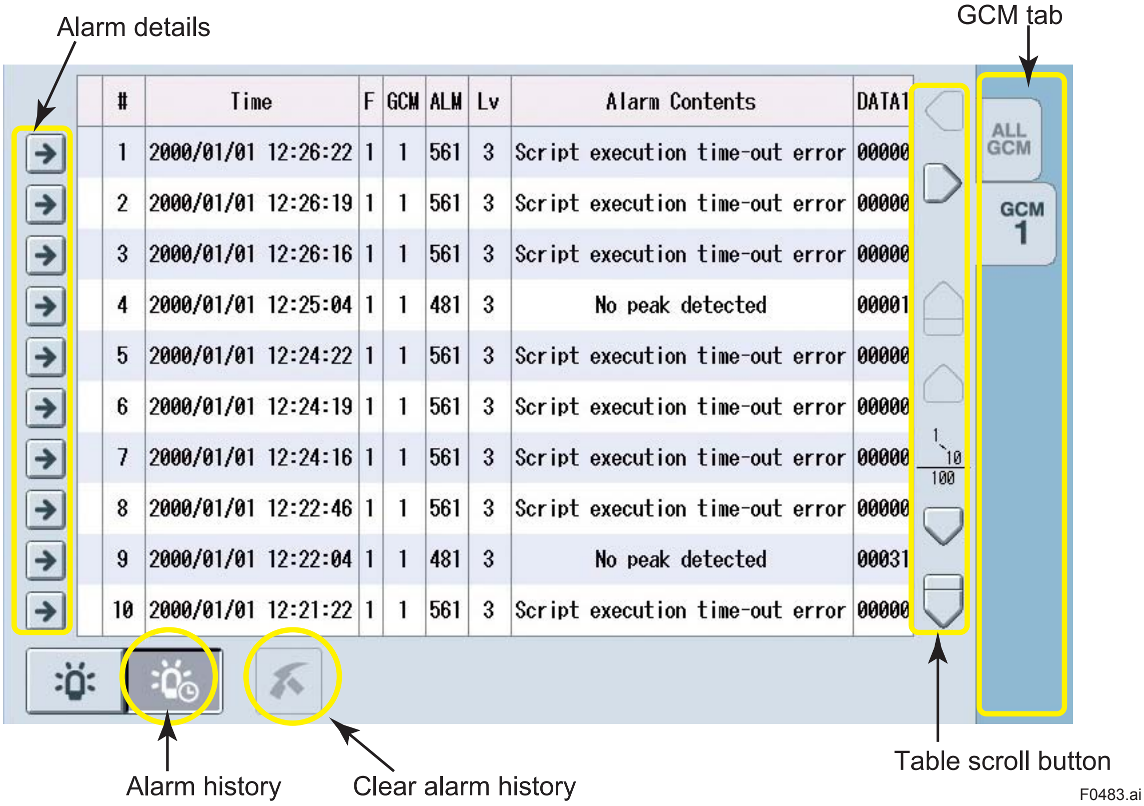


Figure 4.83

Pressing the alarm history button on the lower left of the screen causes a transition to the alarm history screen.

This screen displays a history of alarms which occurred with the GC8000 until the alarm display is requested, either for all GCMs or for each GCM.

Pressing the table scroll button causes scrolling through table display area.

Pressing the clear alarm history button erases the alarm history. This operation is available if the user level is set to B or higher.

Pressing the alarm details button displays the alarm details screen. See 4.7.3 Alarm Details.

4.7.3 Alarm Details

The alarm details screen displays details of alarms.

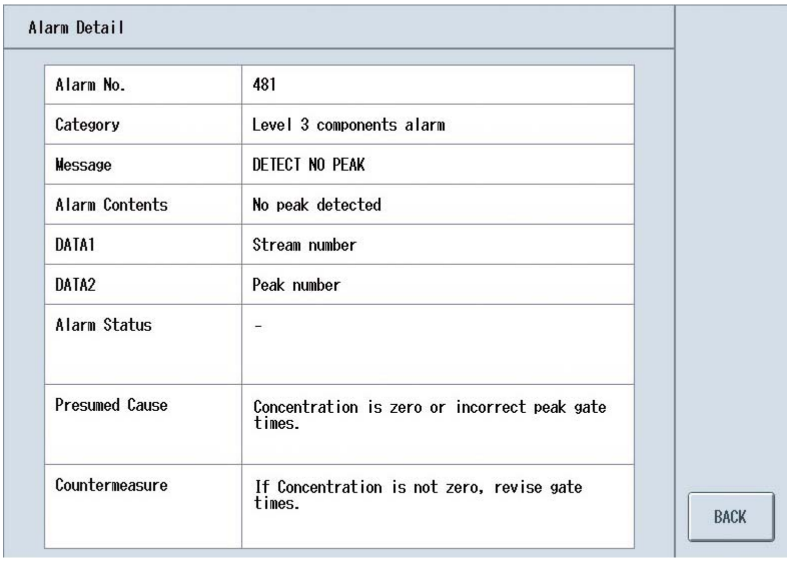


Figure 4.84

4.7.4 Alarm Popup Screen

This screen appears automatically when an alarm occurs.

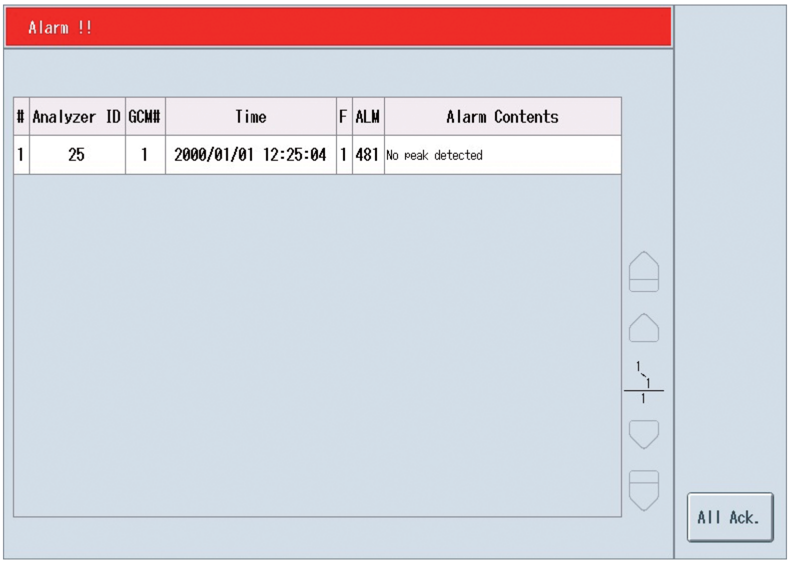


Figure 4.85

The user can configure which alarm level triggers the alarm popup screen. See ## Alarm Popup Restriction on page 4-18??.

The display sequence is not related to alarm levels. The newest occurrence is added to the top of the table.

The table contains a maximum of ten latest alarm occurrence. The table content is updated upon occurrence of an additional alarm.

Pressing the Check all button recalls the screen that was displayed immediately before the alarm popup.

4.8 Help Screen

The help screen displays explanations of buttons and icons displayed on various screens.

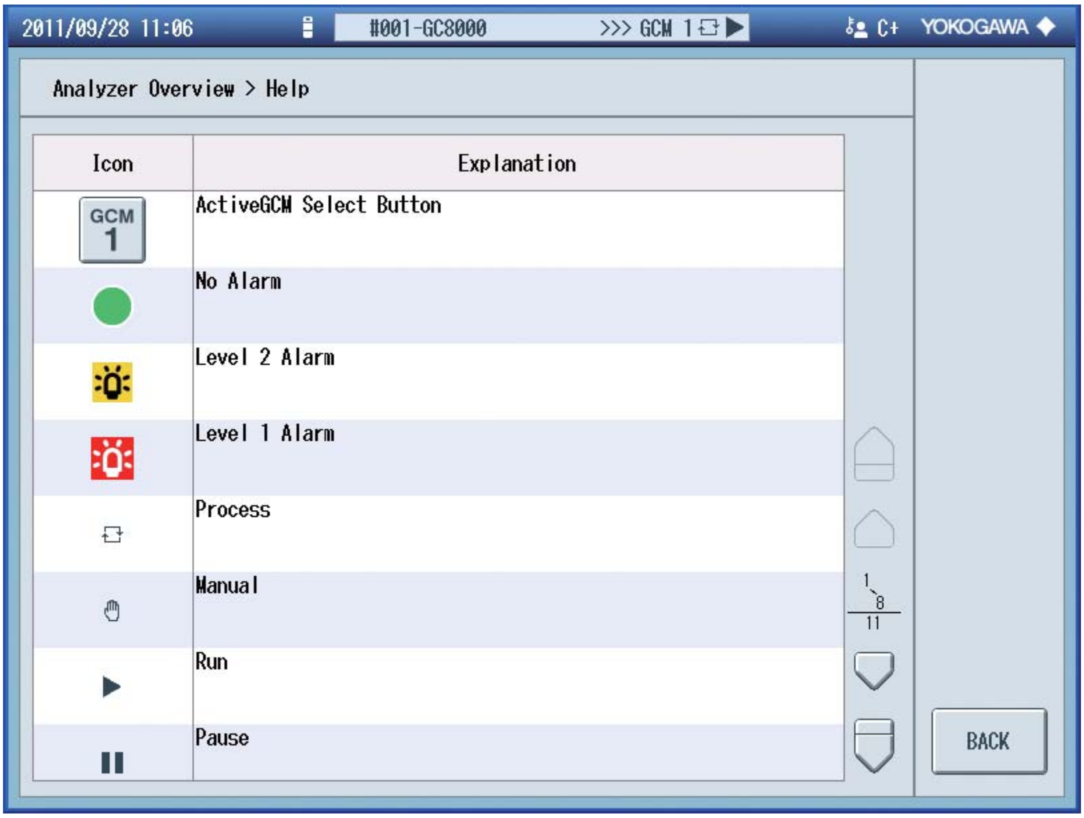


Figure 4.86 Example of Help Screen (Analyzer Overview Screen)

The help screen can be accessed from the screens listed below. Click the  on the respective screen.

Analyzer overview screen
Analyzer operation screen
Analysis result screen
Chromatogram Screen
Alarm screen
Analyzer map screen
Setting screen

Pressing the BACK button recalls the original screen.

5. EtherLCD

This section describes the EtherLCD, the general setting of the GC-HMI.

EtherLCD consolidates the settings for display of I/O and Ethernet connection status of analyzers under connection; operation of I/O, user program, and detectors; and parameters of hardware configuration, analysis method, and I/O, which are mainly used for maintenance among the general settings from the GC-HMI.

This is equivalent to the functions of EtherLCD (display and operation), which is the human-machine interface of GC1000 Mark II, excluding operation and display of analysis data. Therefore, this function is also called EtherLCD for GC8000.

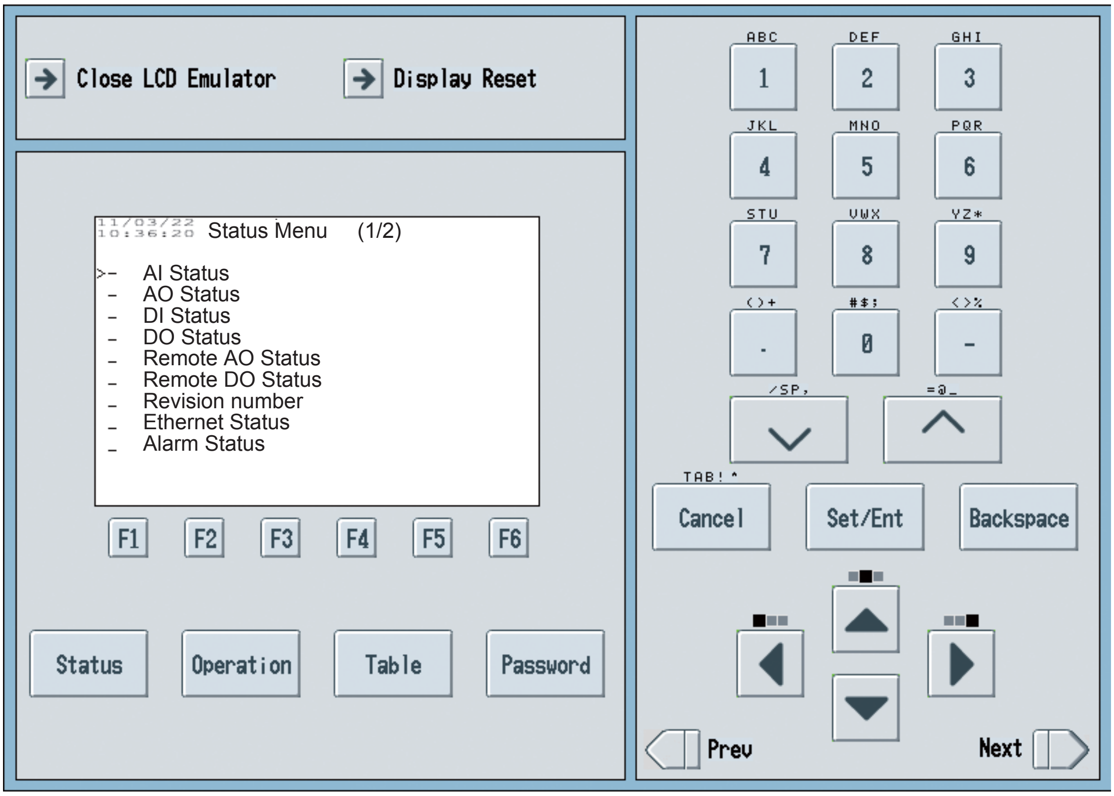
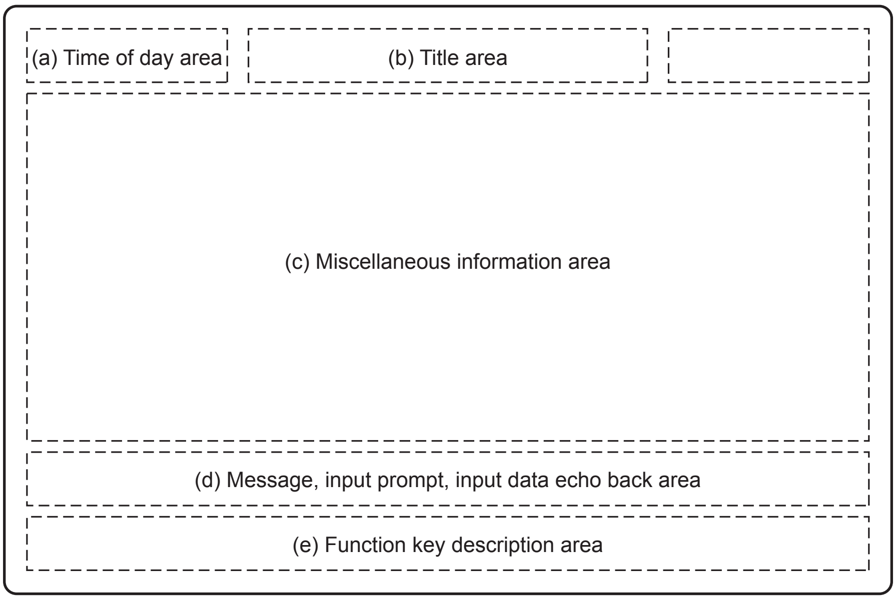


Figure 5.1 Example of the screen display

■ Overall LCD screen layout

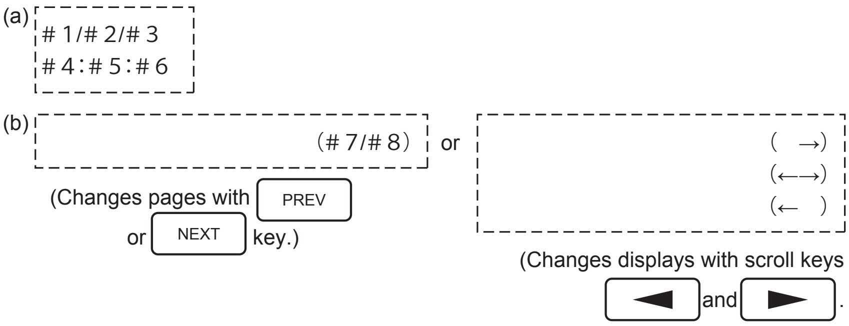
The screen display consists of the following five display areas:

(a) Time of day area
(b) Title area
(c) Miscellaneous information area
(d) Message, input prompt, input data echo back area
(e) Function key description area



F0402_1.ai

Shared information



F0402_2.ai

● Display data list table

Display item	Description	Set	Lower Limit	Upper Limit	Unit	Remarks
#1	Current time: year		00	99	Year	Lower 2 digits of the year
#2	Current time: month		1	12	Month	
#3	Current time: day		1	31	Day	
#4	Current time: hour		00	23	Hour	
#5	Current time: minute		00	59	Minute	
#6	Current time: second		00	59	Second	
#7	Current page number					
#8	Total page number					

Note 1: If display data is outside the limits or unknown, "?" appears in all digits of the item.
Note 2: If display data is shown based on certain values (conditions) and the values are outside the limits or unknown, "?" appears in all digits of the item, too.

Description of the screen examples on and after the following pages:

- Display items vary depending on the setting.
- Only EtherLCD screen is displayed.
- Only specified function keys whose names are shown above F1 to F6 keys on the screen are available. The number of the keys varies depending on the setting.

5.1 User Level Switching

Before conducting any settings, the user level requires to be changed.

NOTE

The user level settings for the Analyzer Operation Data Display and EtherLCD are independent and need to be set separately.

Press Password among menu keys.

If Password is pressed when the current user level is A (default), the screen shown in Figure 5.2 is displayed.

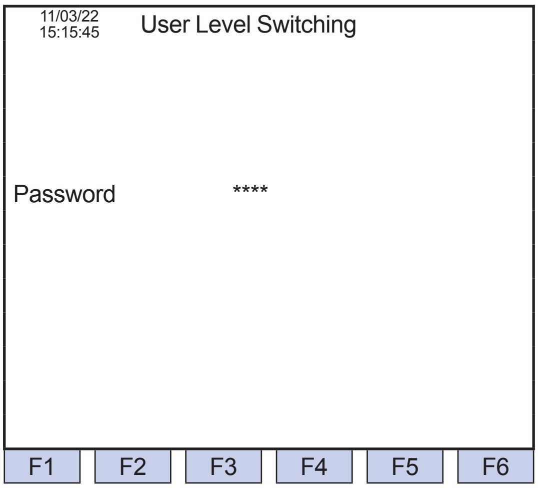


Figure 5.2 User level switching screen (when the current level is A)

This screen is displayed in remote mode.

A four-digit numeric password must be entered.

(Press Set/Ent key to complete.)

(1) When the user level B password (1192) is entered - The user level is set to B.

(2) When the user level C password (1603) is entered - The user level is set to C.

When Set/Ent is pressed after entering a password with numeric keys, the following screen is displayed.

Table 5.1 User levels and authorities

User level	Authorities	Password
A		Not required (default)
B		1192
C		1603
C+		1702

If the user level is other than A, the screen shown in Figure 5.3 is displayed. This example shows the case where the current user level is C.

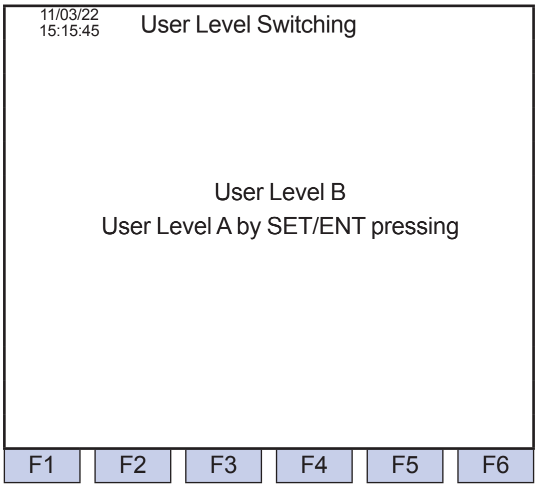


Figure 5.3 Example of the user level switching screen (when the current level is other than A)

This screen is displayed in local mode.

When 

is pressed, the current mode is changed to the remote mode and the user level is changed to A.

Passwords can be changed. See the 5.3.11 Password Setting for details.

5.2 Status Display Screen

When 

is pressed on the EtherLCD screen, the screen navigates to the Status Display screen.

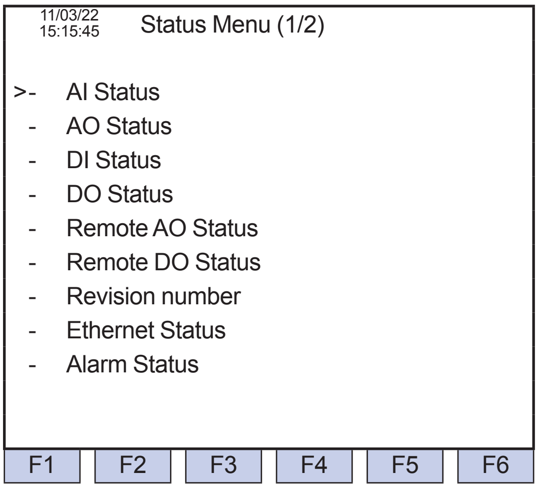


Figure 5.4 Status menu screen (1/2)

The following menu screen is displayed after Next is pressed.

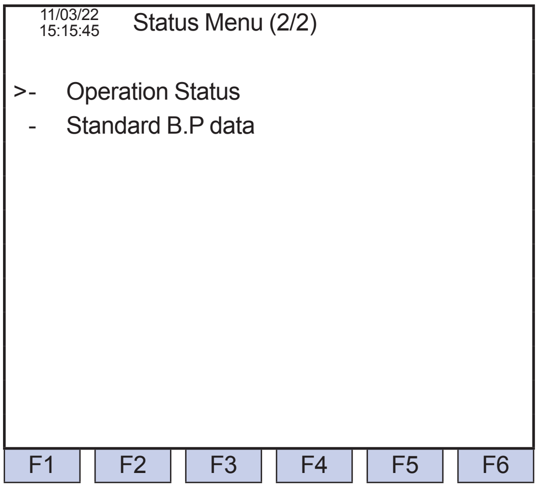


Figure 5.5 Status menu screen (2/2)

To display the Status Menu (1/2), press Prev.

TIP

- If the AI, AO, DI and DO cards are not inserted, the associated menu cannot be selected.
- If the Analog output num is 0 on the GCCU Setup screen, the Remote AO status cannot be selected.

5.2.1 AI Status

To display the Analog Input (AI) status, move the cursor (>) with ▲ or ▼ to the AI Status row and press Set/Ent.

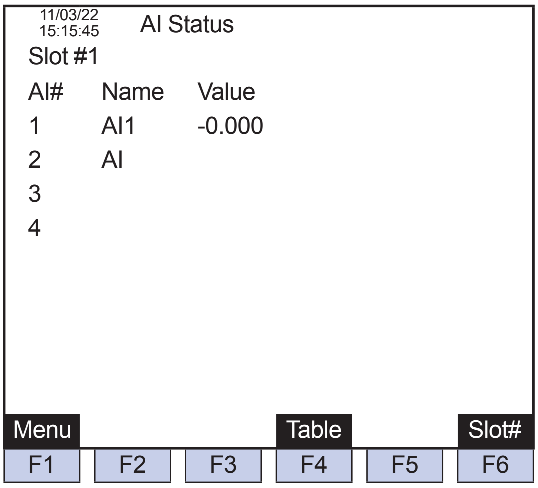


Figure 5.6 Example of the AI status screen

F1 (Menu):	Displays the Status Menu screen.
F4 (Table):	Displays the AI Setup screen (see the 5.4.18 AI Setting).
F6 (Slot #):	Sets a slot number (applicable only when multiple analog input cards are inserted).

TIP

- On the initial screen, the smallest slot number among those of the AI cards inserted is displayed.
- For the slot number setting, only slot numbers of AI cards can be accepted.
- The Value data are refreshed automatically at a fixed interval (1 second).

If no AI cards are inserted, the Status Menu screen displays “Not load” on the bottom.

Table 5.2 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #	Slot number		1	5		Absolute slot number
AI #	AI channel number		1	4		Relative channel number
Name	AI name					8 single-byte alphanumeric characters
Value	AI value		-0.25	1.25		If the value stored in the database is 10000, it is shown as 1.0000.

5.2.2 AO Status

To display the Analog Output (AO) status, move the cursor (>) with ▲ or ▼ to the AO Status row and press Set/Ent.

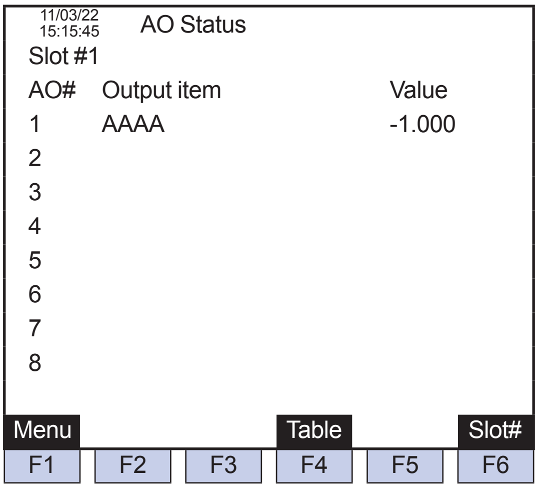


Figure 5.7 Example of the AO status screen

F1 (Menu): Displays the Status Menu screen.
F4 (Table): Displays the A/O Setup screen.
F6 (Slot #): Sets a slot number (applicable only when multiple analog output cards are inserted).

TIP

- The Value data are refreshed automatically at a fixed interval (1 second).
- On the initial screen, the smallest slot number among those of the AO cards inserted is displayed.
- For the slot number setting, only slot numbers of AO cards can be accepted.

If no AO cards are inserted, the Status Menu screen displays “Not load” on the bottom.

Table 5.3 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #	Slot number		1	5		Absolute slot number
AO #	AO channel number		1	8		Relative channel number
	Stream number on the output		1	31		
	Peak number on the output		1	999		Relative peak number
Output item	AO output peak name					8 single-byte alphanumeric characters
	Analysis results on the output		0.000 0.000	999.999 9999.999		When the unit is % For other units * The number of effective digits is 6.
	Analysis value unit on the output					See the Measuring unit of the Peak Setup-Specific screen. * Only the upper 5 characters are displayed.
	Detector number					None, 1-1, 1-2, 2-1, 2-2, 3-1, 3-2 * Oven number and relative detector number
Value	AO value		-0.25	1.25		If the value stored in the database is 10000, it is shown as 1.0000.

5.2.3 DI Status

The DI (contact input) status is displayed on the screen.

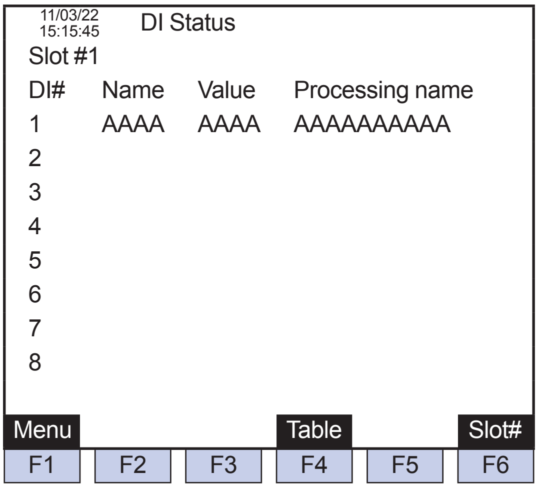


Figure 5.8 Example of the DI status screen

F1 (Menu): Displays the Status Menu screen.
F4 (Table): Displays the DI Setup screen.
F6 (Slot #): Sets a slot number.

TIP

- The Value data are refreshed automatically at a fixed interval (1 second).
- On the initial screen, the smallest slot number among those of the DI cards inserted is displayed.
- For the slot number setting, only slot numbers of DI or DI/O cards can be accepted.
- Up to CH3 are displayed for DI/O cards.

If no DI cards are inserted, the Status Menu screen displays “Not load” on the bottom.

Table 5.4 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #	Slot number		1	5		Absolute slot number
DI #	DI contact number		1	8		Relative channel number
Name	DI name					8 single-byte alphanumeric characters
Status	Status					Open/Close
Processing name	Processing name					No assignment, Stream sequence, Stream, Range change Cal/Val, Operation mode change, Alarm process

5.2.4 DO Status

■ DO Status screen (Normal Output)

The DO (contact output) status is displayed on the screen.

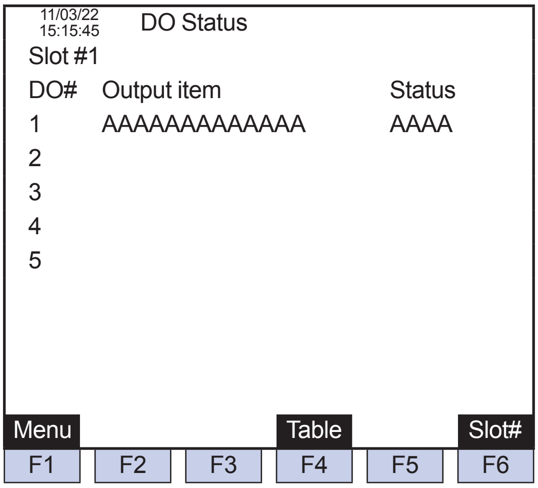


Figure 5.9 Example of the DO status screen

F1 (Menu): Displays the Status Menu screen.
F4 (Table): Displays the DO Setup screen.
F6 (Slot #): Sets a slot number.

TIP

- The Status is refreshed automatically at a fixed interval (1 second).
- On the initial screen, the smallest slot number among those of the DO cards inserted is displayed.
- For the slot number setting, only slot numbers of DO or DI/O cards can be accepted.
- Up to CH3 are displayed for DI/O cards.

If no DO cards are inserted, the Status Menu screen displays “Not load” on the bottom.

■ DO Status screen (Stream Identification)

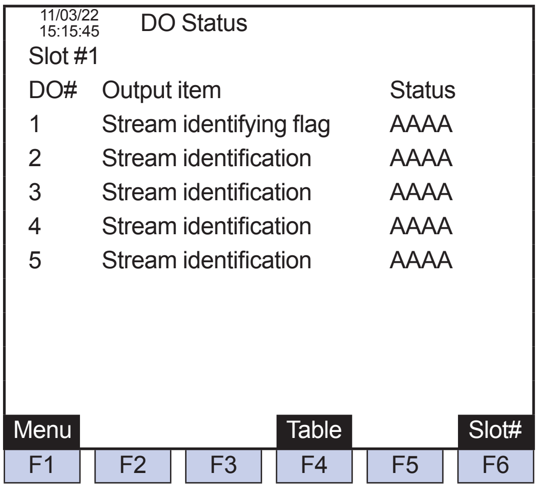


Figure 5.10 Example of the DO Status screen (Stream Identification)

F1 (Menu): Displays the Status Menu screen.
F4 (Table): Displays the DO Setup screen.
F6 (Slot #): Sets a slot number.

TIP

- The Status is refreshed automatically at a fixed interval (1 second).
- On the initial screen, the smallest slot number among those of the DO cards inserted is displayed.
- For the slot number setting, only slot numbers of DO cards can be accepted.
- Up to CH3 are displayed for DI/O cards.
- One GCM stream identifying signal can be applied to multiple DO cards.
- In the case where the Stream identification has been set on the GCM Setup screen, the DO is used for that purpose.

Example: Stream identification setup for the GCM1 (where the first number of the stream identification DO is 1)

Slot	1					2
Stream identification	DO1	DO2	DO3	DO4	DO5	DO1
Up to 3 streams	Stream identifying flag	Stream identification	Stream identification	Normal output	Normal output	Normal output
Up to 7 streams	Stream identifying flag	Stream identification	Stream identification	Stream identification	Normal output	Normal output
Up to 15 streams	Stream identifying flag	Stream identification	Stream identification	Stream identification	Stream identification	Normal output
Up to 31 streams	Stream identifying flag	Stream identification	Stream identification	Stream identification	Stream identification	Stream identification

Table 5.5 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #	Slot number		1	5		Absolute slot number
DO #	DO contact number		1	5	Number	Relative contact number
Output item						0: No assignment 1: Stream sequence 2: Stream 3: Operation mode 4: Alarm 5: Timing 6: Cal/Val 7: Str valve select * See Note.
Status						0: Off 1: On

Note:
1: The selected GCM number and stream sequence number are displayed.
2: The selected stream number is displayed
3: The selected GCM number and operation mode are displayed.
4: The selected GCM number and alarm level/concentration alarm are displayed.
5: The selected SYS number, SYS method and sequence order selection are displayed.
6: The selected GCM number and calibration/validation number are displayed.

5.2.5 Remote AO Status

The remote AO status is displayed.

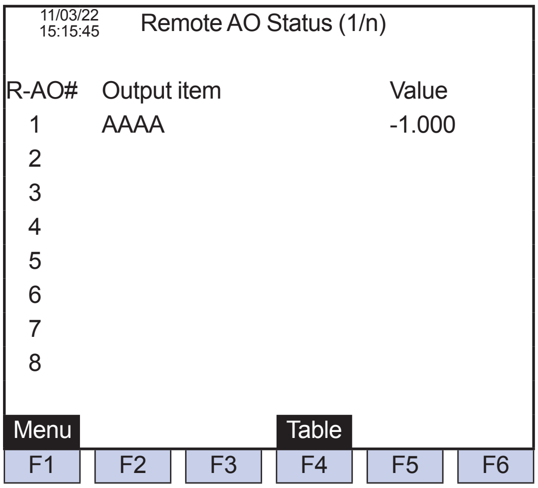


Figure 5.11 Example of the remote AO status screen

F1 (Menu): Displays the Status Menu screen.
F4 (Table): Displays the Remote AO Setup screen.

TIP

- If the Analog output num is 0 on the GCCU Setup screen, this screen will not be displayed.
- Only the Value data are refreshed automatically at a fixed interval (1 second). When the AO output is updated (i.e., the AO screen update flag is 1), all the data are refreshed.
- If an unassigned stream number or an unassigned peak number is specified, “?” appears in all digits of the peak number, output item, analysis result value and its unit of the stream.

Table 5.6 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
R-AO #	Remote AO channel number		1	36	Number	Channel number
	Stream number on the output		1	31	Number	
	Peak number on the output		1	999	Number	
Display item	Remote AO output peak name					Alphanumeric: 8 charactors (8 bytes)
	Analysis result value on the output		0.000 0.000 0.000	999.999 9999.999 9999.999	% ppm	When the unit is % When the unit is ppm No unit * The number of effective digits is 6.
	Analysis result value on the output		0.000 0.000	999.999 9999.999		When the unit is % For other units * The number of effective digits is 6.
Value	Remote AO value		–0.25	1.25		If the value stored in the database is 10000, it is shown as 1.0000.

5.2.6 Remote DO Status

The remote DO status is displayed.

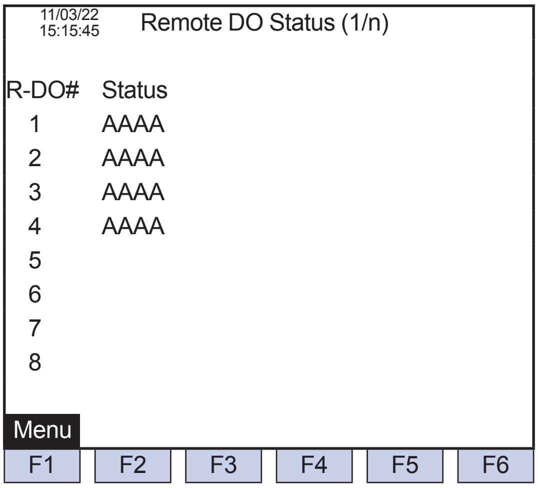


Figure 5.12 Example of the remote DO status screen

F1 (Menu): Displays the Status Menu screen.

TIP

The Status is refreshed automatically at a fixed interval (1 second).

Table 5.7 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
R-DO #	Remote DO contact number		1	32	Number	Contact number
Status						0: Off 1: On

5.2.7 Revision Number

The revisions of the main CPU and the HMI are displayed.

■ Revision Number screen (Main)

To display the revisions of the main CPU and the HMI, move the cursor (>) with or to the Revision Number row and press Set/Ent.

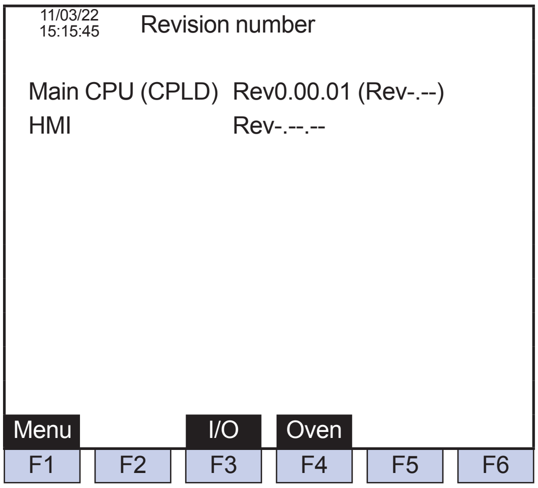


Figure 5.13 Example of the revision number screen (Main)

F1 (Menu): Displays the Status Menu screen.
F2 (Main): Displays the Revision Number screen (Main).
F3 (I/O): Displays the Revision Number screen (I/O).
F4 (Oven): Displays the Revision Number screen (Oven).
F6 (Oven #):

Table 5.8 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Main CPU			0.01.01	9.99.99		The revision number for the HMI is not stored in the database. If the revision data is not existed, the revision number is shown with "-".
HMI						
Main CPU (CPLD)			0.01	9.99		If the revision data is not existed, the revision number is shown with "-".

■ Revision Number screen (I/O)

To display the revision numbers of the I/Os, press F3 (I/O).

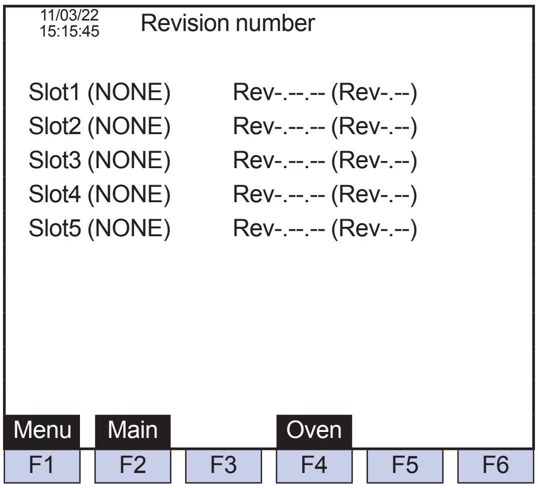


Figure 5.14 Example of the revision number screen (I/O)

* In the parentheses for the AO, the revision number of the CPU is displayed; for the AI, the revision number of the CPLD; and for the DI, DO and DI/O, the revision number of the hardware.

* For the COM and UP, the revision number of the CPU is displayed. In the parentheses, - (hyphen) is shown.

Table 5.9 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot1 to Slot5						The revision number for the HMI is not stored in the database. If the revision data is not existed, the revision number is shown with “-”.
	Names of Slot1 to Slot5					0: Not provided 1: DI 2: DO 3: DI/O 4: AI 5: AO 6: COM 7: UP

■ Revision Number screen (Oven)

The revision number of the oven is displayed.

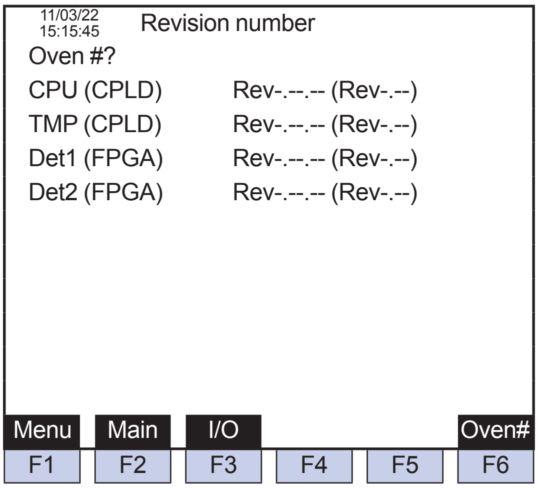


Figure 5.15 Example of the revision number screen (Oven)

To display the revision number of the other oven, press F6 (Oven #).

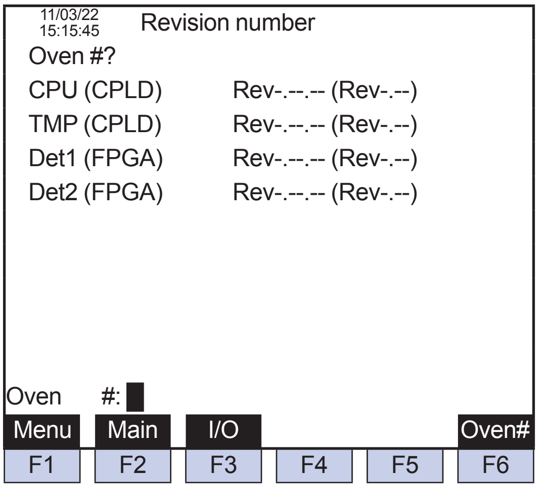


Figure 5.16 Example of the revision number screen (to change Oven #)

Press the Set/Ent key after entering the oven number with numeric keys.

Table 5.10 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
	Oven CPU					The revision number for the HMI is not stored in the database. If the revision data is not existed, the revision number is shown with “-”.
CPU (CPLD)	Oven CPU (CPLD)					If the revision data is not existed, the revision number is shown with “-”.
TEMP (CPLD)						
DET1 (FPGA)						
DET2 (FPGA)						

5.2.8 Ethernet Status

F1 (Menu): Displays the Status Menu screen.
F4 (Modbus): Displays the Modbus IP Address screen.
F5 (TCP): Displays the TCP/IP Address screen.
F6 (MAC): Displays the MAC Address screen.

■ TCP/IP Address screen

The TCP/IP address is displayed.

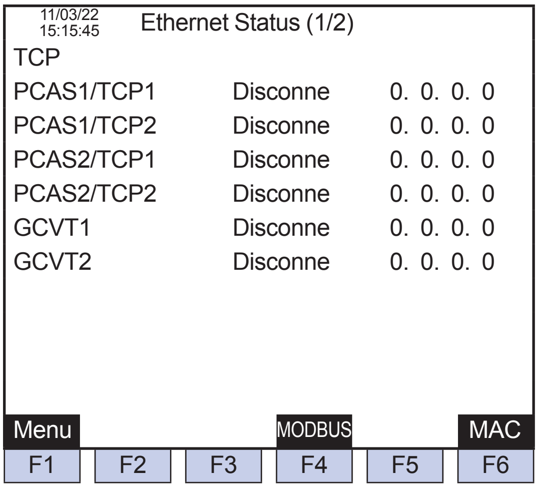


Figure 5.17 TCP/IP address screen (1/2)

TIP

The TCP/IP address is refreshed automatically at a fixed interval (1 second).

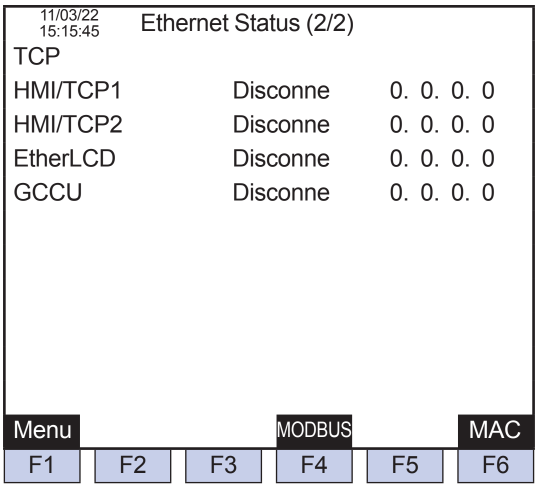


Figure 5.18 TCP/IP address screen (2/2)

Table 5.11 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
TCP	TCP connection flag					Disconnected Connected (normal) Connected (forced)
	TCP/IP address					

MODBUS IP Address screen

To display the MODBUS IP address, press F4 (Modbus).

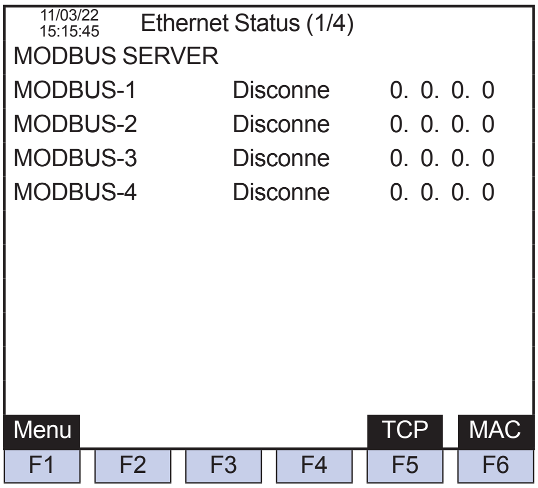


Figure 5.19 Modbus IP address screen (1/4)

TIP

The MODBUS IP address is refreshed automatically at a fixed interval (1 second).

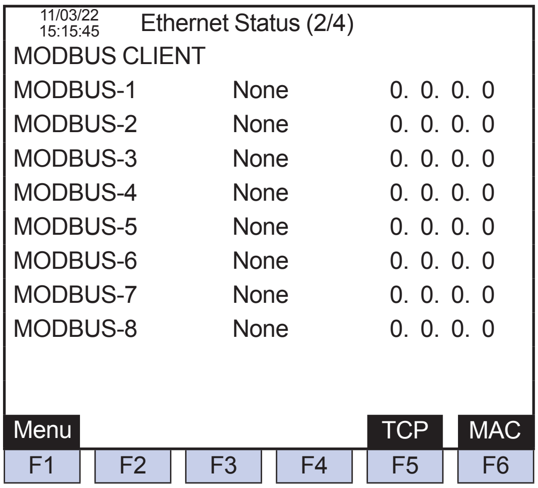


Figure 5.20 MODBUS IP address screen (2/4)

IP addresses for up to MODBUS-20 are displayed (four pages in total).

The MODBUS communication status with the registered GC is displayed together with the IP address of the GC.

Table 5.12 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
MODBUS client	MODBUS connection status					None Connected Disconnected
	MODBUS IP address					

MAC Address screen

To display the MAC address, press F6 (MAC).

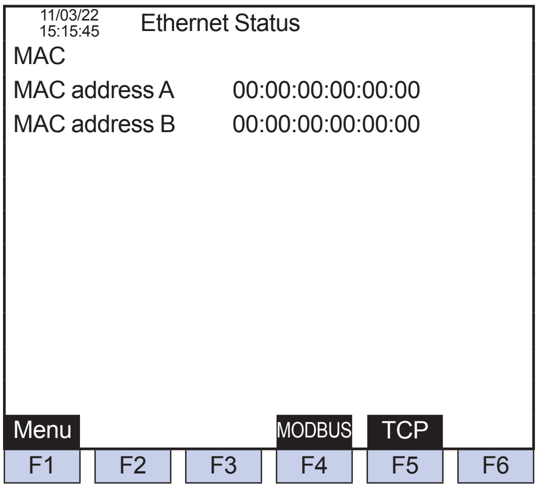


Figure 5.21 Example of the MAC address screen

Table 5.13 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
MAC address A, MAC address B						

Addresses are entered in decimal digits using periods as delimiters. For example, the address 192.168.0.24 can be entered as is.

5.2.9 Alarm Status

■ Alarm Status screen

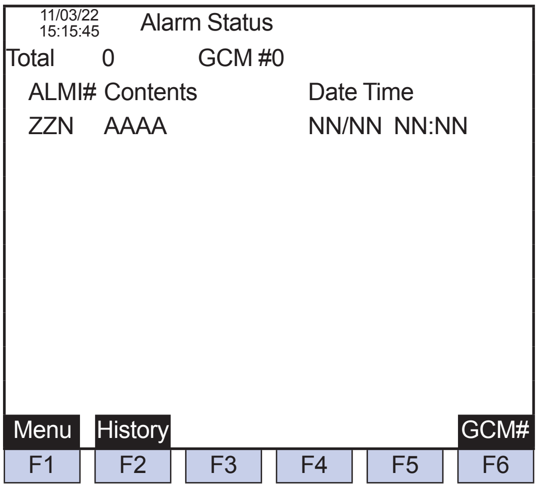


Figure 5.22 Example of the alarm status screen

F1 (Menu): Displays the Status Menu screen.
F2 (History): Displays the Alarm Historical Record screen.
F6 (GCM #): Specifies a GCM number.

TIP

This operation is possible in Manual status.
Alarms for the entire unit can be cleared when all the GCMs are in Manual status.

TIP

- The display is refreshed at an interval of 1 second.
- The screen shows the current Level 1 and Level 2 alarm status.
- When any alarm status change has occurred in the upper eight rows, the display is refreshed automatically.
- The display can be scrolled vertically by the alarm row using the vertical scroll keys.
- The newest current alarm number is shown in the first row.

Table 5.14 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Total	Total number of the current alarms					
GCM #	GCM number		0	6		0: Alarm for the entire unit
ALM #	Alarm number		1	400		
Contents						Alphanumeric: 22 characters
Date Time	Date Time: Month Date Time: Day Date Time: Hour Date Time: Minute		1 1 00 00	12 31 23 59	Month Day Hour Minute	

■ Alarm Historical Record

To display the alarm history, press F2 (History).

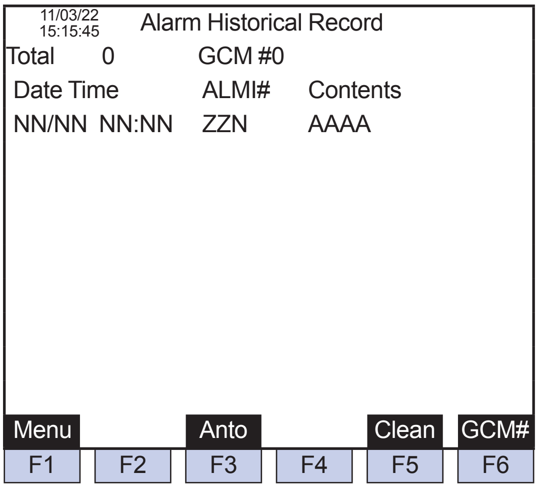


Figure 5.23 Example of the alarm historical record

F1 (Alarm): Displays the Alarm Status screen.

F3 (Auto): Starts to refresh the alarm status automatically at an interval of 1 second.

F5 (Clean): Flushes the alarm history buffer and starts the Auto refresh. For this operation, the user level C or higher is required.

F6 (GCM #): Specifies a GCM number.

TIP

- The display is refreshed at an interval of 1 second.
- The newer data are shown in upper rows in order.
- Auto refresh is executed as long as the top data is the newest upon the occurrence of an alarm incident.
- The display can be scrolled vertically by the alarm row using the vertical scroll keys.
- Between the Date Time and ALM #, the alarm status is shown as 1 (On) or 0 (Off).

Table 5.15 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Total	Total number of alarms in the history data table					
GCM #	GCM number		0	6		0: Alarm for the entire unit
Date Time	Date Time: Month Date Time: Day Date Time: Hour Date Time: Minute		1 1 00 00	12 31 23 59	Month Day Hour Minute	
ALM #	Alarm number		1	600		
Contents						Alphanumeric: 12 characters * The first 12 characters are shown when the length exceeds the limit.
	Alarm information 1		0	0xFFFF		
	Alarm information 2		0	0xFFFF		

5.2.10 Operation Status

To show the Status Menu (1/2), press Next.

- F1 (Menu): Displays the Table Menu screen.
- F2 (GC): Displays the Total Operation Time screen.
- F3 (Oven): Displays the Valve Operation Count screen.
- F4 (StrV): Displays the Stream Valve Operation Count screen.
- F5 (Det): Displays the Detector Operation Count screen.
- F6 (Oven #): Specifies an oven number.

■ Operation Status screen (Total Operation Time)

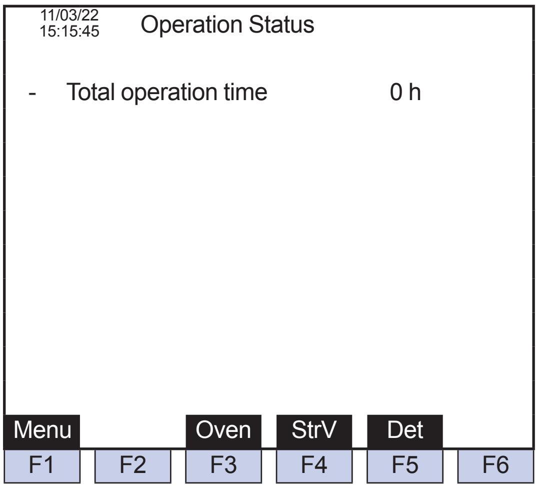


Figure 5.24 Example of the operation status screen (Total Operation Time)

TIP

- Display data are not refreshed automatically.
- For the operation, the user level C or higher is required.

Table 5.16 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Total Operation Time		○	0	99999999	Hours	

Operation Status screen

Press F3 (Oven).

Valve Operation Count

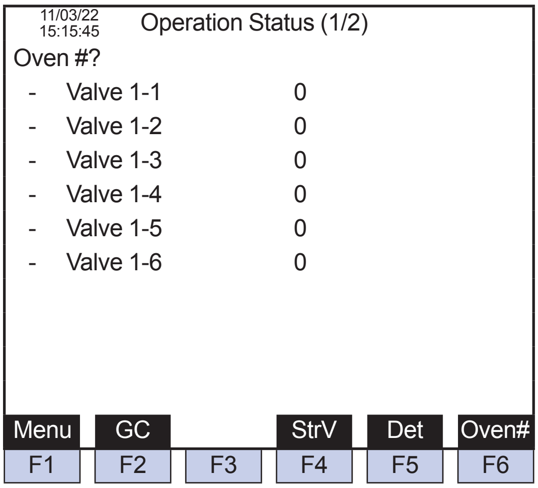


Figure 5.25 Example of the valve operation count screen (1/2)

If no valves are installed, the data will be shown as * (asterisk).

TIP

- Display data are not refreshed automatically.
- For the operation, the user level C or higher is required.

Table 5.17 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
Valve N-1 to Valve N-7	Valve N-1	○	0	99999999	Times	

Valve Operation Count (others)

To show the Operation Status screen (2/2), press Next.

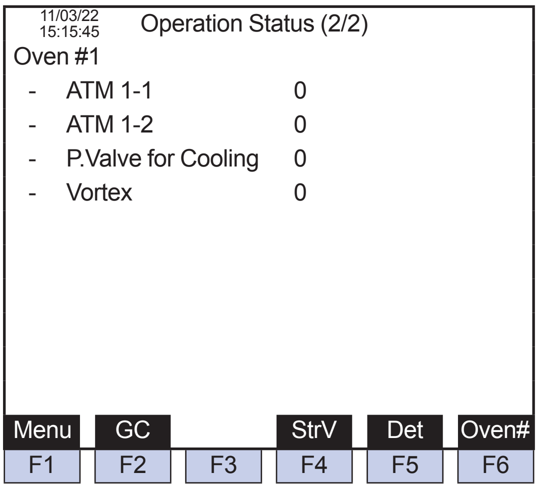


Figure 5.26 Example of the valve operation count screen (2/2)

TIP

- Display data are not refreshed automatically.
- For the operation, the user level C or higher is required.

- If no ATM valve, P. valve for cooling or vortex is installed, the data will be shown as * (asterisk).

Table 5.18 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
ATM valve N-1, N-2		○	0	99999999	Times	
P. valve for cooling		○	0	99999999	Times	
Vortex		○	0	99999999	Hours	

■ Operation Status screen (Stream Valve Operation Count)

Press F4 (StrV).

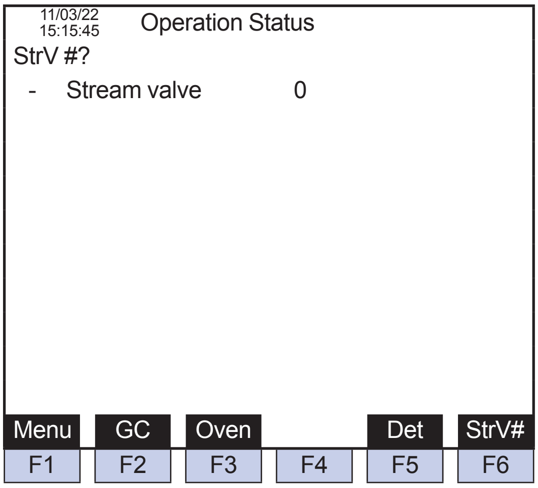


Figure 5.27 Example of the operation status screen (Stream Valve Operation Count)

F1 (Menu): Displays the Table Menu screen.
F2 (GC): Displays the Total Operation Time screen.
F3 (Oven): Displays the Valve Operation Count screen.
F5 (Det): Displays the Detector Operation Count screen.
F6 (StrV #): Specifies a stream valve number.

TIP

- Display data are not refreshed automatically.
- For the operation, the user level C or higher is required.

Table 5.19 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
StrV #	Stream valve number		1	31		
Stream valve		○	0	99999999	Times	

■ Operation Status screen (Detector ON Time)

Press F5 (Det).

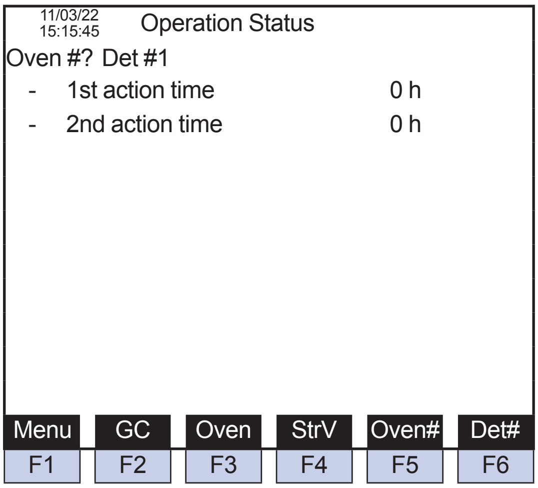


Figure 5.28 Example of the operation status screen (Detector ON Time)

F1 (Menu):	Displays the Table Menu screen.
F2 (GC):	Displays the Total Operation Time screen.
F3 (Oven):	Displays the Valve Operation Count screen.
F4 (StrV):	Displays the Stream Valve Operation Count screen.
F5 (Oven #):	Specifies an oven number.
F6 (Det #):	Specifies a detector number.

TIP

Display data are not refreshed automatically.
If the detector type is TCD or FID, the 2nd action time will be shown as * (asterisk).

- If no detectors are installed, the data will be shown as * (asterisk).

Table 5.20 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
Det #	Detector number		1	2		
1st action time, 2nd action time		○	0	99999999	Hours	

5.2.11 Distillation data

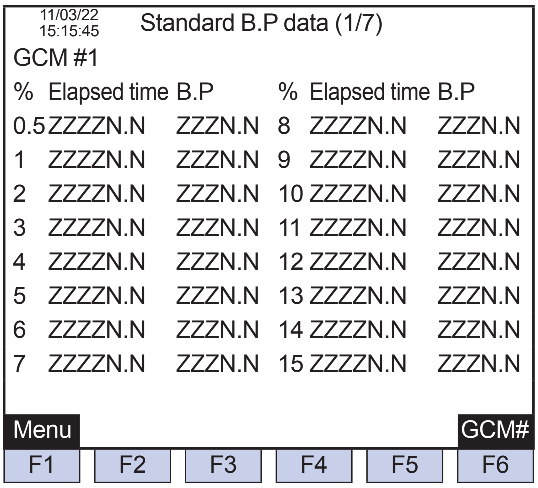


Figure 5.29 Distillation data screen (1/7)

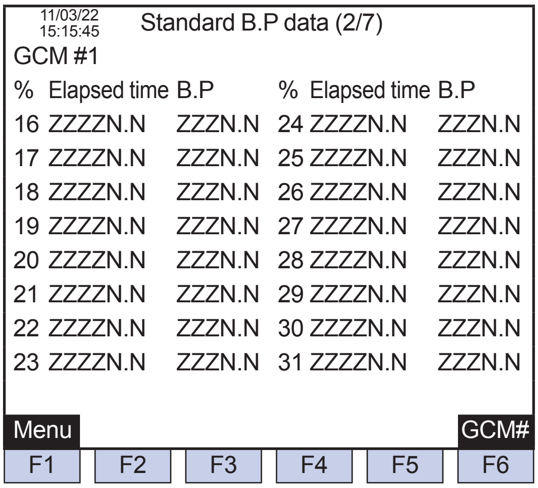


Figure 5.30 Distillation data screen (2/7)

F1 (Menu): Displays the Status Menu screen.
F6 (GCM #): Specifies a GCM number.

- Display data are not refreshed automatically.

Table 5.21 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
%	Distill %		0.5	99.5	%	0.5, 1 to 99 and 99.5
Elapsed time			0.0	21600.0	Seconds	
B.P			–999.9	9999.9		The unit depends on the *Temperature unit* set on the SimDis Setup screen. Reference: The actual possible value range is from –259.0°C to 1013.0°C or –434.2°F to 1855.4°F. * °F = 1.8 × °C + 32

5.3 Operation Display screen

Pressing the Operation menu key navigates to the Operation Display screen.

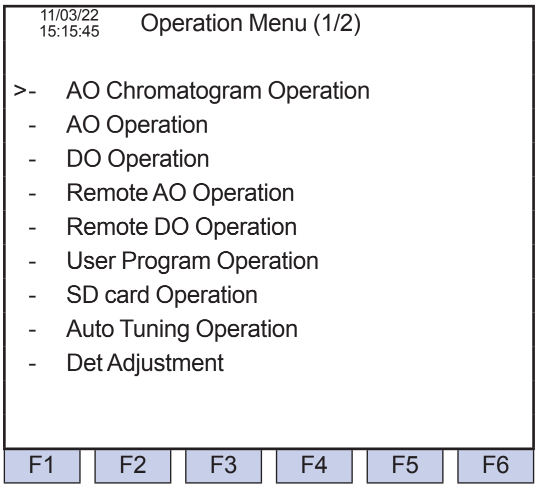


Figure 5.31 Operation menu screen (1/2)

To show the Menu screen below, press the Next key.

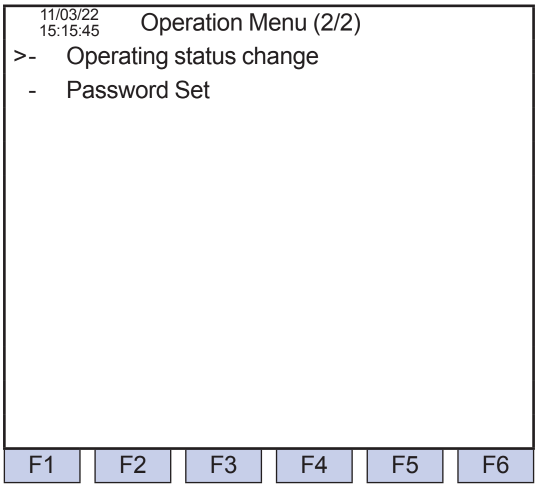


Figure 5.32 Operation menu screen (2/2)

TIP

AO Operation, DO Operation, Remote AO Operation, Remote DO Operation, SD Card Operation and Auto Tuning Operation are selectable only when all the GCMs are in Manual status and in Stop mode.

- The Det Adjustment screen for the detector with the smallest number is displayed.
- If the Analog output num is 0 on the GCCU screen, the Remote AO Operation status cannot be selected.
- During auto tuning, the screen navigates automatically to the Auto Tuning Operation screen.

5.3.1 AO Chromatogram Operation

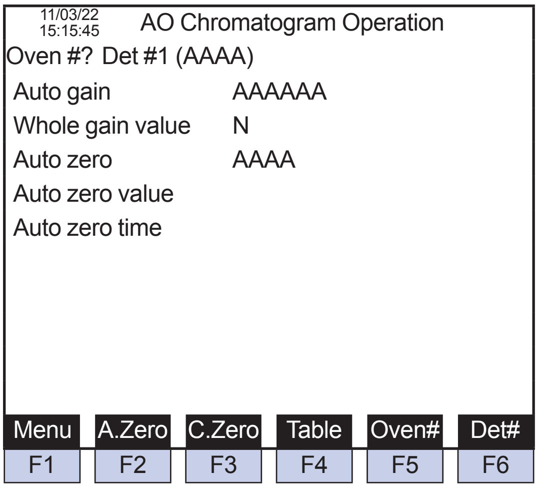


Figure 5.33 Example of the AO chromatogram operation screen

F1 (Menu): Displays the Operation Menu screen.
F2 (A.Zero): Executes the Manual zero.
F3 (C.Zero): Clears values to zero.
F4 (Table): Displays the Det Status Setup screen.
F5 (Oven #): Sets an oven number.
F6 (Det #): Sets a detector number.

- Pressing F2 (A.Zero) sets the current detector output value to 0 mV exclusively for the AO chromatogram. The screen then displays “Auto zero executed.”
- Pressing F3 (C.Zero) displays “Zero value clear executed.”
- The screen for Oven 1 and Det 1 is displayed as the initial screen.

Table 5.22 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
Det #	Detector number		1	2		
	Detector type					None TCD FID FID-MC FPD
Auto gain		○				None (default) Individual gain Whole gain* * Exclusively for the AO chromatogram
Whole gain value		○	0	15		
Auto zero						Automatic feed (default) Auto zero value Disabled
Auto zero value			–1000.0000	1000.0000		Former chromatogram standard value
Auto zero time			0	21600.0		If the value is 0.0 seconds, the value is set to the zero value automatically obtained at the start of the analysis cycle

5.3.2 AO Operation

Navigating to the AO Operation screen sets the mode to AO Manual and all the outputs of 32 AO channels become 4 mA. On the AO Operation screen, setting commands are available for any of the up to 32 AO channels. Navigating to other screens cancels the AO Manual mode, and according to the settings, outputs are made from each AO channel.

To set the output value of an AO, select the AO number with the cursor, enter the set value and press the Set/Ent key. Note that this operation must be done in Manual status and in Stop mode.

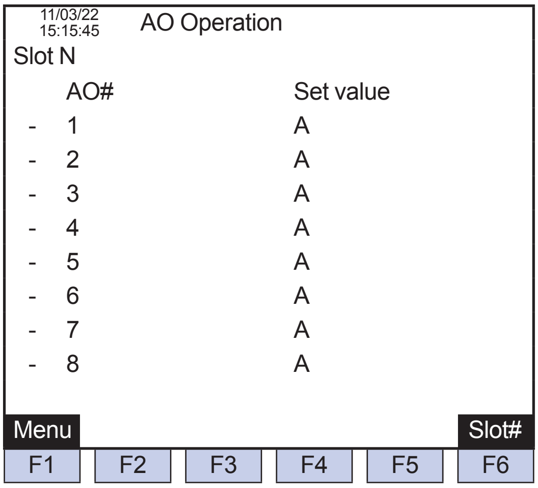


Figure 5.34 Example of the AO operation screen

F1 (Menu): Displays the Operation Menu screen.

F6 (Slot #): Sets a slot number.

TIP

For this operation, the user level C or higher is required.

- On the initial screen, the smallest slot number among those of the AO cards inserted is displayed.
- For the slot number setting, only slot numbers of AO cards can be accepted.

Table 5.23 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot	Slot number		1	5		Absolute slot number
AO #	AO channel number		1	8	Number	Relative channel number
Set value		○	–0.2500	1.2500		After the value is set, 0 to 1 is output as 4 to 20 mA.

5.3.3 DO Operation

Navigating to the DO Operation screen sets the mode to DO Manual and all the DO contacts (up to 25) are turned off. On the DO Operation screen, both the On and Off commands are available. Navigating to other screens cancels the DO Manual mode, and according to the settings, each DO contact is turned On or Off.

To change the DO status to On or Off, select the DO number with the cursor and press the Set/Ent key. Note that this operation must be done in Manual status and in Stop mode.

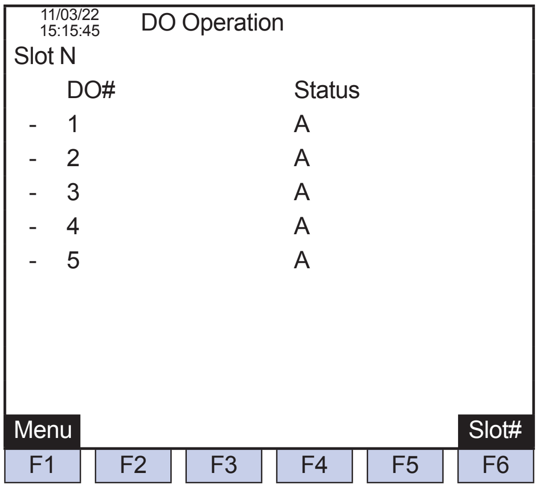


Figure 5.35 Example of the DO Operation screen

F1 (Menu): Displays the Operation Menu screen.
F6 (Slot #): Sets a slot number.

TIP

For this operation, the user level C or higher is required.

- On the initial screen, the smallest slot number among those of the DO cards inserted is displayed.
- For the slot number setting, only slot numbers of DO cards can be accepted.

Table 5.24 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot	Slot number		1	5		Absolute slot number
DO #	DO contact number		1	5	Number	Relative DO contact number
Status		○				0: Off 1: On

5.3.4 Remote AO Operation

Navigating to the Remote AO Operation screen sets the mode to Remote AO Manual and the outputs of all 36 remote AO channels become 4 mA. On the Remote AO Operation screen, a command to set values between 0 and 1 is available for each of the up to 36 remote AO channels. Navigating to other screens cancels the Remote AO Manual mode, and according to the settings, outputs are made from each remote AO channel.

To set the output value of a remote AO, select the remote AO number with the cursor, enter the set value and press the Set/Ent key. Note that this operation must be done in Manual status and in Stop mode.

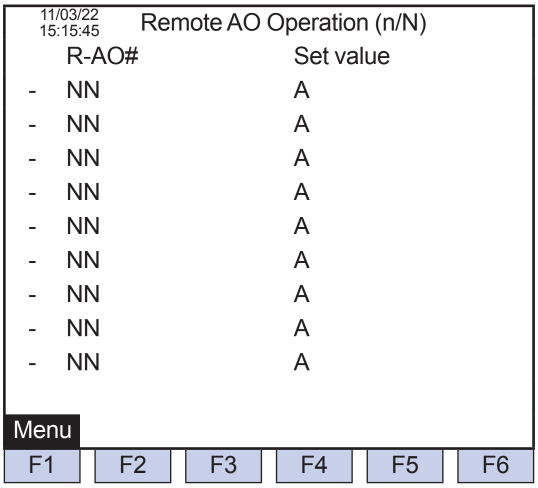


Figure 5.36 Example of the remote AO operation screen

F1 (Menu): Displays the Operation Menu screen.

TIP

For this operation, the user level C or higher is required.

- If the Analog output num is 0 on the GCCU Setup screen, this screen will not be displayed.

Table 5.25 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
R-AO #	Remote AO channel number		1	36	Number	Remote AO channel number
Set value		○	–0.2500	1.2500		After the value is set, 0 to 1 is output as 4 to 20 mA. * Internally, the value is written in the MODBUS remote AO data table. * The initial value is 0.0000.

5.3.5 Remote DO Operation

Navigating to the remote DO Operation screen sets the mode to Remote DO Manual and all the remote DO contacts are turned Off. On the Remote DO Operation screen, both the On and Off commands are available. Navigating to other screens cancels the Remote DO Manual mode, and according to the settings, all remote DO contacts are turned On or Off.

To change the remote DO status to On or Off, select the remote DO number with the cursor and press the Set/Ent key. Note that this operation must be done in Manual status and in Stop mode.

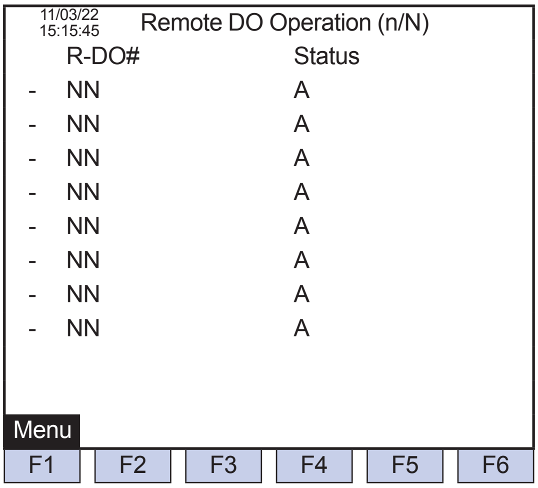


Figure 5.37 Example of the remote DO operation screen

F1 (Menu): Displays the Operation Menu screen.

TIP

For this operation, the user level C or higher is required.

Table 5.26 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
R-DO #	Remote DO contact number		1	32	Number	Up to 32 contacts
Status		○				0: Off 1: On

5.3.6 User Program Operation

■ User Program Operation screen

The screen displays the execution status and current status of the user program (end of peak detect script). The change of the execution status and the forced stop of the script are also possible via this screen.

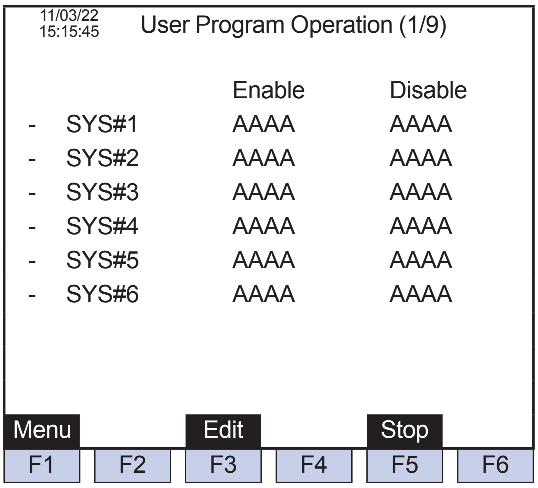


Figure 5.38 Example of the user program operation screen (1/9)

The screen displays the execution status and current status of the user program (period script). The change of the execution status and the forced stop of the script are also possible via this screen.

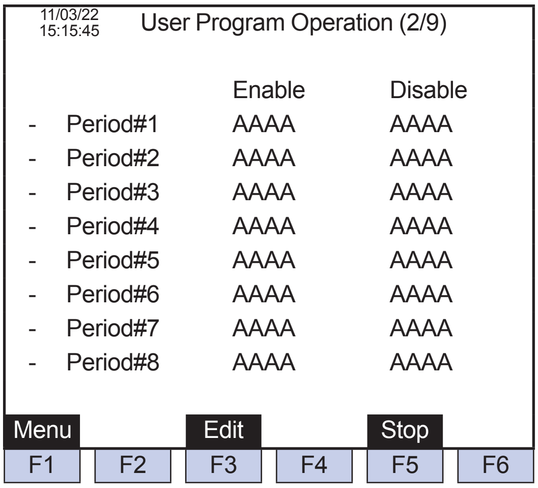


Figure 5.39 Example of the user program operation screen (2/9 to 9/9)

F1 (Menu): Displays the Status Menu screen.
F3 (Edit): Displays the User Program Edit screen.
F5 (Stop): Executes the forced stop command.

- After selecting a SYS number, the option displayed is Enable if the execution status is currently disabled, and Disable if it is currently enabled.
- Pressing F5 (Stop) displays Input script number (SYS #). Entering the target script number for the end of peak detect executes the forced stop command.

TIP

The Status is refreshed automatically at a fixed interval (1 second).

Table 5.27 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Enable		○				Disable Enable
Status		○				Stopping Executing

■ User Program Edit screen

Press F3 (Edit).

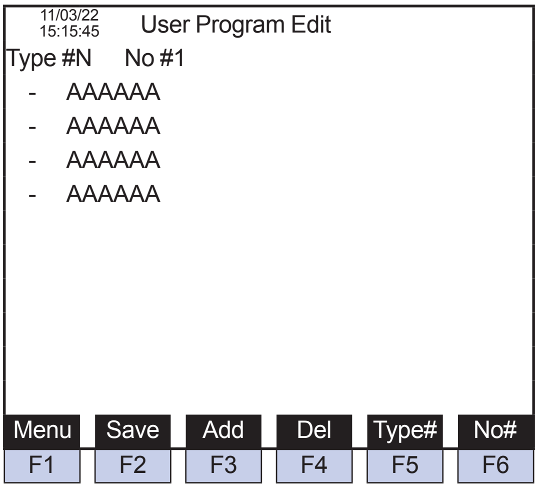


Figure 5.40 Example of the user program edit screen

F1 (Menu): Displays the Operation Menu screen.
F2 (Save): Saves the script file.
F3 (Add): Add a command line.
F4 (Del): Delete a command line.
F5 (Type #): Specifies a type number.
F6 (No #): Specifies a SYS number for the end of peak detect script type; or a period script number for the period script type.

TIP

- For this operation, the user level C+ is required.
- The following values can be entered:
  0 to 9, A to Z, ( ) * / + – =, space and backspace.

- Type number
  1: End of peak detect script
  2: Period script
- Up to 8 lines each of which consists of 32 characters are displayed.
  Note that the maximum number of characters per line of a script is 128; therefore, if a script line contains over 32 characters, it is split into two or more lines on the display.
- Both 0x0A and 0x0D0A can be used for script delimiters.
- Scripts can be scrolled with the Up/Down keys.
- Pressing the Set/Ent key or F3 (Save) after setting the cursor on the target row when the execution status is enabled, the screen displays the error message “No execution because of executing.”

Table 5.28 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Type #	Type Number	○	1	2		End of peak detect script Period script
No #		○	1 1	6 64		For the type number 1 For the type number 2
	Script	○				Alphanumeric: 32 characters

Edit examples:

(1) Displays a script.

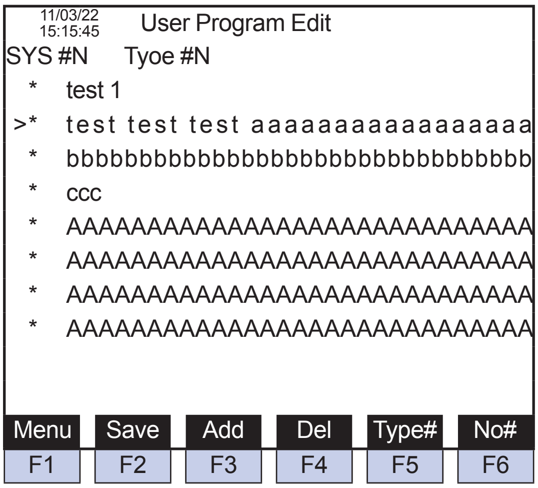


Figure 5.41 User program edit screen (Example of editing 1)

(2) Presses the ENTER key.

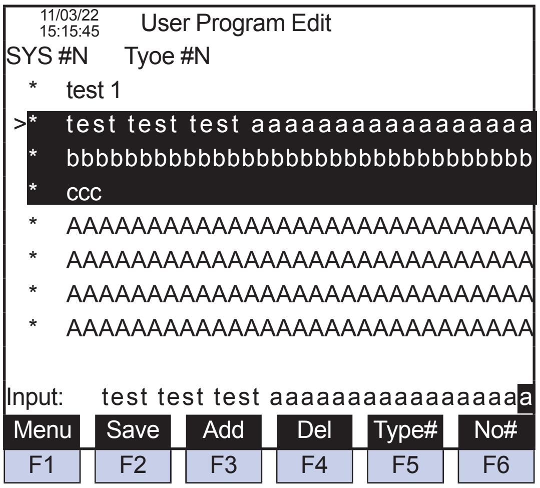


Figure 5.42 User program edit screen (Example of editing 2)

(3) Moves the cursor to the right.

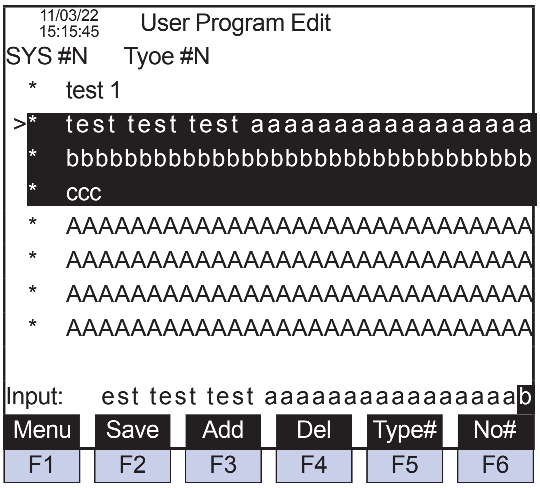


Figure 5.43 User program edit screen (Example of editing 3)

(4) Moves the cursor to the left.

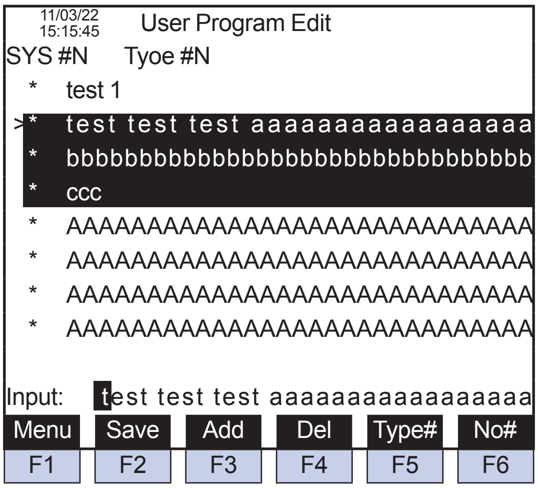


Figure 5.44 User program edit screen (Example of editing 4)

(5) Edits the script.

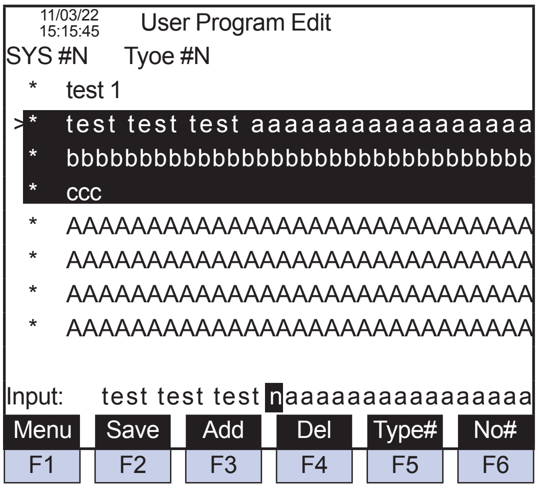


Figure 5.45 User program edit screen (Example of editing 5)

(6) Then, presses the ENTER key.

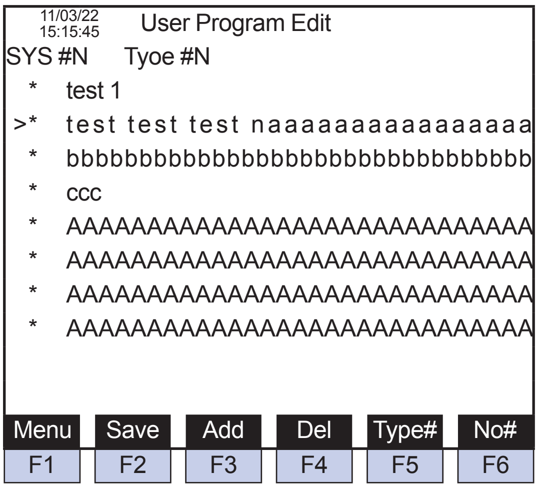


Figure 5.46 User program edit screen (Example of editing 6)

(7) Edits the script.

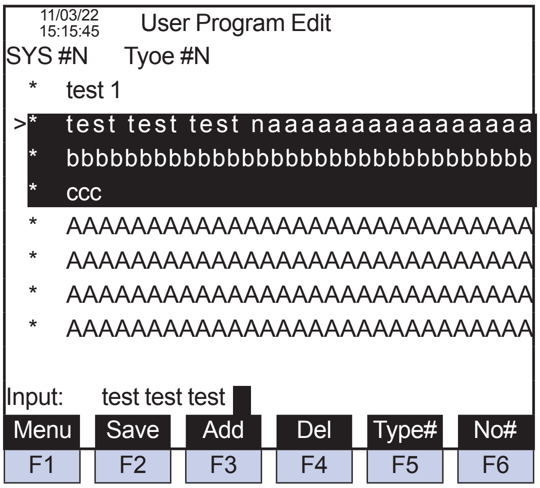


Figure 5.47 User program edit screen (Example of editing 7)

(8) Then, presses the ENTER key.

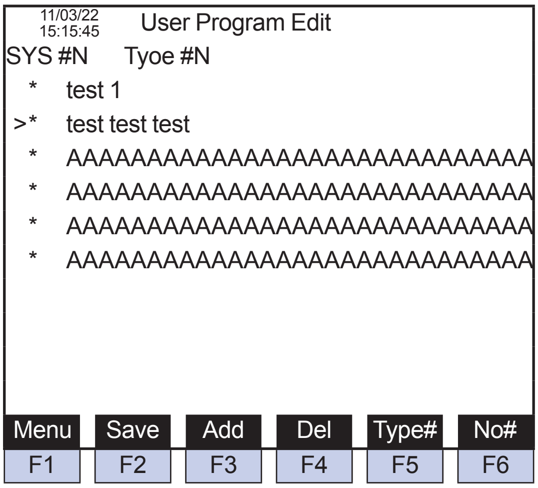


Figure 5.48 User program edit screen (Example of editing 8)

(9) Presses F4 to delete a line.

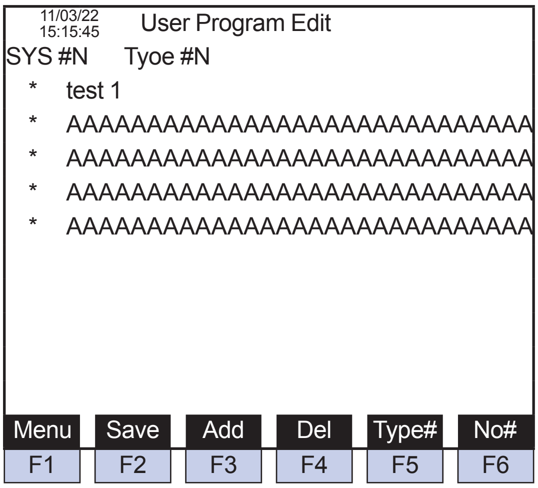


Figure 5.49 User program edit screen (Example of editing 9)

(10) Presses F3 to add a line.

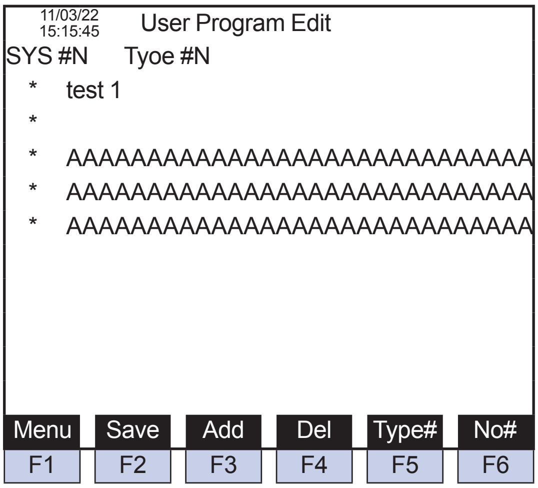


Figure 5.50 User program edit screen (Example of editing 10)

5.3.7 SD Card Operation

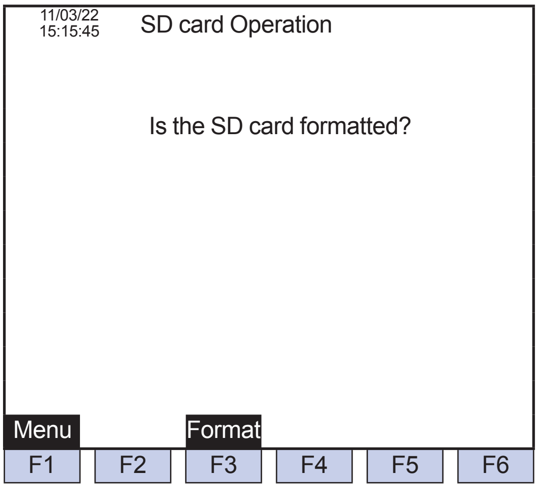


Figure 5.51 SD card operation screen

F1 (Menu): Displays the Operation Menu screen.

F3 (Format): Executes the SD card formatting.

TIP

For this operation, the user level C or higher is required and the operation mode is in Stop mode.

- Pressing F3 (Format) executes formatting. If it is finished successfully, the screen displays “It succeeded in the format”; otherwise “It failed in the format.”

5.3.8 Auto Tuning Operation

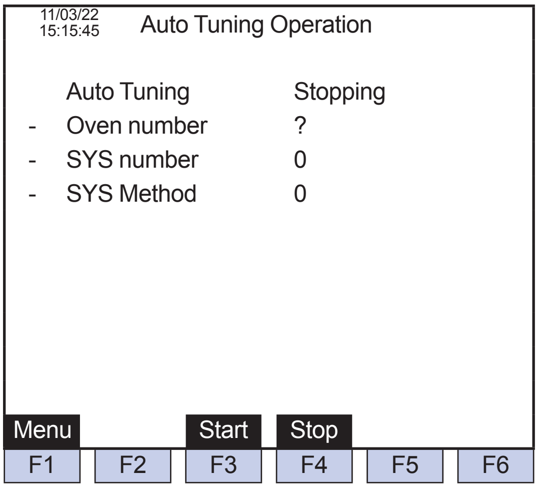


Figure 5.52 Example of the auto tuning operation screen

F1 (Menu): Displays the Operation Menu screen.
F3 (Start): Starts auto tuning.
F4 (Stop): Ends auto tuning.

TIP

- For this operation, the user level C or higher is required.
- The operation is possible when all the GCMs are in Manual status and the operation mode is Stop. In addition, the temperature controller of the associated oven needs to be On.
- During auto tuning, the oven number, SYS number and SYS method cannot be changed.
- After "Stopping" message is outputted, temperature may exceed preset temperature temporarily.

- At the start of auto tuning, a validation check is implemented on the oven number and the SYS number and method. If any invalidity is found, auto tuning will not be executed. The screen then displays the message “The setting is different.”

* If the SYS number does not belong to the specified oven, it results in an error.
* Even when both the SYS number and method are zero, auto tuning will still be executed.

- If the temperature controller of the oven is off when auto tuning is started by pressing F3 (Start), the screen displays the error message “Cannot start auto tuning.”

During auto tuning, pressing F1 (Menu) will not navigate to the Operation Menu screen. It displays the message “Cannot operate because of Auto Tuning.”

Table 5.29 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Auto tuning		○				0: Stopping 1: Executing * If the operation mode for the SYS number is Auto Tuning, “Executing” is displayed.
Oven number		○	1	3		
SYS number		○	(0), 1	6		SYS numbers that are not registered in the GCM cannot be entered.
SYS method		○	(0), 1	6		

5.3.9 Detector Adjustment

■ Detector type: TCD - Reset screen

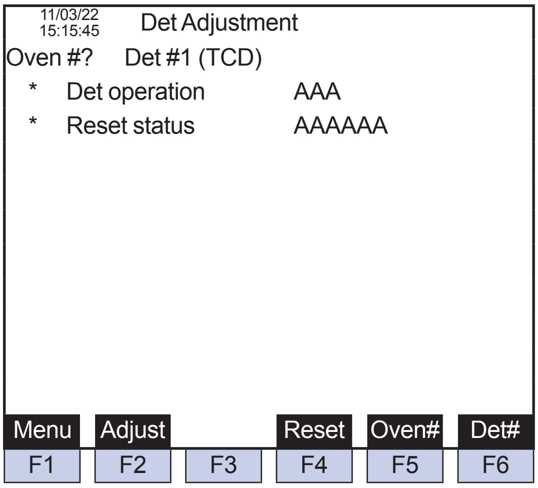


Figure 5.53 Example of the detector type: TCD - reset screen

F1 (Menu): Displays the Table Menu screen.

F2 (Adjust): Displays the Det Adjustment (Execution) screen.

F4 (Reset): Initializes voltage values.

Pressing F4 displays the options Abort and Initialize. If the Set/Ent key is pressed after the selection of Initialize, the TCD voltage value is set to its minimum value 5.0 V.

F5 (Oven #): Sets an oven number.

F6 (Det #): Sets a detector number.

- The TCD voltage value is read at a one-second interval, when, if the value is 0.0 V, the status is refreshed with Initialized; otherwise Setting done.
- The Det operation is refreshed at a one-second interval.
- The numbers of ovens to which no detectors are installed cannot be set via F5.

Table 5.30 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Det #	Detector number	○	1	2		
	Detector type					TCD
Det operation		○				0: Off 1: On * For this operation, the user level C or higher is required and the operation mode must be Stop in Manual status.
Reset status		○				0: Initialized 1: Setting done * If the voltage value is zero, Initialized is displayed; otherwise Setting done.

■ Detector type: TCD - Execution screen

Press F2 (Adjust).

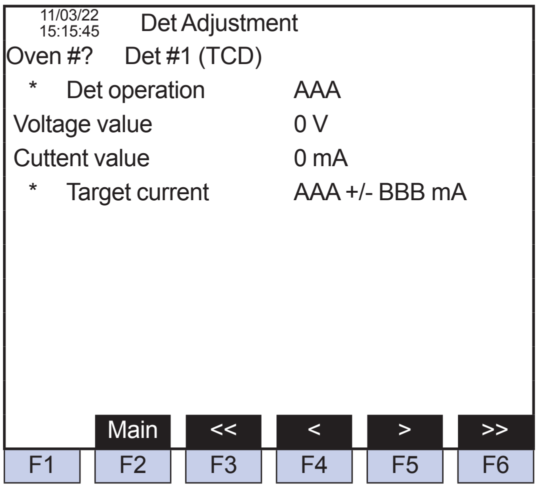


Figure 5.54 Example of the detector type: TCD - execution screen

F2 (Main):	Displays the Det Adjustment (Reset) screen.
F3 (<<):	Decreases the value by 16 steps within the range of 0 to 255 (for the TCD, by approximately 0.94 V within the range of 5.0 V to 20.0 V).
F4 (<):	Decreases the value by 1 step within the range of 0 to 255 (for the TCD, by approximately 0.06 V within the range of 5.0 V to 20.0 V).
F5 (>):	Increases the value by 1 step within the range of 0 to 255 (for the TCD, by approximately 0.06 V within the range of 5.0 V to 20.0 V).
F6 (>>):	Increases the value by 16 steps within the range of 0 to 255 (for the TCD, by approximately 0.94 V within the range of 5.0 V to 20.0 V).

- To toggle the Det On/Off status, set the cursor on the Det operation and press the Set/Ent key. The screen displays “Setting succeeded” or “Setting failed” in the second line on the bottom.
- If the Up/Down command keys are pressed to adjust the value within the range of 0 to 255 and the command is successfully sent internally, “Setting succeeded” is displayed. Users can confirm the results with the voltage value and current value refreshed every second.
- Selecting the Target current displays Target current (AAA/BB):. If the value 250/10 is entered, it will be shown as 250+/–10 mA, 250 as 250+/– mA and 50/5 as +/–5 mA.
- The numbers of ovens to which no detectors are installed cannot be set via F5.

TIP

The Det operation, Voltage value and Current value are refreshed at a one-second interval.

Table 5.31 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Det #	Detector number	○	1	2		
	Detector type					TCD
Det operation		○				0: Off 1: On * For this operation, the user level C or higher is required and the operation mode must be Stop in Manual status.
Voltage value		○	0.0	20.0	V	
Current value			0.0	500.0	mA	
Target current		○				Numeric, period "." and slash "/" are enabled: 16 characters Input format: AA.A/B.B Output format: AA.A+/–B.B mA

5

■ Detector type: FID-MC - Reset screen

Press F2 (Adjust).

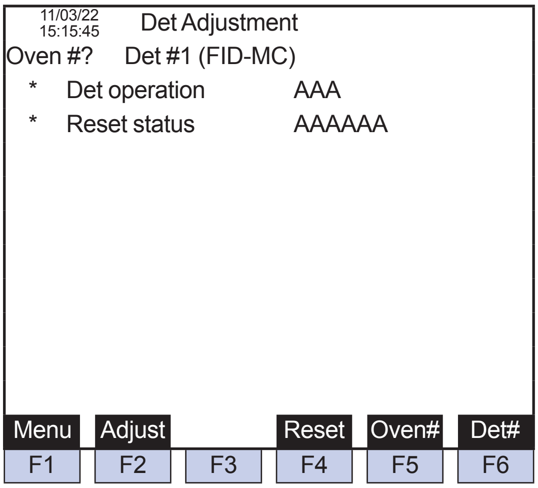


Figure 5.55 Example of the detector type: FID-MC - reset screen

F1 (Menu): Displays the Table Menu screen.
F2 (Adjust): Displays the Det Adjustment (Execution) screen.
F4 (Reset): Initializes a voltage value.
Pressing F4 displays the options "Abort" and "Initialize." If the Set/Ent key is pressed after the selection of "Initialize," the MC voltage value is set to its minimum value 10.0 V.
F5 (Oven #): Sets an oven number.
F6 (Det #): Sets a detector number.

- Pressing F4 displays the options "Abort" and "Initialize" in the second line on the bottom. If the Set/Ent key is pressed after the selection of "Initialize," the MC voltage value is set to its minimum value 10.0 V.
- The MC voltage value is read at a one-second interval, when, if the value is 0x0, the status is refreshed with "Initialized"; otherwise Setting done.
- The Det operation is refreshed at a one-second interval.
- The numbers of ovens to which no detectors are installed cannot be set via F5.

Table 5.32 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Det #	Detector number	○	1	2		
	Detector type					FID-MC
Det operation		○				0: Off 1: On * For this operation, the user level C or higher is required and the operation mode must be Stop in Manual status.
Reset status		○				0: Initialized 1: Setting done If the voltage value is zero, Initialized is displayed; otherwise Setting done.

■ Detector type: FID-MC – Execution screen

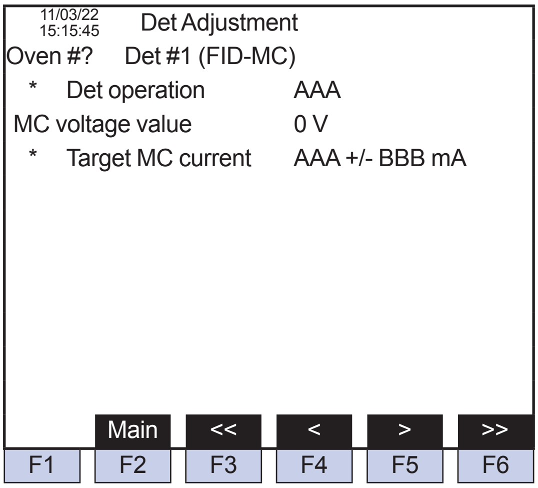


Figure 5.56 Example of the detector type: FID-MC – execution screen

F2 (Main): Displays the Det Adjustment (Reset) screen.

F3 (<<): Decreases the value by 16 steps within the range of 0 to 255 (for the MC, by approximately 0.75 V within the range of 10.0 V to 22.0 V).

F4 (<): Decreases the value by 1 step within the range of 0 to 255 (for the MC, by approximately 0.05 V within the range of 10.0 V to 22.0 V).

F5 (>): Increases the value by 1 step within the range of 0 to 255 (for the MC, by approximately 0.05 V within the range of 10.0 V to 22.0 V).

F6 (>>): Increases the value by 16 steps within the range of 0 to 255 (for the MC, by approximately 0.75 V within the range of 10.0 V to 22.0 V).

- To toggle the Det On/Off status, set the cursor on the Det operation and press the Set/Ent key. The screen displays “Setting succeeded” or “Setting failed” in the second line on the bottom.
- If the Up/Down command keys are pressed to adjust the value within the range of 0 to 255 and the command is successfully sent internally, “Setting succeeded” is displayed. Users can confirm the results with the voltage value and current value refreshed every second.
- Selecting the Target MC voltage displays Target MC voltage (AA.A/B.B):. If the value 17.5/0.5 is entered, it will be shown as 17.5+/–0.5 V, 5.0 as 5.0+/– V and 2/1 as 2.0+/– 1.0 V.
- The numbers of ovens to which no detectors are installed cannot be set via F5.

TIP

The Det operation, MC voltage value are refreshed at a one-second interval.

Table 5.33 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Det #	Detector number	○	1	2		
	Detector type					FID-MC
Det operation		○				0: Off 1: On * For this operation, the user level C or higher is required and the operation mode must be Stop in Manual status.
MC voltage value			0.0	20.0	V	
Target MC voltage		○				Numeric, period "." and slash "/" are enabled: 16 characters Input format: AA.A/B.B Output format: AA.A+/–B.B mA

■ Detector type: FID or FPD

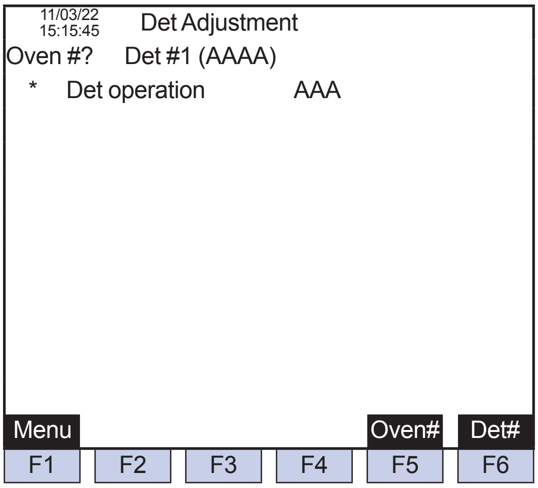


Figure 5.57 Example of the detector adjustment screen (FID or FPD)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Sets an oven number.
F6 (Det #): Sets a detector number.

- The Det operation is refreshed at a one-second interval.
- The numbers of ovens to which no detectors are installed cannot be set via F5.

Table 5.34 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Det #	Detector number	○	1	2		
	Detector type					FID FPD
Det operation		○				0: Off 1: On * For this operation, the user level C or higher is required and the operation mode must be Stop in Manual status.

5.3.10 Operating Status Change

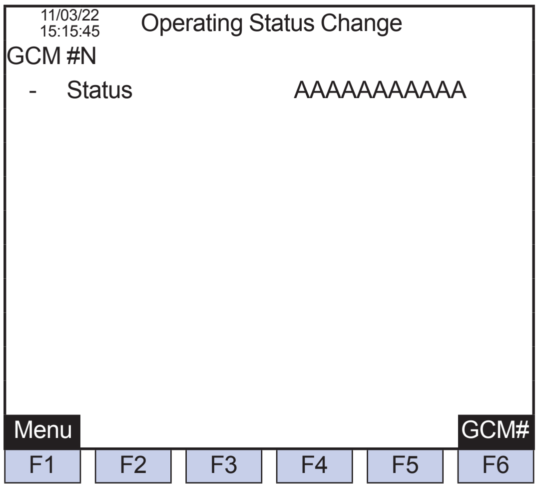


Figure 5.58 Example of the operation status change screen

F1 (Menu): Displays the Operation Menu screen.
F6 (GCM #): Sets a GCM number.

- The status is refreshed every one second.

Table 5.35 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number	○	1	6		
Status		○				Process, Manual

5.3.11 Password Setting

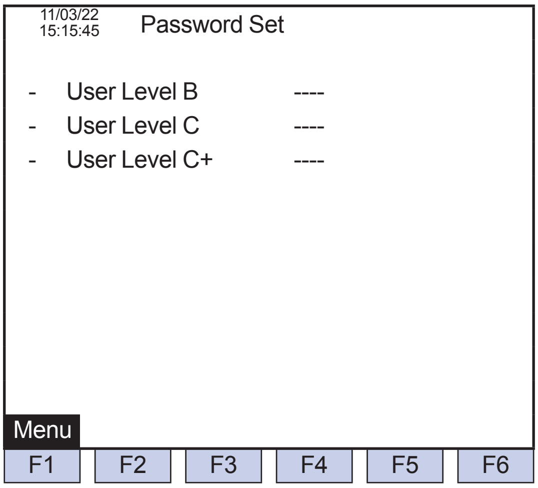


Figure 5.59 Example of the password setting screen

F1 (Menu): Displays the Operation Menu screen.

TIP

- For this operation, the user level C+ is required.
- All zeros and passwords used for other user levels cannot be accepted.
- The password length is fixed at four digits.

- The password will not be displayed on the screen.
- The entered value is shown. (Numeric only)

Table 5.36 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
User level B		○				Numeric: 4 characters
User level C		○				Numeric: 4 characters
User level C+		○				Numeric: 4 characters

5.4 Table screen

To navigate to the Table Menu screen, press the menu key 

.

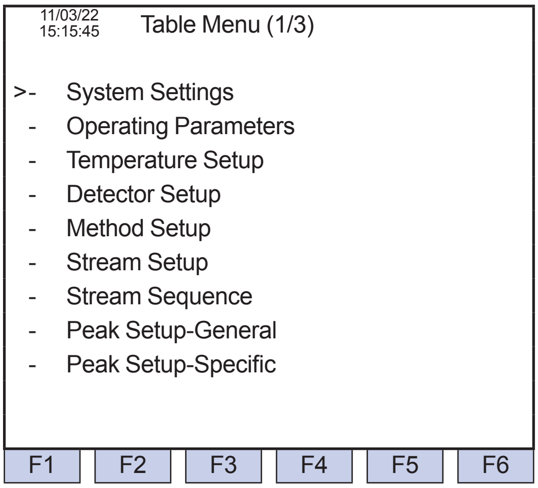


Figure 5.60 Table menu screen (1/3)

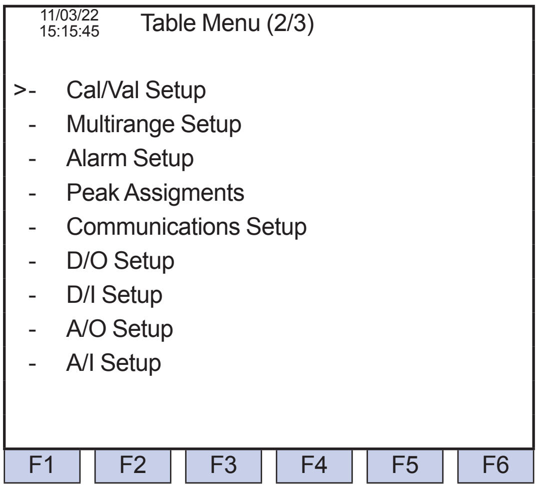


Figure 5.61 Table menu screen (2/3)

- The menu items DO Setup, DI Setup, AO Setup and AI Setup are display-only when the associated cards are not installed. Selecting any of them displays the error message.

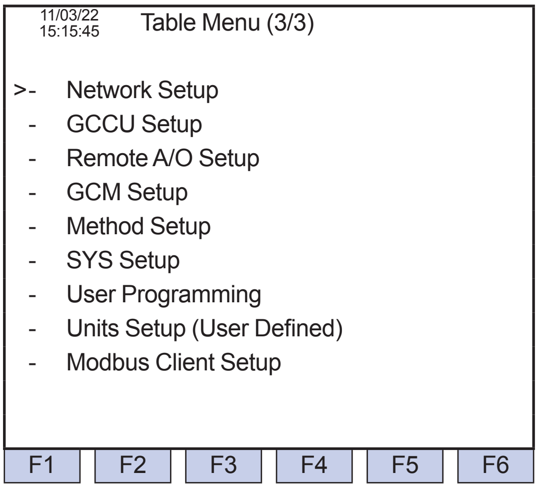


Figure 5.62 Table menu screen (3/3)

- The menu item User Programming is display-only when it is not installed. Selecting it displays the error message.
- The menu item SimDis Setup is visible when the Distillation is set on for at least one GCM on the GCM Setup (2/2) screen.
- If the Analog output num is 0 on the GCCU Setup screen, the Remote AO Setup cannot be selected.

5.4.1 System Settings

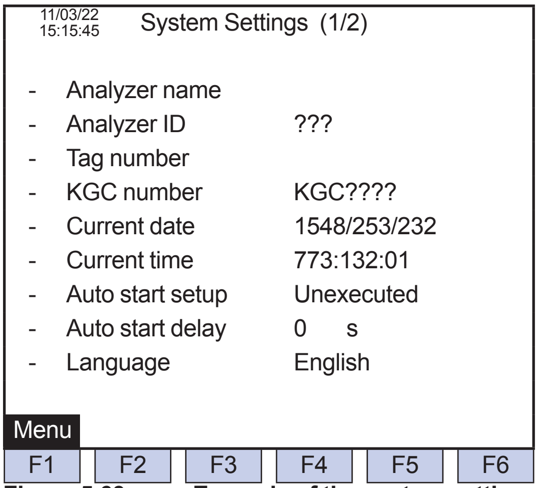


Figure 5.63 Example of the system settings screen (1/2)

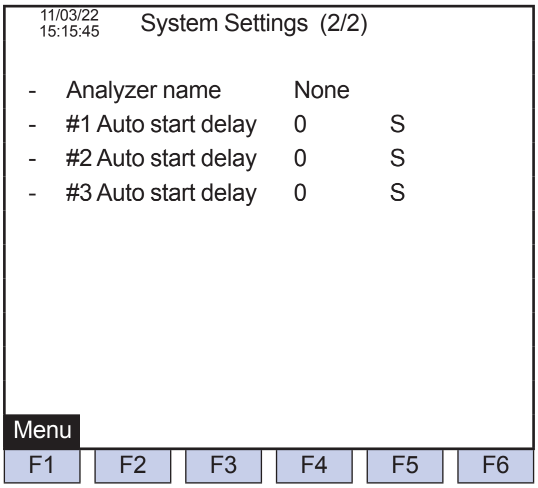


Figure 5.64 Example of the system settings screen (2/2)

F1 (Menu): Displays the Table Menu screen.

TIP

- The date and time displayed at the top left of the screen are updated when the Current date and Current time are set.
- The KGC number is shown as a five-digit number with zero padding. For example, if the value is 8924, the KGC number is displayed as KGC08924.

Table 5.37 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Analyzer name		○				Alphanumeric: 8 characters
Analyzer ID		○	1	240		
Tag number	Tag number	○				Alphanumeric: 16 characters
KGC Number		○	1	99999		The fixed string KGC is attached as a prefix.
Current date	Analysis start year Analysis start month Analysis start day	○	2000 1 1	2099 12 31*	Year Month Day	In four digits * Subject to change depending on the month.
Current time	Analysis start hour Analysis start minute	○	0 0	23 59	Hour Minute	
Language		○				Japanese English
Auto start setup		○				Off On
Auto start time	1st auto-start time 2nd auto-start time 3rd auto-start time	○	0	10000	Seconds	

5.4.2 Operating Parameters

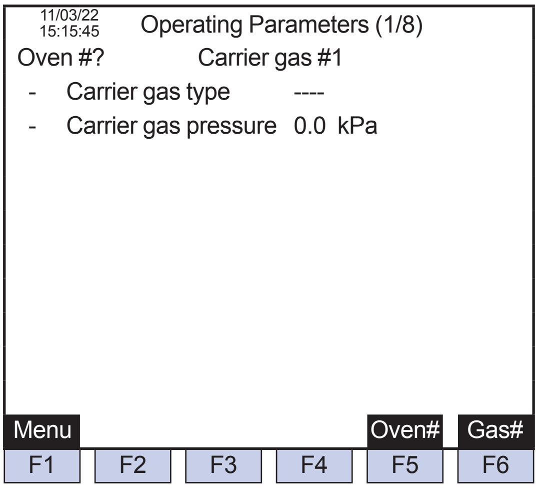


Figure 5.65 Example of the operating parameters screen (1/8)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Specifies an oven number.
F6 (Gas #): Specifies a carrier gas number.

TIP

The oven numbers that are set to Not provided or that are assigned to programmed temperature ovens on the Temperature Control Set cannot be selected.

- The initial screen displays the smallest oven number among those assigned to isothermal ovens on the Temperature Control Set.

Table 5.38 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Carrier gas #	Carrier gas number	○	1	2		
Carrier gas types	Carrier gas type	○				--- H_2 He Ar N_2 * --- indicates not used.
Carrier gas pressure	Carrier gas pressure	○	0 0.0	490 72.5	kPa psi	Numeric entry psi (see the definition of SI units) 500 kPa = 72.5 psi

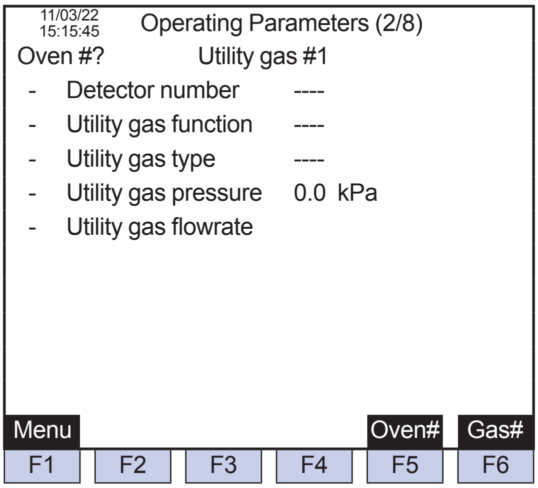


Figure 5.66 Example of the operating parameters screen (2/8)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Selects an oven number.
F6 (Gas #): Selects a utility gas number.

TIP

- If the detector number is set to --- (not used), the Utility gas function and the Utility gas type are shown as ---.
- The oven numbers set to Not provided or assigned to programmed temperature ovens on the Temperature Control Set cannot be selected.
- The detector numbers set to Not provided on the Detector Set screen cannot be selected.

- The initial screen displays the smallest oven number among those assigned to isothermal ovens on the Temperature Control Set.

Table 5.39 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Utility gas #	Utility gas number	○	1	4		
Detector number		○				--- 1-1 1-2 2-1 2-2 3-1 3-2 * --- indicates not used.
Utility gas function	Utility gas function	○				--- Burner fuel Burner air Make up * The initial value is ---.
Utility gas type	Utility gas type	○				--- (not used) H_2 He Ar N_2 Air * The initial value is ---. * The value becomes effective by turning power Off and then On.
Utility gas pressure	Utility gas pressure	○	0 0.0	490 71.0	kPa psi	Numeric entry Limits vary depending on the unit (see left). psi (see the definition of SI units.)
Utility gas flow rate	Utility gas flow rate	○				Alphanumeric: 10 characters e.g., 100 ml/s, 0.5 ul/s, etc.

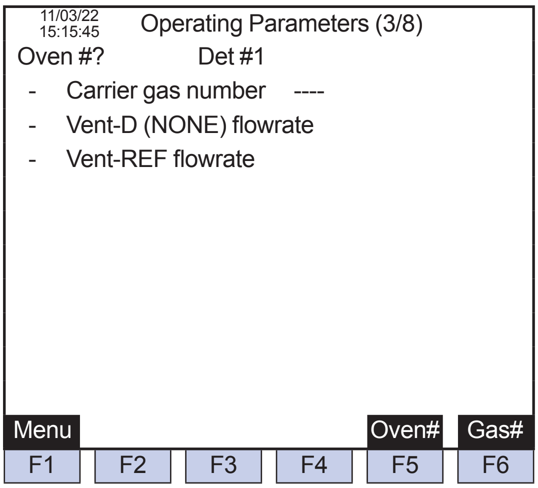


Figure 5.67 Example of the operating parameters screen (3/8)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Specifies an oven number.
F6 (Det #): Specifies a detector number.

TIP

- The oven numbers set to Not provided or assigned to programmed temperature ovens on the Temperature Control Set cannot be selected.
- The detector numbers set to Not provided on the Detector Set screen cannot be selected.

- The initial screen displays the smallest oven number among those assigned to isothermal ovens on the Temperature Control Set.

Table 5.40 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Det #	Detector number	○	1	2		
Carrier gas number	Carrier gas number					--- 1-1 1-2 2-1 2-2 3-1 3-2 * --- indicates not used.
Vent-D flow rate		○				Alpanumeric: 10 characters * The detector type is displayed. TCD/FID/FID-MC/FPD
	Detector type					None TCD FID FID-MC FPD
Vent-REF		○				Alpanumeric: 10 characters

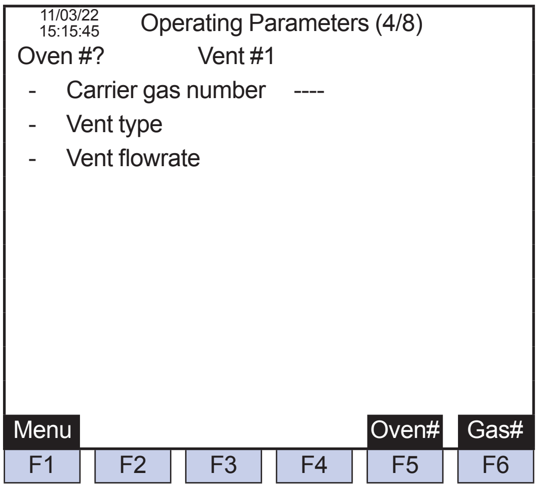


Figure 5.68 Example of the operating parameters screen (4/8)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Specifies an oven number.
F6 (Vent #): Specifies a vent number.

TIP

- Oven numbers set to Not provided or assigned to programmed temperature ovens on the Temperature Control Set cannot be selected.
- Only carrier gas numbers for which a gas type is set on the Operation Parameters screen (1/8) can be selected.

- The initial screen displays the smallest oven number among those assigned to isothermal ovens on the Temperature Control Set.

Table 5.41 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Vent #	Vent number	○	1	6		
Carrier gas number	Carrier gas number					--- 1-1 1-2 2-1 2-2 3-1 3-2 * --- indicates not used. The value is set on the Detector Set screen.
Vent type	Vent type	○				--- BF FF Split * --- indicates not used.
Vent flow rate	Vent flow rate	○				Alpanumeric: 10 characters

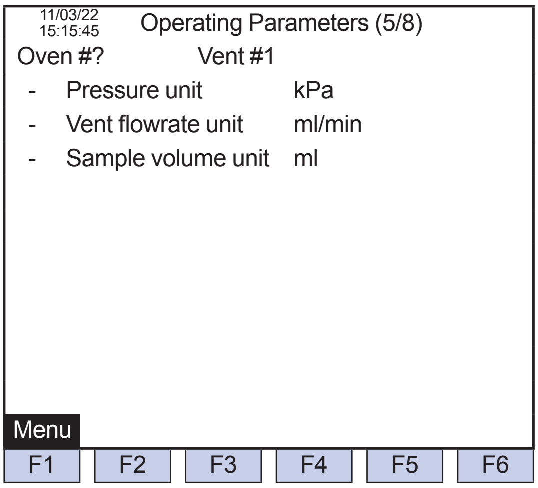


Figure 5.69 Example of the operating parameters screen (5/8)

F1 (Menu): Displays the Table Menu screen.

TIP

If the pressure unit is changed, the gas pressure value including the one set to EPC controlled will be converted according to the new unit. For example, if the unit is changed from kPa (the value range is set to 0 to 500 kPa) to psi (the value range 0 to 72.5 psi), 250 kPa is converted to and displayed as 36.25 psi.

Table 5.42 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Pressure unit		○				kPa psi (see the definition of SI units.)
Vent flow rate unit		○				ml/min
Sample volume unit		○				ml µl

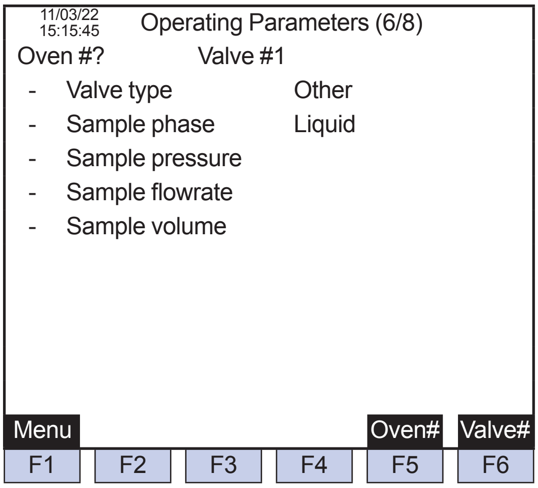


Figure 5.70 Example of the operating parameters screen (6/8)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Specifies an oven number.
F6 (Valve #): Specifies a valve number.

TIP

- Oven numbers set to Not provided on the Temperature Control Set cannot be selected.
- Valve numbers set to Not provided on the Valve Set screen cannot be selected.

- The initial screen displays the smallest oven number among those assigned to isothermal ovens on the Temperature Control Set.

Table 5.43 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Valve #	Valve number	○	1	7		
Valve type	Valve type	○				Other Sample * The valve type for Valve #7 is fixed to 0 (Other).
Sample phase	Sample phase	○				Liquid Gas
Sample pressure	Sample pressure	○				Alpanumeric: 10 characters
Sample flow rate	Sample flow rate	○				Alpanumeric: 10 characters
Sample volume	Sample volume	○				Alpanumeric: 10 characters

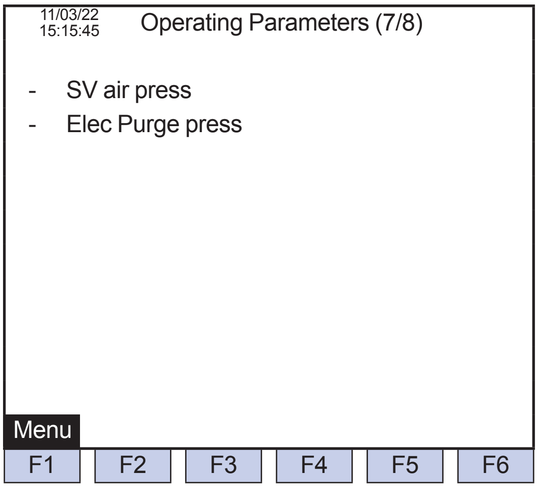


Figure 5.71 Example of the operating parameters screen (7/8)

F1 (Menu): Displays the Table Menu screen.

Table 5.44 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
SV air press		○				Alpanumeric: 18 characters
Elec purge press		○				Alpanumeric: 18 characters

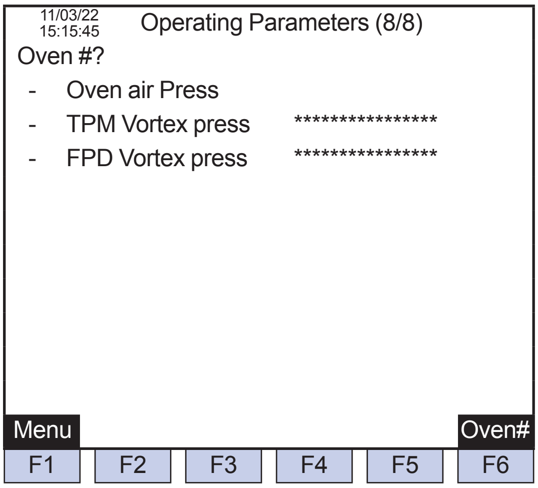


Figure 5.72 Example of the operating parameters screen (8/8)

F1 (Menu): Displays the Table Menu screen.
F6 (Oven #): Selects an oven number.

TIP

- Oven numbers set to Not provided on the Temperature Control Set cannot be selected.

- The initial screen displays the smallest oven number among those assigned to isothermal ovens on the Temperature Control Set.

Table 5.45 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number	○	1	3		
Oven air press		○				Alpanumeric: 18 characters
TPM vortex press		○				Alpanumeric: 18 characters
FPD vortex press		○				Alpanumeric: 18 characters

5.4.3 Temperature Setup

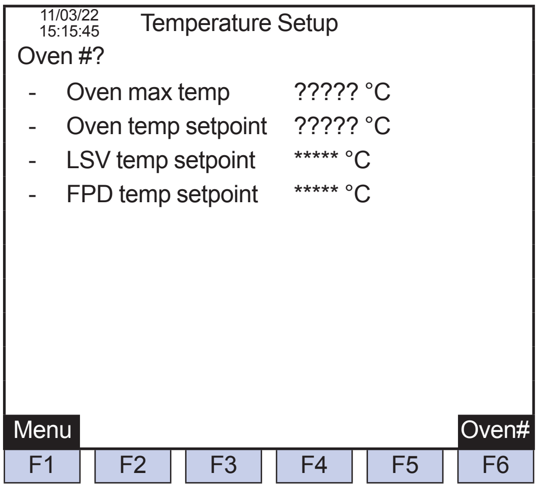


Figure 5.73 Example of the temperature setup screen

F1 (Menu): Displays the Table Menu screen.

F6 (Oven #): Specifies an oven number.

- If the LSV and FPD are not installed, the pertinent values are shown as * (asterisk).
- If the Temp type is set to Not provided on the Temperature Control Set, the temperature setup is not available.

Table 5.46 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
Oven max temp			5	See Remarks.	°C	No explosion: 320°C T1: 320°C T2: 225°C T3: 145°C T4: 95°C * The value varies depending on the explosionproof specification.
Oven temp setpoint			5	Oven max temp	°C	
LSV temp setpoint			60	See Remarks.	°C	No explosion: 250°C T1: 250°C T2: 225°C T3: 145°C T4: 95°C
FPD temp setpoint		○	0	60	°C	

5.4.4 Detector Setup

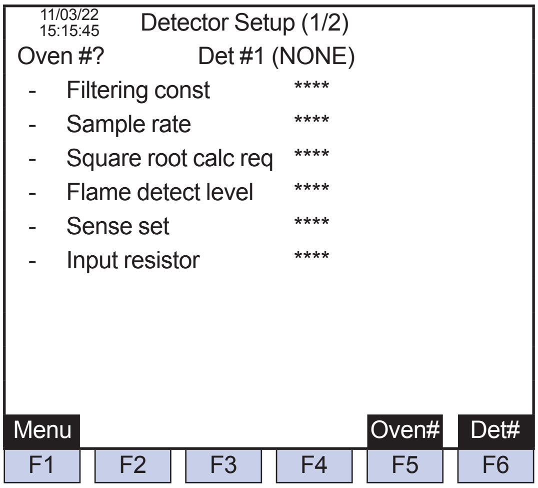


Figure 5.74 Example of the detector setup screen (1/2)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Sets an oven number.
F6 (Det #): Sets a detector number.

TIP

- Oven numbers set to Not provided on the Temperature Control Set cannot be selected.
- If the Detector type has been set to None on the Detector Set screen, all the options are shown as * (asterisk).

Table 5.47 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
Det #	Detector number		1	2		
	Detector type					None TCD FID FID-MC FPD
Filtering const		○	0.001	1.000		
Sample rate		○				20 ms 40 ms 80 ms 160 ms
Square root calc req		○				The value is shown except when the FPD is installed. No Yes * The square root of the area value
Flame detect level		○	–20	20	mV	The item is displayed only when the FID, FPD or FID-MC is installed.
Sense set						No amplification Tenfold
Input resistor		○				1 Mohm 6 Mohm 20 Mohm 60 Mohm 200 Mohm 600 Mohm 1 Gohm 2 Gohm

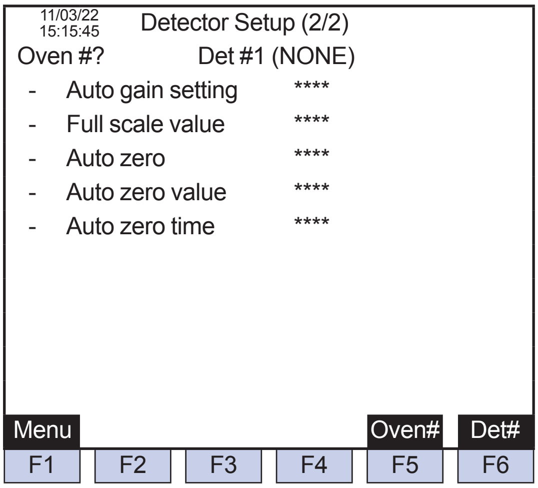


Figure 5.75 Example of the detector setup screen (2s/2)

F1 (Menu): Displays the Table Menu screen.
F5 (Oven #): Sets an oven number.
F6 (Det #): Sets a detector number.

TIP

- Oven numbers set to Not provided on the Temperature Control Set cannot be selected.
- If the Detector type has been set to None on the Detector Set screen, all the options are shown as * (asterisk).

- The initial screen displays Oven number 1 and Det number 1.
- When AO chromatogram is set to None, items for Auto gain and Whole gain value are displayed but an asterisk is given for set value.
- The initial screen displays the smallest oven number among those set in the isothermal ovens on the Temperature Control Set.
- The initial screen displays Oven number 1 and Det number 1.

Table 5.48 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Oven #	Oven number		1	3		
Det #	Detector number		1	2		
Detector type						0) None 1) TCD 2) FID 3) FID-MC 4) FPD
Auto gain		○				0) None (default) 1) Individual gain 2) Whole gain *1 *1 Only for the AO chromatogram
Whole gain value		○	0	15		0(default) *1 Only for the AO chromatogram
Auto zero		○				0)Automatic feed (default) 1)Auto zero value 2)Disabled * If the value is Automatic feed, the value is set to the zero value automatically obtained at the auto zero time. * If the value is Auto zero value, the value is set to the auto zero value at the start of the analysis.
Auto zero value		○	−1000.0000	1000.0000		Former chromatogram standard value
Auto zero time		○	0	21600		If the value is 0.0 seconds, the value is set to the zero value automatically obtained at the start of the analysis cycle. * Upper Limit will use the shortest analysis cycle for the SYS analysis cycle that the detector belongs to.

5.4.5 Method Setup

■ GCM method setup screen (Main)

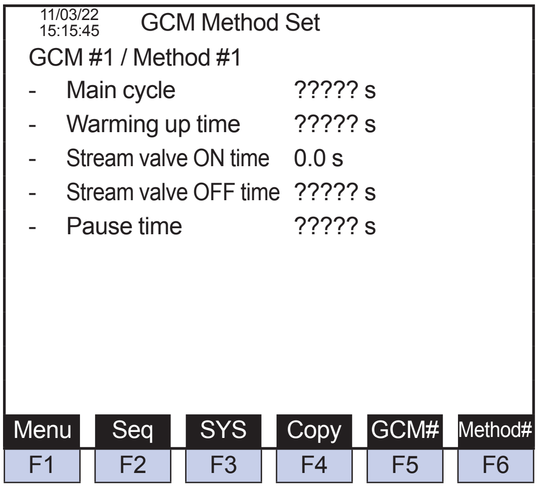


Figure 5.76 Example of the GCM method setup screen

F1(Menu): Displays the Table Menu screen.
F2(Seq): Displays the GCM Sequential screen.
F3(SYS): Displays the SYS Method screen.
F4(Copy): Displays the GCM Method Copy screen.
F5(GCM #): Specifies the GCM number.
F6(Method #): Specifies the Method number.

- Pressing F3 (SYS) displays the SYS Method Setup screen with the smallest number among the SYS numbers set to GCM.
- Pressing F5 (GCM #) displays GCM number: in the second line on the bottom. Entering the method number reflects the GCM number in the second line on the top and displays the GCM method setup assigned to that number.
- Pressing F6 (Method #) displays Method number: in the second line on the bottom. Entering the method number reflects the method number in the second line on the top and displays the GCM method setup assigned to that number.

Table 5.49 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number	○	1	6		
Method #	Method number	○	1	6		
Main cycle		○	10	See right	seconds	Upper Limit will depend on sample rate When 20 ms: 2700 seconds When 40 ms: 5400 seconds When 80 ms: 10800 seconds When 160 ms: 21600 seconds * The smallest sample rate set for the detector used by the SYS belonging to the relevant GCM.
Warming up time		○	5.0	9999.9	seconds	
Stream valve ON time		○	−Warming up time	0.0	seconds	
Stream valve OFF time		○	0.0	Main cycle − 2	seconds	
Pause time		○	5	Main cycle − 2	seconds	

■ GCM Method Copy Screen

Press F4 (Copy).

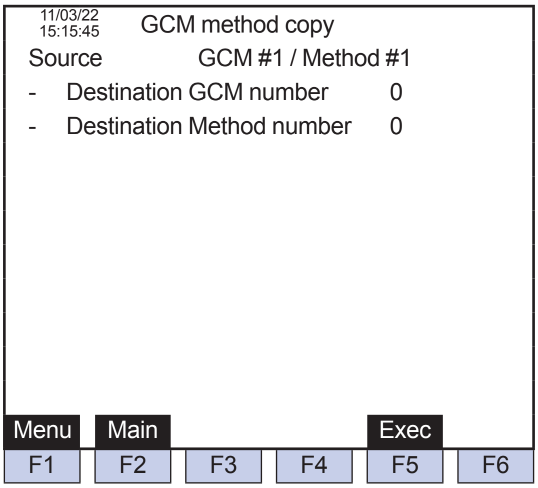


Figure 5.77 Example of the GCM method copy screen

F1(Menu): Displays Table Menu screen.
F2(Main): Displays GCM Method Setup screen.
F5(Exec): Executes the GCM method copy.

Table 5.50 Display data list

Table	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	Copy source GCM number		1	6		
Method #	Copy source method number		1	6		
Copy Target GCM Number		○	1	6		
Copy Target Method Number		○	1	6		

(1) Just prior to navigating to this screen, the number on the GCM Method screen when F4 (Copy) was pressed is displayed as the copy source for GCM number and method number.

(2) Navigating to this screen displays the initial number for the copy target GCM number and method number are 0.

(3) Selecting the copy target GCM number displays Copy target GCM number: in the second line on the bottom. The copy target GCM number must be entered here.

(4) Selecting the copy target method number displays Copy target method number: in the second line on the bottom. The copy target method number must be entered here.

(5) Pressing F5 (Exec) executes the method copy. The GCM number and method number of the copy target are then displayed again as 0.

TIP

If the SYS numbers of the copy source and the copy target are different, copy cannot be executed.

(6) If the copy fails (If the SYS numbers of the copy source and the copy target are different), “Copy not executed” is displayed in the second line on the bottom. The GCM method copy executes both the GCM method and SYS method. For that reason, the copy can be executed only when the numbers of SYS are equal.

■ GCM Sequential Display Screen

Press F2(Seq).

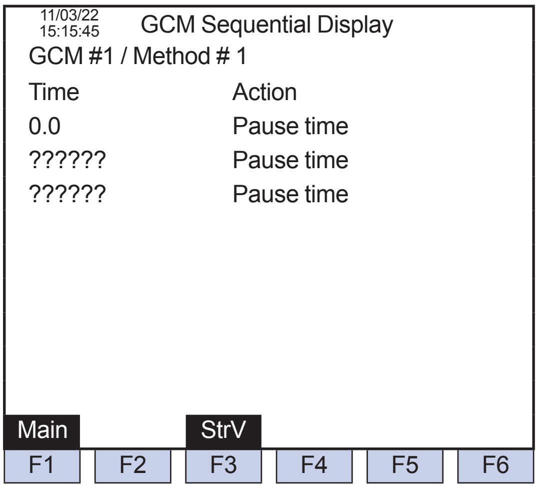


Figure 5.78 Example of the GCM sequential display screen

F1(Main): Displays GCM Method (Main) screen.
F3(StrV): Displays Stream Valve Set screen.

Displays the sequence of the GCM method and the SYS method set in the GCM.

When newly displayed, the sequential display from the first sequence is displayed.
However, SYS sequence set to No for the SYS usage set is not displayed.

Table 5.51 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number	○	1	6		
Method #	Method number	○	1	6		
Time						
Action Time						Pause time S1 to S6 Peak detect end StrV on time, StrV off time

● Stream Valve Set Screen

Press F3 (StrV).

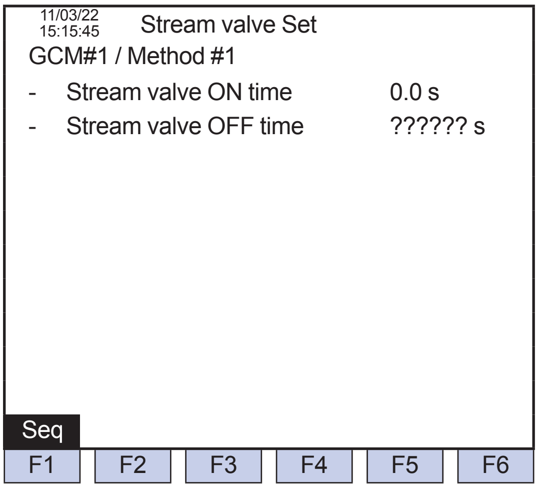


Figure 5.79 Example of the stream valve set screen

F1(Seq): Displays Sequential Display screen.

Table 5.52 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM Number	○	1	6		
Method #	Method number	○	1	6		
Stream valve ON time		○	−Warming up time	0.0	seconds	
Stream valve OFF time		○	0.0	Main cycle − 2	seconds	

■ SYS Method Setup Screen (Main)

Press F3 (SYS).

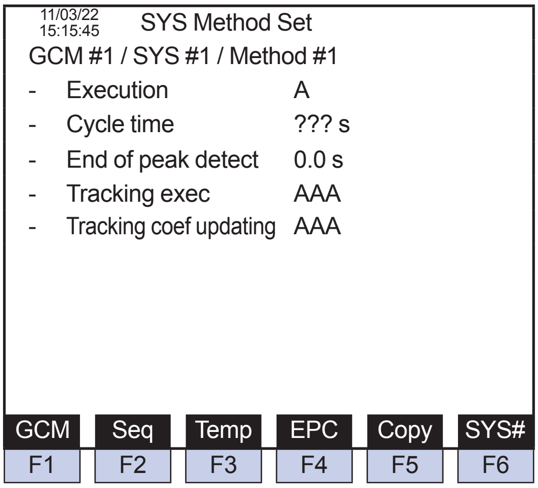


Figure 5.80 Example of the SYS method setup screen

F1(GCM): Returns to GCM Method Setup screen.
F2(Seq): Displays SYS Sequential Display screen.
F3(Temp): Displays Oven Program Set screen.
F4(EPC): Displays Pressure Program Set screen.
F5(Copy): Displays Copy screen of the SYS method.

F6(Sys#): Specifies the SYS number.

The GCM number and the method number displayed in the second line on the top will succeeds the setup of the GCM method screen.

Pointing the cursor to each setup and pressing ENT display each name in the second line on the bottom.

Enters the time using the tenkey.

Pressing F2(Seq) navigates to the SYS sequential screen display.

Pressing F5 (Copy) navigates to the copy screen display for the SYS method.

Pressing F6 (SYS #) displays SYS number: in the second line on the bottom.

Pressing SET/ENT on the tenkey navigates to that SYS number.

Only the SYS number set in the GCM can be selected, “Over upper/lower limit” is displayed in the second line on the bottom when anything else is entered.

Pressing F1 (GCM) navigates to the GCM method selection screen.

F3 (Temp) is available only when a programmed temperature oven has been set.

F4 (EPC) is available only when EPC has been set.

Usage set, tracking exec and tracking coef updating share one setup in the SYS. In other words, changing the method number after a set change is made by one SYS method displays the changed setup.

Table 5.53 Display data list

Table	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
Usage set		○				Not used Used When SYS is not used, stop status (no action) will occur during run.
Analysis cycle		○	10.0	Main cycle	seconds	Some data are invalid.
End of peak detect		○	5.0	Analysis cycle	seconds	Some data are invalid.
Tracking exec		○				Not executed/executed
Tracking coef updating		○				No updating/updating

■ SYS Method Copy Screen

Press F5 (Copy).

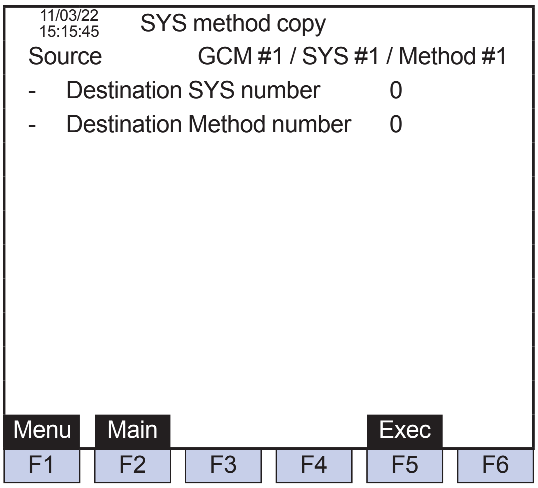


Figure 5.81 Example of the SYS method copy screen

F1(Menu): Displays Table Menu screen.
F2(Main): Displays SYS Method Setup screen (Main).
F5(Exec): Executes the method copy.

(4) Selecting the copy target method number displays Copy target method number: in the second line on the bottom. Then enters the copy target method number.

(5) Pressing F5 (Exec) executes the method copy under the normal operation and displays COPY END in the second line on the bottom. SYS number and method number of the copy target are displayed as 0.

- The set range for Copy target SYS number is the SYS number belonging to the assigned GCM.
- Usage set, tracking exec and tracking coef updating share one setup in the SYS. In other words, the SYS method copy is not applicable.
- Before copying the SYS method, confirm the analysis cycle and the main cycle.
  When the analysis cycle of copy source is greater than (>) the main cycle of copy target, a copy failed message is output.

Table 5.54 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Copy source GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number	○	1	6		
Copy target GCM number		○	1	6		
Copy target method number		○	1	6		

■ EPC Program Set Screen (Part 1)

Press F4 (EPC).

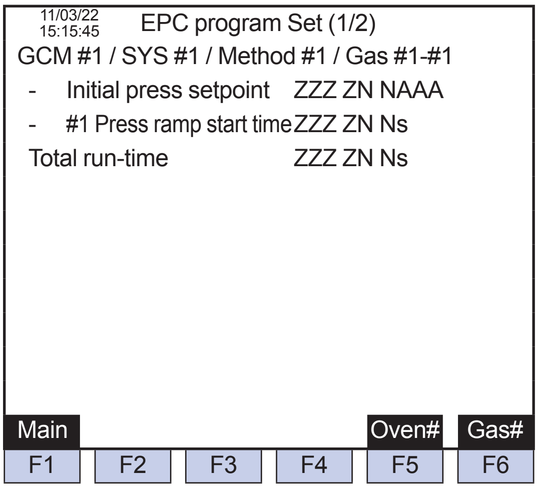


Figure 5.82 Example of the EPC program set (1/2) screen

F1(Main): Navigates to SYS Method Setup screen (Main).
F5(Oven #): Specifies an oven number.
F6(Gas #): Specifies a carrier gas number

- This screen is displayed when EPC has been set.
- Displays the total time for press program.
  Initial time setpoint + Σ_i (Press hold setpoint i − Press hold setpoint i − 1)/Press ramp rate + Temp hold time)
- Only the gas belonging to the relevant SYS can be set with F6 (Gas #).

Table 5.55 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
Gas # − #	Carrier gas number		1	2		Provides two each to Ovens 1, 2 & 3.
Initial press setpoint		○	0 0.0	490 71.0	kPa psi	Pressure unit is set in the operating parameters screen. (see SI unit limitation) Some data are invalid.
#1 Press ramp start time		○	0	Analysis cycle	s	Some data are invalid.
EPC program time			0	Analysis cycle		Displays total time of oven program. Initial time setpoint +Σ I (Temp hold setpoint i − Temp hold setpoint i − 1)/Temp ramp rate i + Temp hold time i) * When the temp ramp rate is zero, only temp hold time is added. * When data is all invalid, displays program time as 0s. * Same for the EPC program time

■ EPC Program Set Screen (Part 2)

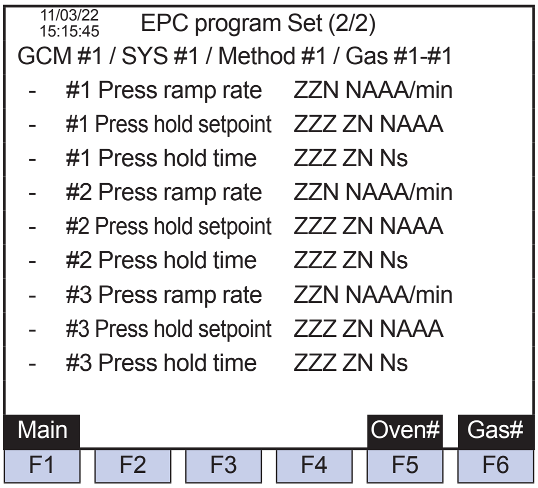


Figure 5.83 Example of the EPC program set (2/2) screen

F1(Main): Displays SYS Method Setup screen (Main)
F5(Oven #): Specifies an oven number.
F6(Gas #): Specifies a carrier gas number.

This screen is displayed when EPC has been set.

Table 5.56 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
Gas # − #	Carrier gas number		1	2		Provides two each to Ovens 1,2 & 3.
1st to 3rd press ramp rate		○	0.0	999.9	kPa/min psi/min	Pressure unit is set in the operating parameters screen. (see SI unit limitation) Some data are invalid.
1st to 3rd press hold setpoint		○	*1 0.0 *1 0.0	490 71.0	kPa psi	Pressure unit is set in the operating parameters screen. (see SI unit limitation) Some data are invalid. *1:The minimum set of the 1st press hold setpoint is set to the initial press setpoint, the minimum set of the 2nd press hold setpoint is set to the 1st press hold setpoint, the minimum set of the 3rd press hold setpoint is set to the 3rd press hold setpoint.
1st to 3rd press hold time		○	0	Analysis cycle	s	Some data are invalid.

■ SYS Sequential Display Screen

Press F2 (Seq).

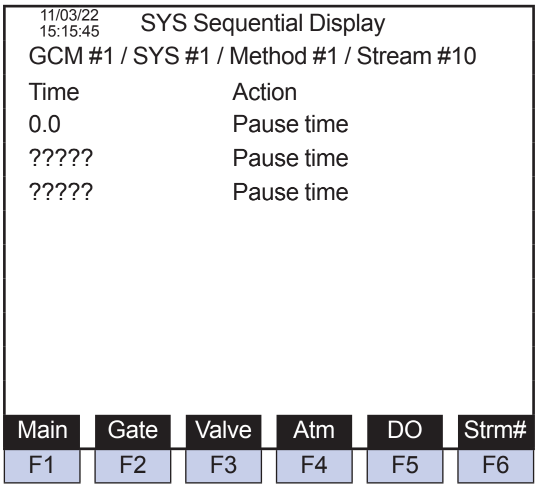


Figure 5.84 Example of the SYS sequential display screen

F1(Main):	Displays SYS Method Setup screen (Main).
F2(Gate):	Displays Action Set (gate) in the action set screen.
F3(Valve):	Displays ON/OFF time screen in a valve (1st, 2nd & 3rd of the maximum No. 1 to No. 18).
F4(Atm):	Displays ON/OFF time screen of ATM Valve (1st, 2nd & 3rd).
F5(DO):	Displays DO Setup screen in the action set screen.
F6(Strm#):	Specifies a stream number.

- Stream number is assigned with F6 (Stm #). Only the stream number being used by the relevant GCM number can be set. The smallest stream number is displayed in the initial display.
- Up to 512 sequences can be displayed.
- SYS sequence with SYS usage set as “Not executed” is also displayed.
- Gate ON/OFF time for the peak not executed is not displayed.
- Base/signal/noise level and AI signals 1 to 4 of the action time are displayed.
- When DO is not installed, F5 (DO) is not displayed.
- When any peak is not assigned, selecting F2 (gate) displays the message “No assignment peak of request tream.”

Table 5.57 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
Stream #	Stream number		1	31		
Time						
Action						

■ Action Set Screen (Gate)

Press F2 (Gate).

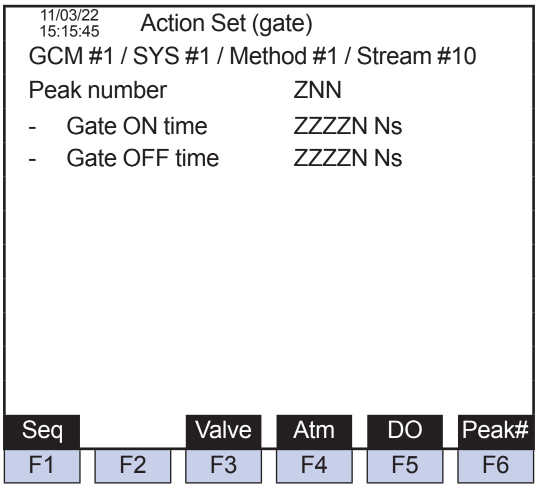


Figure 5.85 Example of the action set (gate) screen

F1(Seq): Displays SYS Sequential Display screen.
F3(Valve): Displays Valve screen of the action set screen.
F4(Atm): Displays ON/OFF time screen of ATM Valve (1st, 2nd & 3rd).
F5(DO): Displays DO Setup screen in the action set screen.
F6(Peak#): Specifies a peak number (relative peak number).

- Sets possible for User Level C and above.
- Only the peak belonging to the relevant SYS can be selected. Default displays the peak with the smallest number belonging to the SYS.

Table 5.58 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
Stream #	Stream number		1	31		
Peak number	Peak number		1	Assigned peak number		Default displays peak number 1. After that, the previous peak number is displayed.
Gate ON time	Gate ON time	○	0.0	*1 21600.0	seconds	Some data are invalid. *1: Upper limit varies depending on the sample rate of the detector number set for the relevant peak. Sample rate Max 20 ms 2700.0 s 40 ms 5400.0 s 80 ms 10800.0 s 160 ms 21600.0 s
Gate OFF time	Gate OFF time	○				

Valve Set Screen

Press F3 (Valve).

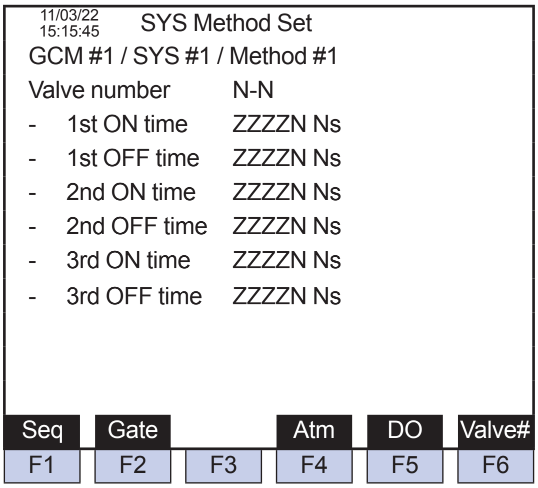


Figure 5.86 Example of the SYS method setup (valve) screen

F1(Seq): Displays SYS Sequential Display screen.
F2(Gate): Displays Gate screen of the action set screen
F4(Atm): Displays ON/OFF time screen of ATM Valve (1st, 2nd & 3rd).
F5(DO): Displays DO Setup screen in the action set screen.
F6(Valve#): Specifies a using valve number.

- Sets possible for User Level C and above.

Pressing F6 (Valve #) displays Oven number in the second line on the bottom.
After selecting an oven number, Valve number is displayed.
Selecting the valve number and pressing ENT sets the valve ON/OFF time of that number.

Executing ENT with a cursor pointing at each set displays the cursor in the second line on the bottom.
Enter a time with a tenkey.
Pressing F1 (Seq) navigates to the SYS sequential display screen.

Only valves belonging to the relevant SYS can be set by F6 (Valve #).

Table 5.59 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
Valve Number	Valve number	○	1 − 1	3 − 7		0: None 1 to 3 Oven 1 to 7 Valve
1st to 3rd ON Time		○	0	Analysis cycle − 2	seconds	Valve time set Some entry data are invalid.
1st to 3rd OFF Time		○	ON time	Cycle Time − 2	seconds	* When ON time is invalid, OFF time cannot be set.

■ ATM Valve Time Set Screen

Press F4 (AtmV).

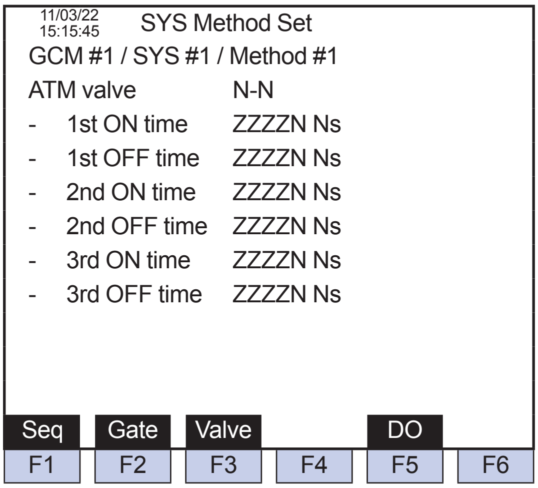


Figure 5.87 Example of the SYS method setup (ATM valve) screen

F1(Seq): Displays SYS sequential Display screen.
F2(Gate): Displays Gate of the action set screen.
F3(Valve): Displays ON/OFF time screen of a valve (1st, 2nd & 3rd of maximum No. 1 to 18).
F5(DO): Displays DO Setup screen in the action set screen

- ATM valve number set in GCM setup is displayed for ATM valve number (display only).

Functions of the function keys F2, F3 and F5 are the same as those in SYS method setup (Part 1; Main).

Table 5.60 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
ATM valve	ATM valve number		0	3 − 2		0: None 1 to 3 Oven 1 to 2 ATM valve
1st to 3rd ON time		○	−Warming up time	Analysis cycle − 2	seconds	ATM valve time setup Some entry data are invalid.
1st to 3rd OFF time		○			seconds	

DO Action Set Screen

Press F5 (DO).

11/03/22
15:15:45 Action Set (DO)
GCM #1 / SYS #1 / Method #1

- 1st ON time ZZZZN Ns
- 1st OFF time ZZZZN Ns
- 2nd ON time ZZZZN Ns
- 2nd OFF time ZZZZN Ns
- 3rd ON time ZZZZN Ns
- 3rd OFF time ZZZZN Ns

Seq Gate Valve Atm
F1 F2 F3 F4 F5 F6

Figure 5.88 Example of the DO action set screen

F1(Seq): Displays SYS Sequential Display screen.
F2(Gate): Displays Gate of the action set screen.
F3(Valve): Displays ON/OFF time screen of a valve (1st, 2nd & 3rd of the maximum No. 1 to No. 18).
F4(Atm): Displays ON/OFF time screen of ATM valve (1st, 2nd & 3rd).

Table 5.61 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM number		1	6		
SYS #	SYS number		1	6		
Method #	Method number		1	6		
1st to 3rd ON Time		○	0	Analysis cycle − 2	seconds	DO time setup Some entry data are invalid.
1st to 3rd OFF Time		○	ON time	Analysis cycle − 2	seconds	* When ON time is invalid, the minimum OFF time is 0.

5.4.6 Stream Setup

11/03/22
15:15:45 Stream Setup
Stream #1
- Name of stream
- Str valve number 0
- Type of stream Measurement
- Normalization Not excuted
- Total value ???? %
- Base line corr Not excuted
- GCM number ?
- Method number ?
- SIMDIS calib stream

Menu Strm#
F1 F2 F3 F4 F5 F6

Figure 5.89 Example of the stream setup screen

F1 (Menu): Displays Table Menu screen.
F6 (Strm #): Specifies a stream number (1 to 31).

- The SimDis calib stream item is displayed only when distillation is set to Yes in the GCM setup (2/2) screen for the GCM specified by the GCM number. Displays a stream type when it is a sample run.
- In the case of the area correction percentage for GCM, normalization for the stream belonging to that GCM is displayed by an asterisk.

Table 5.62 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Stream #	Stream number		1	31		
Stream name		○				Alphanumeric: 8 characters
Stream valve number		○	0	31*		0: No stream valve * Only stream valve number belonging to the GCM can be set (GCM setup screen).
Stream type		○				Measurement, Cal, Val, Calibration run (only when distilling), Sample run (only when distilling)
Normalization		○				Not executed, Executed * When the GCM of the relevant stream is configured with multiple SYS, Executed cannot be set.
Total value		○	0.1	100.0		
Base line corr		○				Not executed, Executed
GCM number		○	1	6		
Method number		○	1	6		
Distillation configuration stream		○	0	31		

5.4.7 Stream Sequence

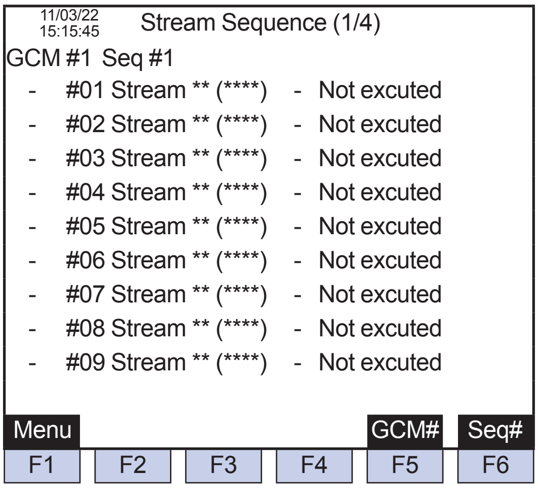


Figure 5.90 Example of the stream sequence set (1/4) screen

F1(Menu): Displays Table Menu screen.
F5(GCM#): Specifies GCM number.
F6(Seq#): Specifies a stream sequence number (1 to 8).

Same for pages 2, 3, and 4 (up to 31 streams can be set).

Streams other than that of the relevant GCM cannot be set.

Table 5.63 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
	Number of pages		1	4		Scheduling for up to 31 streams
GCM #			1	6		
Seq #	Stream sequence number		1	8		
nn (AAAA)	Stream number (Stream name)		1	31		When the interval is Not executed, an asterisk is displayed. * Only stream belonging to the GCM can be set. Stream name cannot be set. Displays in 8 alphanumeric characters.
	Interval	○				Not executed, Executed

5.4.8 Peak Setup-General

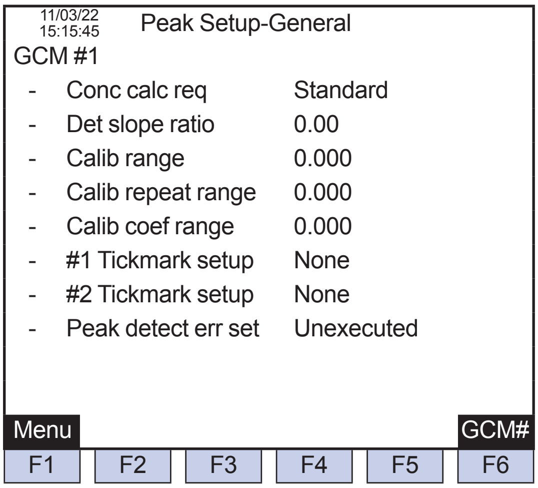


Figure 5.91 Example of the peak setup-general screen

F1(Menu): Displays Table Menu screen
F6(GCM#): Specifies GCM number.

Table 5.64 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #			1	6		0: Standard, 1: Correction area fraction
Conc cal req		○				
Det slope ratio		○	0.00	9.99		
Calib range		○	0.000	1.000		
Calib repeat range		○	0.000	2.000		
Calib coef range		○	0.000	4.000		
#1 Tickmark setup		○				None, Start, 10s, Start − 10s, 60s, Start − 60s, 10s to 60s, Start −10s to 60s
#2 Tickmark setup		○				None, Gate, Peak, Gate to Peak
Peak detect err set		○				Not executed, Executed

5.4.9 Peak Setup-Specific

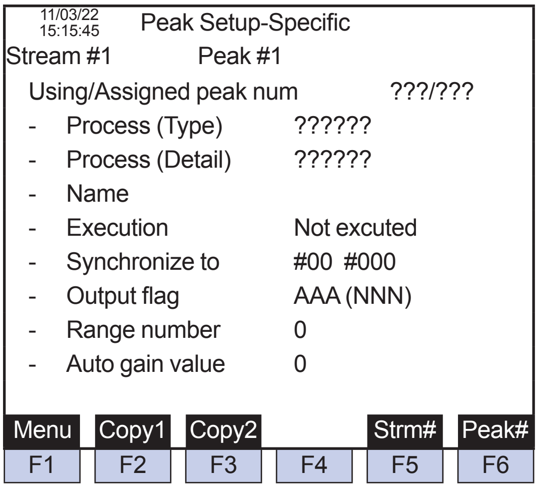


Figure 5.92 Example of peak setup-specific screen

F1 (Menu): Displays the Table Menu screen.
F2 (Copy1): Displays the Peak copy 1 screen.
F3 (Copy2): Displays the Peak copy 2 screen.
F5 (Strm#): Specifies the Stream number.
F6 (Peak#): Specifies the Peak number.

- When using F1 (Menu) to move to other screen and then return to the Peak Setup-Specific screen again, the screen for the previously displayed stream number and peak number appears. However, when peak assignment has been changed in the Peak Assigments screen, the screen for Stream 1/Peak 1 appears.

Table 5.65 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
	Display/ Setting stream number		1	31		
	Display/ Setting peak number		1	999		
Range			1	31		• When the type of stream is calibrating, the range number will be shown as * (asterisk).
Using peak number			0	999		
Assigned peak number			0	999		
	Process (Indication)					Indication only.
Process (Type)						Distillation, Peak, Calculation, Heating value, AI, Program output, No processing
Process (Detail)						Type: "Distillation" Std B.P proc, RVP proc, Distill % proc Type: "Peak" External 3rd, External linear, Indirect • When "Distillation" or "Corr area norm" is set, only "Indirect" is available. Type: "Calculation" Base level, Signal level, Noise level, Deviation calc, Linear 1, Linear 2, Linear 3, Linear 4, Linear 5, Ratio, Separation cape, Divisor Type: "Heating value" A1-Calorific val, A1-Spec gravity, A1-Compress fact, A1-Wobbe index, A2-Heating v/vol, A2-Heating v/mas, A2-Relative dens, A2-Density, A2-Compress fact, A2-Wobbe index, J-Calorific val, J-Spec gravity, J-Compress fact, J-Wobbe index, I-CalorificV/mol, I-CalorificV/mas, I-CalorificV/vol, I-Relative dens, I-Density, I-Compress fact, I-Wobbe index Type: "AI" AI signal 1, AI signal 2, AI signal 3, AI signal 4, AI signal 5, AI signal 6, AI signal 7, AI signal 8, AI signal 9, AI signal 10, AI signal 11, AI signal 12, AI signal 13, AI signal 14, AI signal 15, AI signal 16 Type: "Program output" Program output
Peak name		○				A(8)
Execution		○				Not executed, Executed
Synchronized stream number		○	1(0)	31		When "0" is entered to both stream number and peak number, synchronism is dissolved. [0xFFFF] is set to the data. It is not available to setting to own peak number.
Synchronized peak number		○	1(0)	999		

Output flag		○				None, Provided
Range number		○				• When the type of stream is calibrating, the range number will be shown as * (asterisk).
Auto gain value		○				2 to the n th power
	Modbus address					Indication only.
Tracking coef a		○				
Tracking coef b		○				
Peak name		○				A(8)
Detector number		○				---, 1-1, 1-2, 2-1, 2-2, 3-1, 3-2 • Only the detector that belong to the SYS that belong to the GCM is available.
Gate cut method		○				Time gate, Slope gate, Slope/Time, Time/Slope, Zone
Auto tracking req		○				No tracking, Tracking exec, Tracking std • Base level/Noise level: "No tracking and "Tracking exec" are available.
Peak polarity		○				Positive, Negative
Detected slope		○	0.0	999.9999	mV/sec	• When Detected slope is 0.000, the gate ON/OFF timing is same as the peak ON/OFF timing.
Peak std time		○	0.0	21600.0 *	second	* The upper limit value depends on the sampling rate of the detector. Sampling rate / Upper limit 20 ms / 2700.0 s 40 ms / 5400.0 s 80 ms / 10800.0 s 160 ms / 21600.0 s
Gate ON time		○	0.0	21600.0 *	second	
Gate OFF time		○	0.0	21600.0 *	second	
Integ method		○				Skimming, Vert method
A/H req		○				Area, Height
Factor K		○	-9999.999	9999.999		
Factor A			-9999.999	9999.999		
Factor B			-9999.999	9999.999		
Factor a			-9999.999	9999.999		
Factor b			-9999.999	9999.999		
Measuring unit		○	1	100		No unit, %, ppm, ppb, wt%, wtppm, wtppb, vol%, volppm, volppb, mol%, molppm, molppb, (space), (User definition)
Linear calc 1 factor		○	-9999.999	9999.999		
Linear calc 2 factor			-9999.999	9999.999		
Linear calc 3 factor			-9999.999	9999.999		
Linear calc 4 factor			-9999.999	9999.999		
Linear calc 5 factor			-9999.999	9999.999		
Auto gain value		○	0	15		2 to the n th power
Std conc		○	0.000	9999.999		
Measuring range		○	0.000	9999.999		
Normalization		○				Not executed, Executed
Total Std area		○	0.000	9999.999		
Response factor f		○	-9999.999	9999.999		
Min peak width		○	0.2	30.0		0.2, 1.0, 2.0, 5.0, 10.0, 30.0
Min peak height		○	0.008	128.0	mV	0.008, 0.016, 0.031, 0.063, 0.125, 0.250, 0.500, 1.000, 2.000, 4.000, 8.000, 16.00, 32.00, 64.00, 128.0
Min peak area		○			mVs	
Std peak: Stream number		○	1	31		
Std peak: Peak number			1	999		

Ref peak: Stream number			1	31		Available for “Calibration” or “Calibration run”.
Ref peak: Peak number			1	999		
Ref peak 1: Stream number			1	31		
Ref peak 1: Peak number			1	999		
Ref peak 2: Stream number			1	31		
Ref peak 2: Peak number			1	999		
Ref peak nume: Stream number		○	1	31		Ratio (numerator)
Ref peak nume: Peak number			1	999		
Ref peak deno: Stream number			1	31		Ratio (denominator)
Ref peak deno: Peak number			1	999		
Ref peak l: Stream number			1	31		Separation capacity (component l)
Ref peak l: Peak number			1	999		
Ref peak m: Stream number			1	31		Separation capacity (component m)
Ref peak m: Peak number			1	999		
Action time		○	0.0 or 5.0	21600.0 *	second	* The upper limit value depends on the sampling rate of the detector. **Sampling rate** / **Upper limit**: 20 ms / 2700.0 s; 40 ms / 5400.0 s; 80 ms / 10800.0 s; 160 ms / 21600.0 s • Minimum value is 5.0 seconds for noise level.
Std area		○	0.000	9999.999		
Calib factor		○	0.000	9999.999		
Area %		○	0.5	99.5		
RVP coef A		○	-9999.999	9999.999		
RVP coef B		○	-9999.999	9999.999		
Std B.P		○	-999.9	999.9		
Set up Conc.			0.00000	1.00000		
Section set stop		○	0.0			
0% value		○	-999.999	9999.999		AI signal 1 to 16
100% value		○	-999.999	9999.999		
H2 peak no		○				
Compress fact.(air)		○	-9.9999	9.9999		
Temp.(degC)		○	-9.9999	999.99		
	SYS number	○	1	6		• The SYS that belong to the GCM that belong to the stream is available.

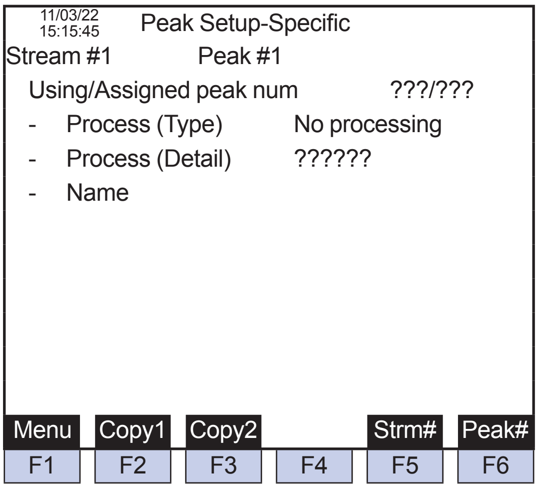


Figure 5.93 Example of peak setup-specific screen (when process assignment is not processed).

- When execution is set to Executed, process assignment cannot be changed to No processing.

<Synchronized Peak Rules>

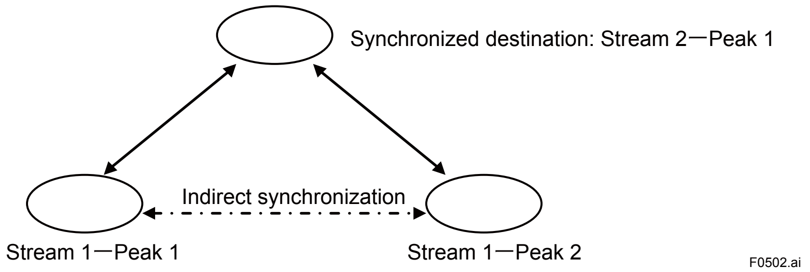
1. When 0 is entered for both stream and peak number, synchronization is released.
2. Individual peak number cannot be set.
3. Setting synchronized peak of parent peak is invalid.
4. Cannot set peak within the same stream to synchronized destination.
5. Cannot set peak within calibration stream to synchronized destination.
6. Calibration run stream cannot be set for synchronization.
7. Only sample run streams can be set up for synchronization.
8. Distillation analysis stream and normal analysis stream can be synchronized.

Table 5.66 Synchronization rules table

Destination Source	Measurement	Cal	Val	Calibration run	Sample run
Measurement	○	×	○	×	×
Cal	▲	×	▲	×	×
Val	○	×	○	×	×
Calibration run	×	×	×	×	×
Sample run	×	×	×	×	○

○, ▲: Synchronization possible, see Synchronize items for synchronization items.
*: The ▲ symbol in the Synchronization Rules Table signifies (Cal →Measurement, Cal →Val) and he synchronization items ▲ (process assignment, reference peak, etc.) cannot be synchronized.
×: Cannot be synchronized.

The following is an example of setting error.



Contradicts the rule “Cannot set peak within the same stream to synchronized destination.”

Table 5.67 Peak synchronization and peak copy items

Name	Peak Synchronization	Peak Copy
Absolute peak number 1 Peak name	○	×
Stream number	×	×
Relative peak number	×	×
Peak execution	○	× *1 Always set copy target to Not executed.
Detector number or SYS number	○	○
Process assign	○	○
DCS output flag	○	×
Ref Peak 1 Stream number	▲	○
Peak number	▲	○
Ref Peak 2 Stream number	▲	○
Peak number	▲	○
Measuring range	▲	○
Unit	▲	○
Normalization	○	○
Factor 1 <1000-fold data> Factor K, Factor a, Factor f <10000-fold data> Compress fact.(air) <100-fold data> Temp.(degC)	▲	○

Factor 2 <1000-fold data> Factor A, Factor b, RVP coef A, 0% value, Area %, Std B.P	▲	○
Factor 3 <1000-fold data> Factor B, RVP coef B, 100% value	▲	○
Factor 4 <1000-fold data> Std conc <100000-fold data> Set up Conc.	▲	○
Range number	▲	×
Gate cut method	○	○
Auto tracking req	○	○
Peak polarity	○	○
Detected slope	○	○
Detection level	○	○
A/H req	○	○
Integ method	○	○
Cal method req	○	×
Chrom gain req (Auto gain value)	○	○
Peak std time	○	○
Gate ON Time	○	○
Gate OFF Time	○	○
Linear Calc 1 factor	▲	○
Linear Calc 2 factor 10000-fold data Section set stop	▲	○
Linear Calc 3 factor	▲	○
Linear Calc 4 factor	▲	○
Linear Calc 5 factor 10000-fold data Calib factor, Response factor	▲	○
Std area	▲	○
Min peak width	○	×
Min peak height	○	×
Min peak area	○	×
Modbus address	×	×
Tracking Factor a	×	×
Tracking Factor b	×	×

Peak copy 1

Press F2 (Copy1).

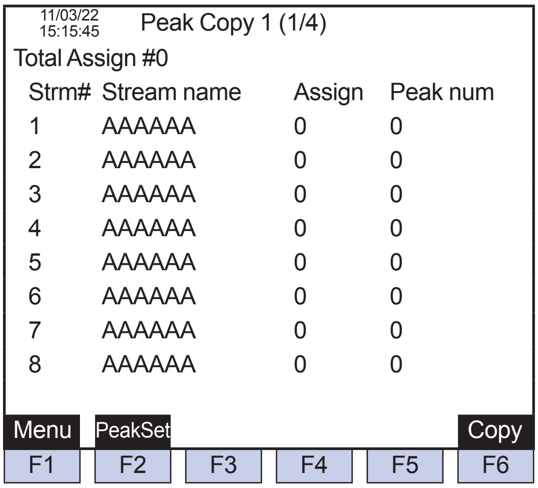


Figure 5.94 Example of peak copy 1 (1/4) screen

F1 (Menu): Displays the Table Menu screen.
F2 (PeakSet): Displays the Peak Setup-Specific screen.
F6 (Copy): Executes copy after entering Source stream and Destination stream.

- Copy destination peak must be an independent peak.
- See Peak synchronization and peak copy items regarding data for copy.

Table 5.68 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Total Assign #	Total assign		0	999		Total assigned peak of all streams
Strm#	Stream number		1	31		
Stream name						
Assign			0	999		Total assigned peak of stream
Peak num			0	999		Total used peak number of stream

<Peak copy rules 1 (Peak copy screen 1)>

1. Copy peak assigned to stream source and destination.
2. When stream source and destination of assignment number are different, use the stream with the smaller assignment number as the standard.
3. When the assignment number of either the stream source or destination is zero, error will occur and copy cannot be made.
4. Copy rules for synchronized peaks.

Destination / Source	Independent peak	Parent peak	Child peak
Independent peak	Copy as is (change copy item)	Maintain destination peak in independent peak and synchronize (comply with synchronization rules to change synchronization items).	Assess using peak synchronizing rules. When synchronization is not possible, maintain independent peak and synchronize. When synchronization is possible, set synchronization as synchronization target of copy destination = synchronization target of copy source.
Parent peak	Cannot copy	Cannot copy	Cannot copy
Child peak	Convert to independent peak and copy (change copy item).	Convert to independent peak and synchronize (comply with synchronization rules to change synchronization items).	Assess using peak synchronizing rules. When synchronization is not possible, maintain independent peak and synchronize. When synchronization is possible, set synchronization as synchronization target of copy destination = synchronization target of copy source.

5. Copy items: Copy stream number in peak process-specific setup part (T19) and parts other than relative peak number

● Peak copy 2

Press F3 (Copy 2).

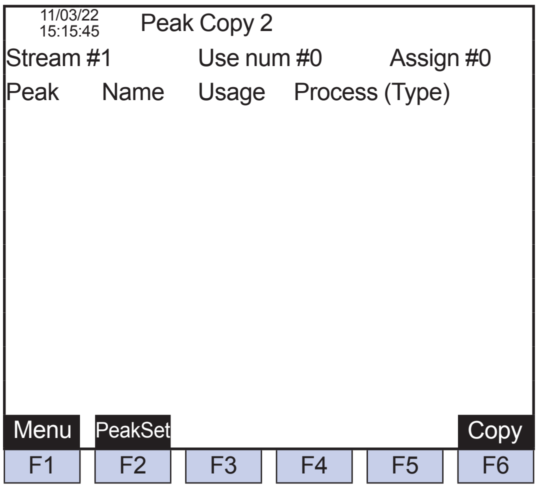


Figure 5.95 Example of peak copy 2 screen

F1 (Menu): Displays the Table Menu screen.
F2 (PeakSet): Displays the Peak Setup-Specific screen
F6 (Copy): Executes copy after entering Source peak and Destination peak.

- Stream number for display and setting becomes the stream number in the peak setup-specific screen when relevant screen is requested.
- Copy destination peak must be an independent peak.
- See Peak synchronization and peak copy items regarding data for copy.
- When Process (Type) is set to No processing, Process (Detail) displays No processing.

Table 5.69 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Stream #	Stream number		1	31		
Use num #	Use		0	999		Number of peaks in the relevant stream
Assign #	Assign	○	0	999		Number of assigned peaks in the relevant stream
Peak	Relevant stream peak number		1	999		
Name	Peak/Processing name					Eight one-bite characters
Usage	Peak usage status					ON when in use, OFF when not in use
Process (Type)						

5.4.10 Cal/Val Set

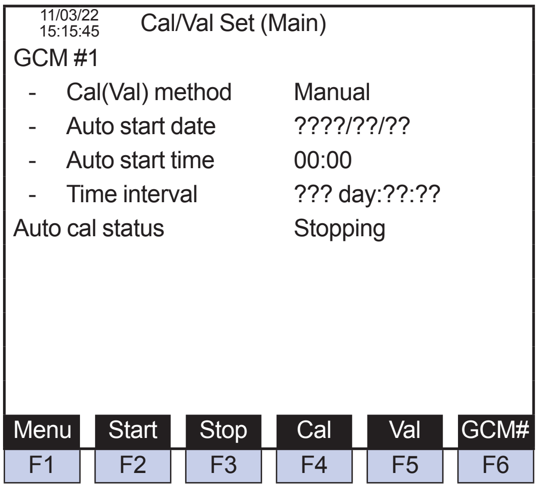


Figure 5.96 Example of Cal/Val Set (main) screen

F1 (Menu): Displays the Table menu screen.
F2 (Start): Executes the Auto cal start command.
F3 (Stop): Executes the Auto cal stop command.
F4 (Cal): Displays the Calibration set screen.
F5 (Val): Displays the Validation Set screen.
F6 (GCM #): Specifies a GCM Number.

- In the case of auto cal, when auto calibration is started using the F2 (Start) auto calibration start command, the message “Operation change selected” is displayed. When measurement status is executing calibration, validation or auto-calibration status, the message “Operation change not selected” is displayed.
- In the case of auto cal, auto cal is stopped using the F3 (Stop) auto cal stop command, the message “Operation change selected” is displayed. When measurement status is stopping calibration, validation or auto-calibration status, the message “Operation change not selected” is displayed.
- When auto-calibration start command is executed using F2 (Start), and where Cal/Val setting for auto cal and auto val is not set to execute, the message “Auto cal or val has not been set yet” is displayed.
- When auto cal status is executing and Cal (Val) method is changed to semi-auto or manual, the auto cal status is changed to stopping. However, for calibration that is already in session, the analysis is performed until the main cycle ends.

Table 5.70 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #						
Cal (Val) method		○				Manual, Semi-auto, Auto
Auto start date		○				2000 to 2099, Jan to Dec, 1st to 31st* * Upper Limit will differ depending on the month
Auto start time		○				0 to 23 hours, 0 to 59 minutes
Time interval		○				0 to 255 days, 0 to 23 hours, 0 to 59 minutes Date, Hour, and Min cannot be set to all 0.
Auto cal status						Stopping, Executing

5

● Calibration set

Press F4 (Cal).

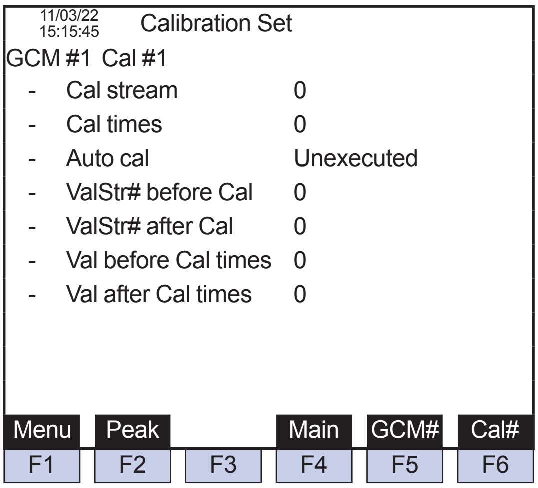


Figure 5.97 Example of calibration set screen

F1 (Menu): Displays the Table Menu screen.
F2 (Peak): Displays the calibration peak set screen.
F4(Main): Displays the Cal/Val Set (main) screen.
F5 (GCM #): Specifies a GCM number.
F6 (Cal #): Specifies a Cal number.

When ValStr # before Cal and ValStr # after Cal are set to 0, Val stream is not executed.

- When a GCM number is changed, the Cal number is allowed to return to 1.
- A Cal stream can be set to Cal only when a stream type is set to Cal. When the setting is attempted with a stream type other than Cal, the message “The kind of stream is incorrect” is displayed. When it does not exist in the relevant GCM, the message “The stream doesn’t exist in GCM” is displayed.
- A ValStr # before Cal and a ValStr # after Cal can only be set when the stream type is Val. When the stream type is other than Val, the message “The kind of stream is incorrect” is displayed. When it does not exist in the relevant GCM, the message “The stream doesn’t exist in GCM” is displayed.

Table 5.71 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #						
Cal #	Cal Number		0	6		
Cal stream		○	0	31*		* Only stream numbers and cal streams belonging to GCM can be set. (Stream setup screen)
Cal times		○	0	30		Cal times + Val before cal times + Val after cal times must not exceed 31.
Auto cal specification		○				Not done, Done
ValStr # before and after cal		○	0	31**		** Only stream numbers and Val streams belonging to GCM can be set. (Stream setup screen)
Val before and after cal times		○	0	30		Cal times + Val before cal times + Val after cal times must not exceed 31.

Calibration peak set

Press F2 (Peak).

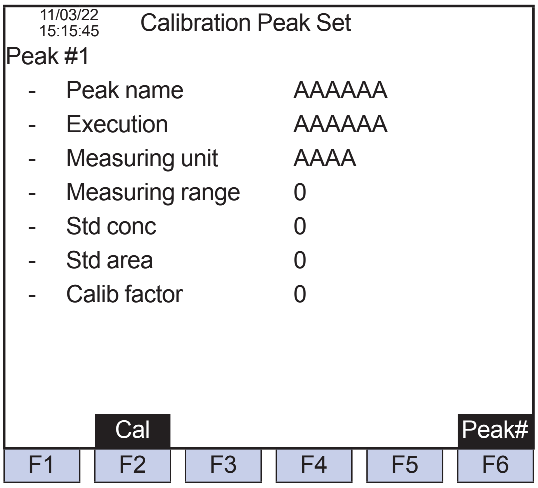


Figure 5.98 Example of calibration peak set screen

F2 (Cal): Displays the calibration set screen
F6 (Peak #): Specifies a peak number.

- Displays the stream peak set in Cal stream.

Table 5.72 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Peak #	Peak number		1	999		
Peak name		○				Alphanumeric: 8 characters
Execution		○				Executed Not executed
Measurement unit		○	1	100		1 ( ) 2 (%) 3 (ppm) 4 (ppb) 5 (wt.%) 6 (wt.ppm) 7 (wt.ppb) 8 (vol.%) 9 (vol.ppm) 10 (vol.ppb) 11 (mol.%) 12 (mol.ppm) 13 (mol.ppb) 14 and over ( )
Measuring range		○	0.000	9999.999		
Std conc		○	0.000	9999.999		
Standard area		○	0.000	9999.999		
Calibration factor		○	0.000	9999.999		

Validation Set

Press F5 (Val).

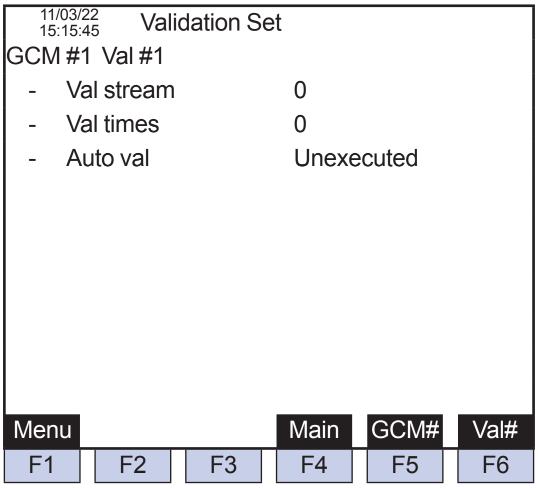


Figure 5.99 Example of validation set screen

F1 (Menu): Displays the Table menu screen.
F4(Main): Displays the Cal/Val Set (main) screen.
F5 (GCM #): Specifies a GCM number.
F6 (Val #): Specifies a Val number.

- Validation stream can only be set when stream type is Val. When stream type is other than Val, the message “The kind of stream is incorrect” is displayed. When it does not exist in the relevant GCM, the message “The stream doesn’t exist”in GCM is displayed

Table 5.73 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #						
Val #	Val number		1	6		
Validation stream		○	0	31*		* Only val streams belonging to GCM can be set. (Stream setup screen)
Validation times		○	0	30		
Auto validation specification		○				Not done, Done

5.4.11 Multirange Setup

When using peak setup-specific to set a range number, the multirange setup is made effective.

When synchronizing the data in the range number with peak setup-specific, changes can be made bidirectionally.

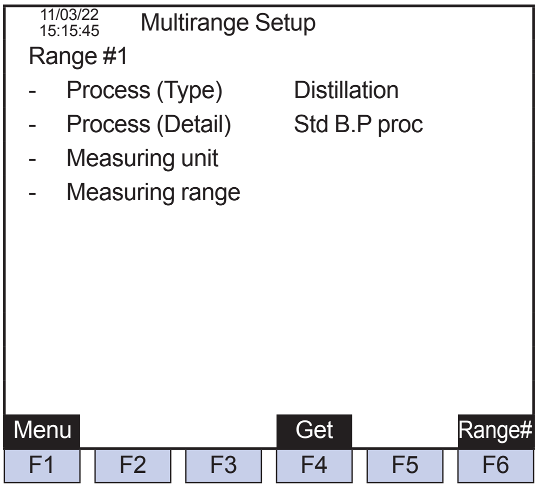


Figure 5.100 Example of multirange setup screen

F1 (Menu): Displays the Table Menu screen.

F4(Get): Gets the set values of the Process assign, measurement unit, measurement range, etc. of the specified peak.

F6 (Range #): Specifies a range number (1 to 31).

<Range synchronization rules>

Stream type / Range synchronization	Measurement	Calibration	Validation	Calibration run	Sample run
—	Valid	Invalid	Valid	Invalid	Invalid

Table 5.74 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Range #	Range number		1	31		
Process (Type)						See the Display Data List for Peak setup-specific screen.
Process (Detail)						See the Display Data List for Peak setup-specific screen.
Measurement Unit						See the Display Data List for Peak setup-specific screen.
Measuring range						See the Display Data List for Peak setup-specific screen.
Ref peak number						
0, 100% value						

5

Display when the Process (detail) entails indirect, deviation calculation and linear 1 to 5.

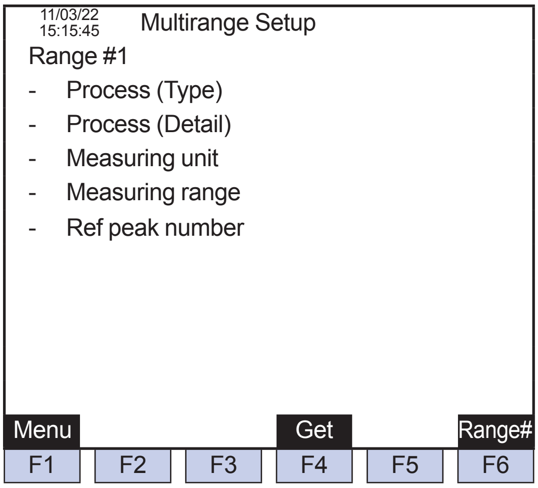


Figure 5.101 Example of multirange setup screen

Displayed when the Process (detail) entails external 3rd.

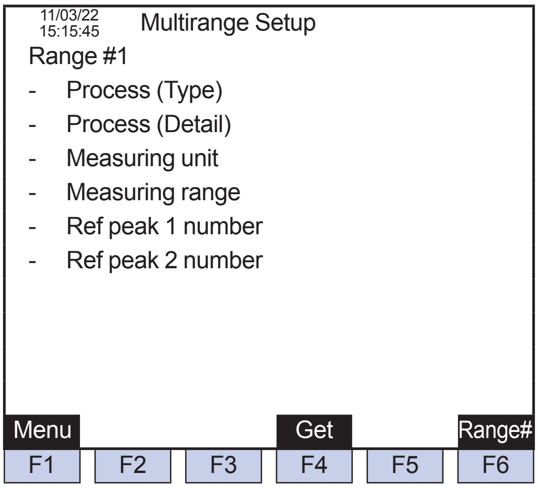


Figure 5.102 Example of multirange setup screen

Displayed when the Process (detail) entails external linear.

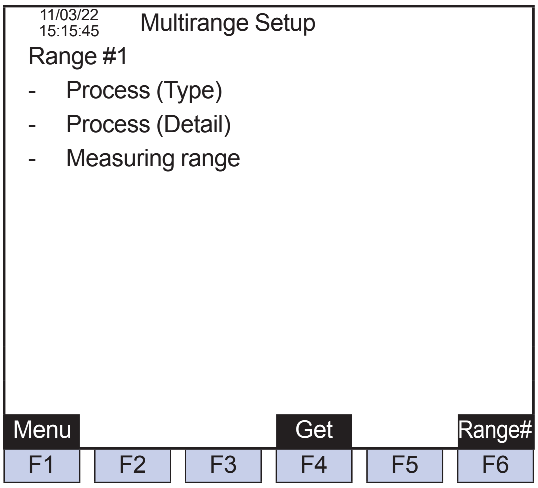


Figure 5.103 **Example of multirange setup screen**

Displayed when the Process (detail) entails ratio, separation, base/signal/noise level, divisor, A2-Heating v/vol, A2-Heating v/mas, A2-Relative dens, A2-Density, A2-Compress fact, A2Wobbe index, I-CalorificV/mol, I-CalorificV/mas, I-CalorificV/vol, I-Compress fact, I-Relative dens, I-Wobbe index, I-Density, A1-Calorific val, A1-Spec gravity, A1-Compress fact, A1-Wobbe index, J-Calorific val, J-Spec gravity, J-Compress fact, J-Wobbe index.

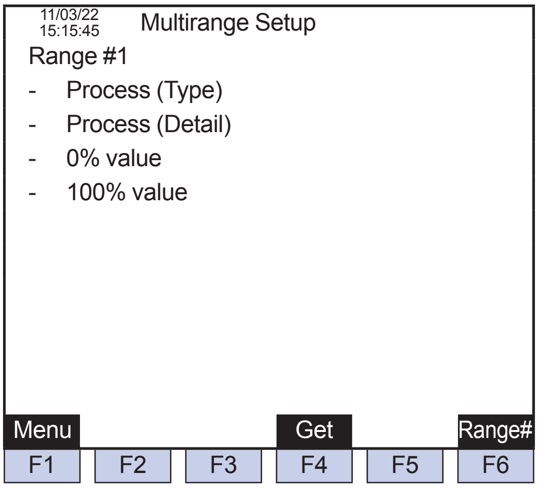


Figure 5.104 **Example of multirange setup screen**

Displayed when the Process (detail) entails AI signals 1 to 16.

5.4.12 Alarm Setup

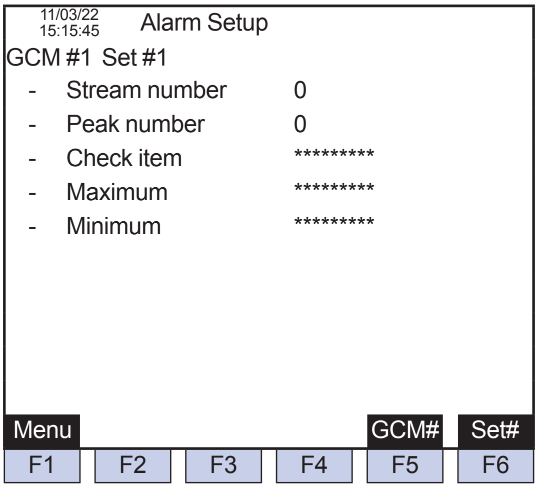


Figure 5.105 Example of alarm setup screen

F1 (Menu): Displays the Table Menu screen.
F5 (GCM #): Specifies a GCM number.
F6 (Set #): Sets an alarm number.

- When a stream and a peak number in database are both zero, they are assessed as no settings and all data is displayed with * (asterisk).

Table 5.75 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #						
Set #						Relevant set number (1 to 32), 32 per GCM (Total 192)
Stream number		○	(0), 1	31		99 can also be entered.
Peak number		○	(0), 1	999		When a stream number is 99, all streams belonging to GCM is applicable and a relative peak number is assigned to the peak number. Assign 0 to the stream number and the peak number to enable setting invalid data.
Check items		○				Alarm check items, Density, R. Time, Vari coeff, Tailing coeff
Upper Limit, Lower Limit		○				Density: −999.999 to 9999.999 (Process assign is AI signal), 0.000 to 9999.999 (Process assign is other than AI signal) R. Time:0.000 to 21600.0 sec Vari coeff: 0.000 to 1.999 Tailing coeff: 0.000 to100.000

5.4.13 Peak Assignments

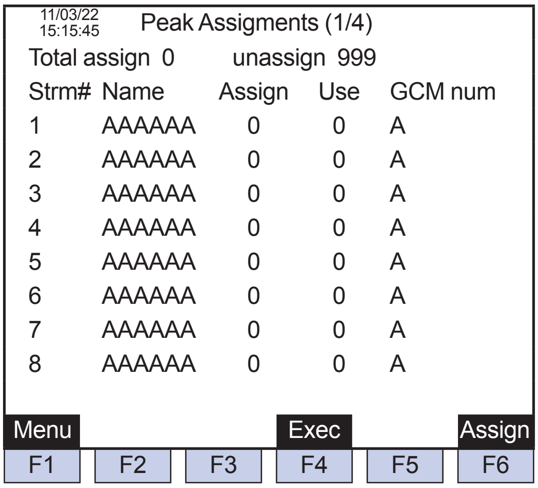


Figure 5.106 Example of peak assignments (1/4) screen

F1 (Menu): Displays the Table menu screen.
F4 (Exec): Executes configuration change of peak table.
F6 (Assign): Sets stream numbers and assign numbers for the setting.

The setting is enabled only when all GCMs are in stop mode.
The total usage of peak table is set per stream.
When a stream set in GCM is selected, the GCM number is displayed in the GCM number area.
When a stream that is not set in GCM is selected, the GCM number area is blank.

Stream numbers and relative peak numbers are reset by executing F4 (Exec). Execution is initialized to Off.

Table 5.76 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Total assign	Total assigned peak		0	999		
Unassigned	Unassigned peak number		0	999		
Stream #	Stream number		1	31		
Stream name						If any stream name or set name exists, the table content is directly shown.
Assignment number	Relevant stream peak assign number	○	0	999		Settable
Usage	Relevant stream peak usage		0	999		
GCM Number			1	6		

5.4.14 Communications Setup

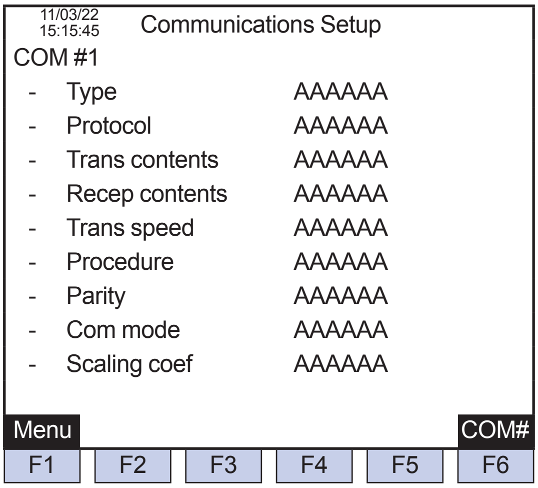


Figure 5.107 Examples of communications setup screen

F1 (Menu): Displays the Table menu screen.

F6 (COM #): Sets a communication port number.

- Modbus protocol can be set to both COM1 and COM2. However, GCCU and GCCU or Y-Protocol (GC1000/GC8, GC6, GCHC) and Y-Protocol cannot be set to COM1 and COM2 respectively.
- Items that cannot be set due to types and protocols are displayed with * (asterisk).

Type	NA	DCS				GCCU
Protocol	×	MODBUS	GC1000/GC8	GC6	GCHC	×
Trans contents	×	×	○	○	○	○
Recep contents	×	×	○	○	○	○
Trans speed	×	○	○	○	○	○
Procedure	×	×	○	○	○	○
Parity	×	○	○	○	○	○
Com mode	×	○	×	×	×	×
Scaling coef	×	○	×	×	×	×

Table 5.77 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
COM #			1	2		None, DCS, GCCU
Type		○				None, DCS, GCCU
Protocol		○				MODBUS, GC1000/GC8, GC6, GCHC * Only when the type is DCS
Trans contents		○				Analyzed value, Alarm, All data
Recep contents		○				None, Command, All data, GC8 type
Trans speed		○				1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps
Procedure		○				Without procedure, With procedure
Parity		○				None, Odd, Even
Com mode		○				RTU mode, ASCII mode
Scaling coef		○				Real, 9999, 65535

5.4.15 DO Setup

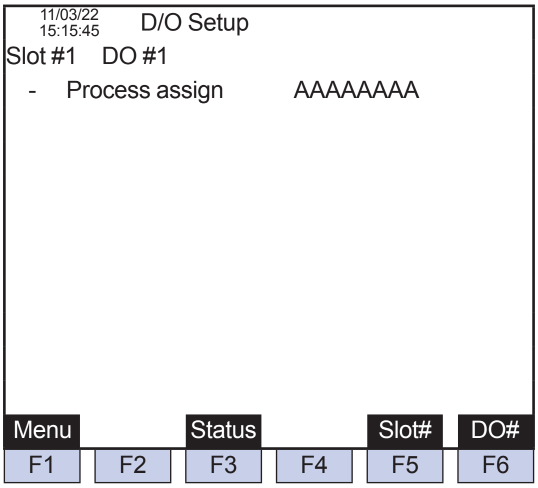


Figure 5.108 Example of DO setup screen

F1 (Menu): Displays the Table menu screen.
F3 (Status): Displays the DO status screen.
F5 (Slot #): Specifies a slot number.
F6 (DO #): Specifies a DO number.

- A DO contact number displays the relative number of each SLOT.
- When F5 (Slot #) is pressed, Slot #: is displayed at the bottom line. When a slot number is entered and SET/ENT key is pressed, the set value of the specified slot number is displayed.
- When setting the slot number, if a card other than DO or DI/O is installed in the relevant slot, any entry is not accepted.
- When F6 (DO #) is pressed, DO #: is displayed at the bottom line (the default is 1). When DO number is entered and SET/ENT key is pressed, the set value of the specified DO number is displayed.
- When any DO number is used for stream identification on the GCM setup screen , the Process assign displays ****** and not selectable.

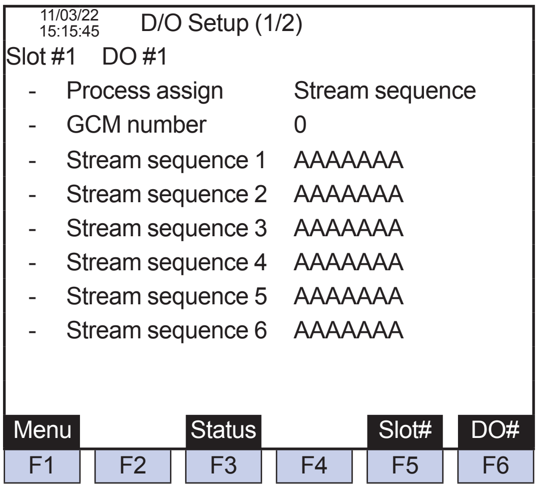


Figure 5.109 Example of DO setup (1/2) screen (setting the Process assign to stream sequence)

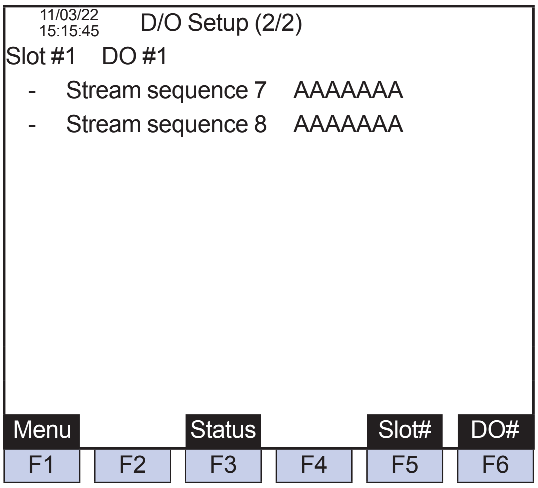


Figure 5.110 Example of DO setup (2/2 screen (setting the Process assign to stream sequence)

When the stream sequence is set in the Process assign, items to set up specified output of each stream sequence are added, and all two pages are displayed.

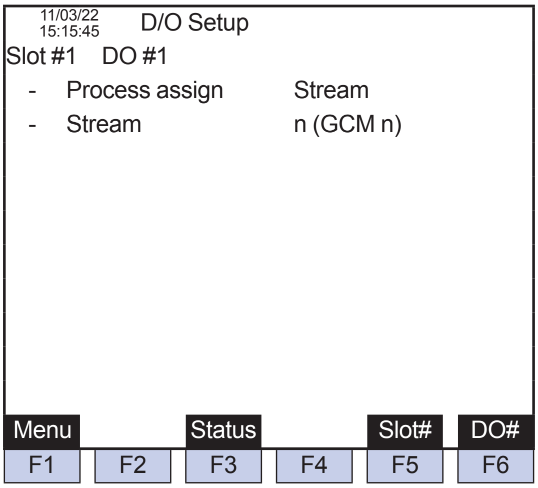


Figure 5.111 Example of DO setup screen (setting the Process assign to stream)

- The GCM number displayed on the screen cannot be set.
- When an Over limit value is set as the stream, “Over limit” is displayed in the bottom line and the set value is not shown.

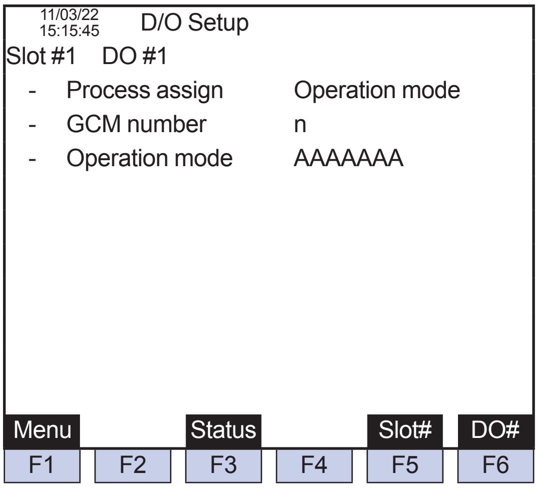


Figure 5.112 Example of DO setup screen (setting the Process assign to 0peration mode)

- When an Over limit value is set as a GCM number, “Over limit” is displayed in the bottom line and the set value is not shown.
- Warming up time for the currently operated stream is not included in case of Run.

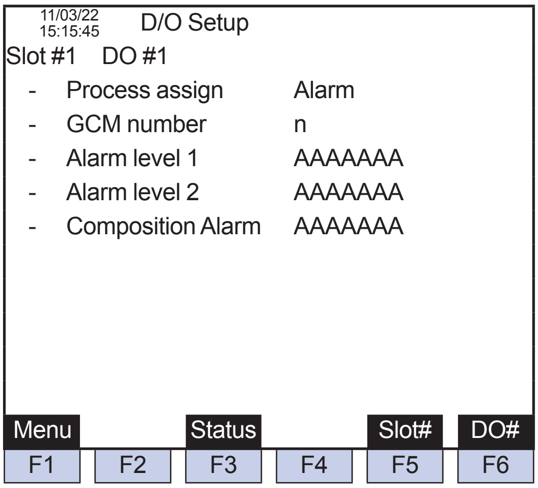


Figure 5.113 Example of DO setup screen (setting the Process assign to Alarm)

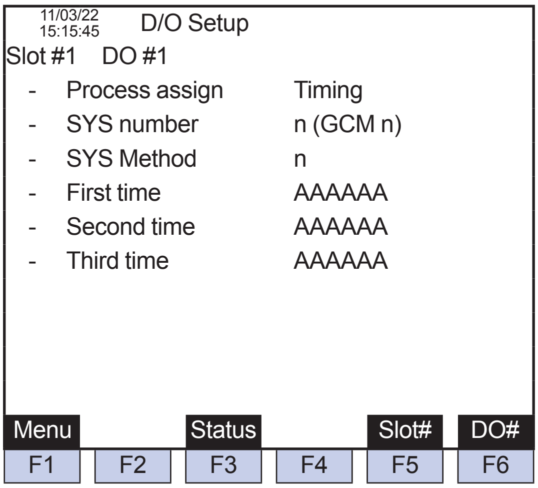


Figure 5.114 Example of DO setup screen (setting the Process assign to Timing)

- Any SYS number that is not set in GCM cannot be set.
- When an Over limit value is set as a SYS number, “Over limit” is displayed in the bottom line and the set value is not shown.

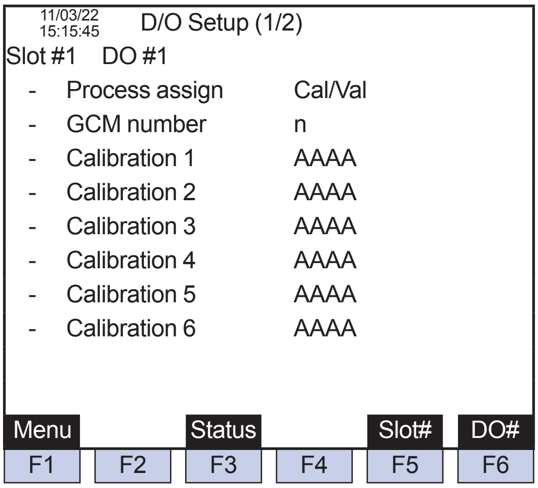


Figure 5.115 Example of DO setup (1/2) screen (setting the Process assign to Cal/Val)

- When an Over limit value is set as a GCM number, “Over limit” is displayed in the bottom line and the set value is not shown.

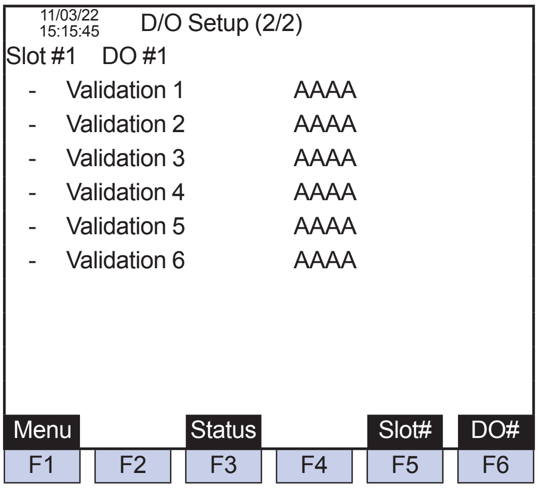


Figure 5.116 Example of DO setup (2/2) screen (setting the Process assign to Cal/Val)

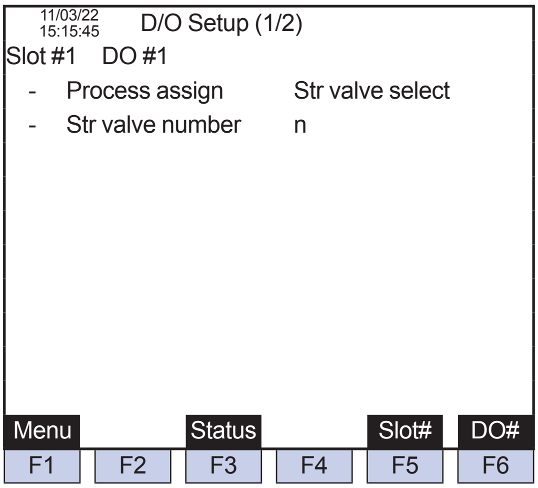


Figure 5.117 Example of DO setup screen (setting the Process assign to Str valve select)

- The Str valve select is a function to operate stream selection valves, and is operated according to the Stream valve ON/OFF time in the Method.

Table 5.78 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #			1	5		Limited
DO #			1	5		Limited
Process assignment		○				No process, Stream sequence, Stream, Operation mode, Alarm, Timing, Cal/Val, Str valve select
GCM number		○	1, (0)	6		Setting possible only when 1(0) to 6, process assign entails stream sequence, cal (val), operation mode and alarm. In the case of alarm, GCM number 0 is applicable to all GCEX alarm. GCM number range is 1 to 6 when other than alarm.
Stream sequence 1 to 8		○				No output, Output Initial value for stream sequence 1 only has Output. Others have No output.
Stream number		○	1	31		
Operation mode		○				Run, Run (including warming up time), Stop, Pause
Alarm level 1, 2, Composition alarm		○				No output, Output
SYS Number		○	1	6		Limited
SYS method		○	1	6		Limited
1st to 3rd times		○				No output, Output
Cal 1 to 6		○				No output, Output
Val 1 to 6		○				No output, Output
Stream valve number		○	1	31		

5.4.16 DI Setup

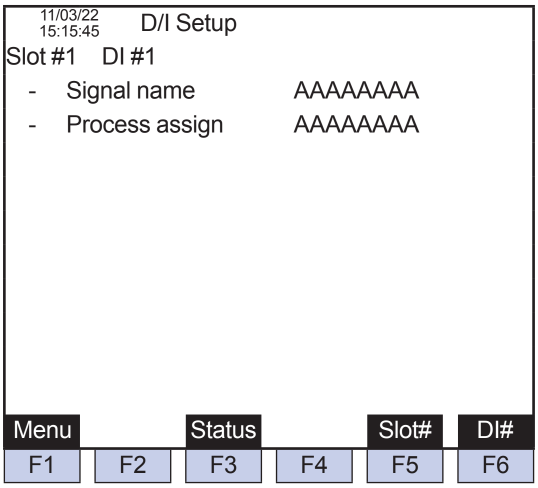


Figure 5.118 Example of DI setup screen

F1 (Menu): Displays the Table menu screen.
F3 (Status): Displays the DI status screen.
F5 (Slot #): Sets a slot number.
F6 (DI #): Sets a DI number.

* Press F5 (Slot #), and Slot No. is displayed in the second line below. Use the numeric keypad to select slot number and press Set/Ent to set the slot number. When the selected slot is not DI, the message “Cannot select” is displayed in the second line below.

* Press F6 (DI #) and DI number is displayed in the second line below. Use the numeric keypad to select contact number and press Set/Ent to set the contact number. When the selected contact number exceeds the limits, “Over limit” is displayed in the second line below.

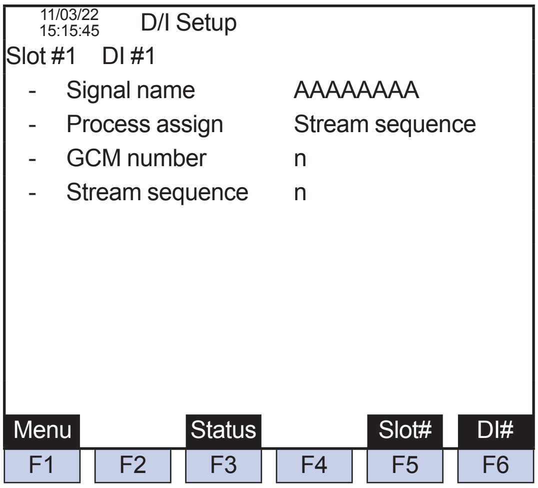


Figure 5.119 Example of DI setup screen (setting the Process assign to Stream sequence)

* When stream sequence is set in the Process assign, items to select stream sequence are added.

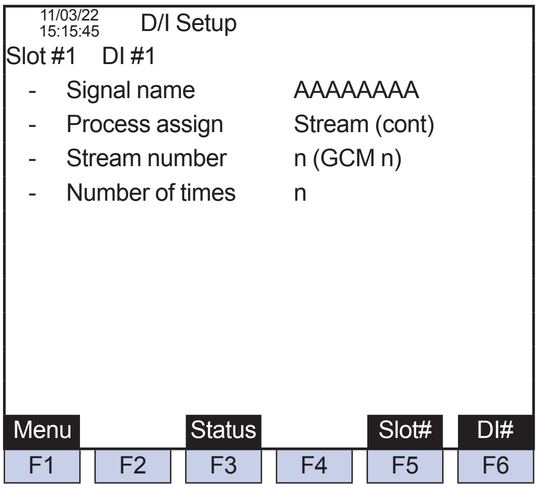


Figure 5.120 Example of DI setup (setting the Process assign to Stream)

* When stream is set in the Process assign, items to select a Stream number and the Number of times and a GCN number display are added. The displayed GCN number cannot be set.

* When Over limit numerical values are selected for the Stream number and the Number of times, “Over limit” is displayed in the second line below and the numerical values that were set are not reflected.

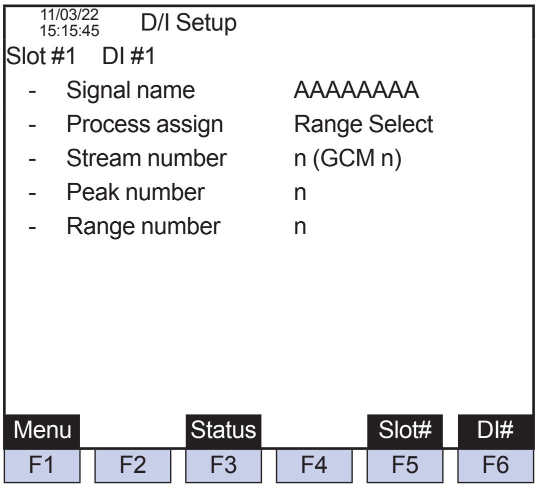


Figure 5.121   Example of DI setup screen (setting the Process assign to Range select)

* When Range select is set in the Process assign, items to select a range assigned stream, a range assigned peak and a range number for Range select and a GCN number are additionally displayed. The displayed GCN number cannot be set.
* When Over limit numerical values are selected for a range assigned stream, a range assigned peak and a range number, “Over limit” is displayed in the second line below and the numerical values that were set are not reflected.

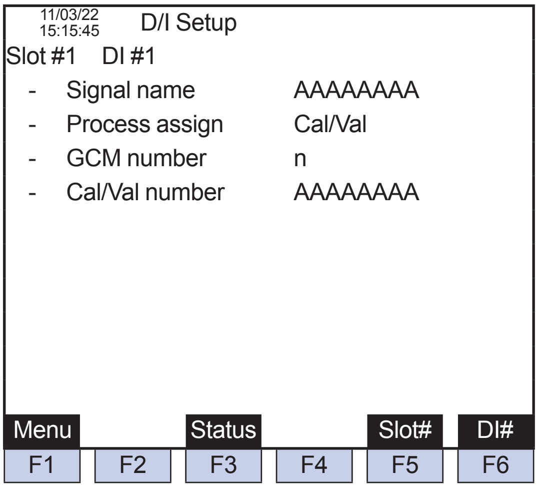


Figure 5.122   Example of DI setup screen (setting the Process assign to Cal (Val))

* When Cal (Val) is set in the Process assign, selection items for Cal (Val) and a GCM number are added.
* When Over limit numerical values are selected for a GCM number, “Over limit” is displayed in the second line below and the numerical values that were set are not reflected.

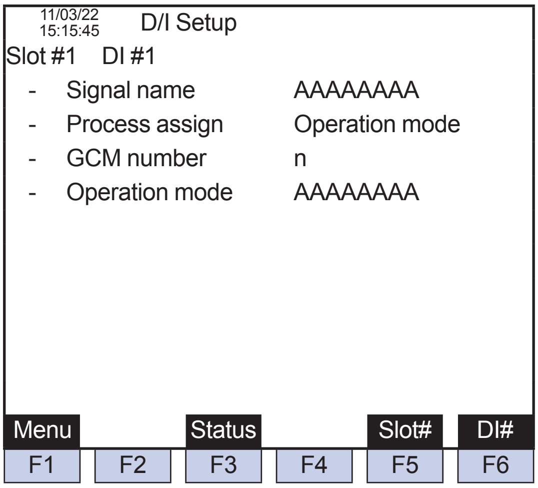


Figure 5.123 Example of DI setup screen (setting the Process assign to Operation mode)

* When Operation mode is set in the Process assign, selection items for operation mode and a GCM number are added.

* When Over limit numerical values are selected for a GCM number, “Over limit” is displayed in the second line below and the numerical values that were set are not reflected.

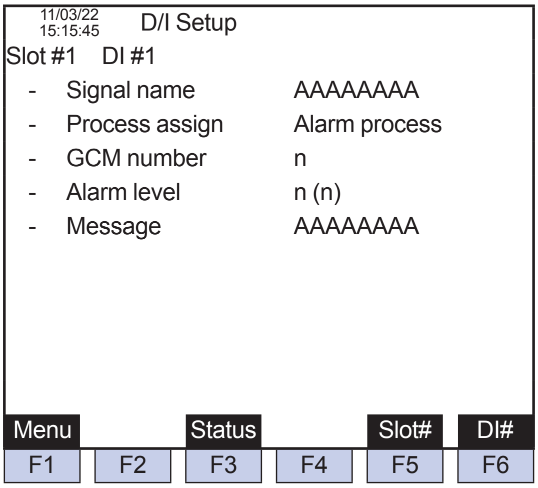


Figure 5.124 Example of DI setup screen (setting the Process assign to Alarm process)

* When Alarm process is set in the Process assign, selection items for an alarm level and a message are added.

* When the set numerical values are Over limit of the alarm level or a set message has more than 22 characters, “Over limit” is displayed in the second line below and the numerical values that were set are not reflected.

Table 5.79 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #			1	5		Limited
DI #			1	8		Limited
Signal name		○				Alphanumeric: 8 characters
Process assign		○				0: No process, 1: Stream sequence, 2: Stream, 3: Range select, 4: Cal/Val, 5: Operation mode, 6: Alarm process
GCM number		○				Setup possible when 0 to 6, process assign entails Stream sequence, Cal (Val) and Operation mode. * In the case of zero, applicable to all GCM. When process assign entails alarm, applicable to alarms for all GCM and equipment.
Process sequence		○	1	8		
Stream number		○	1	31		
Number of times		○	0	999		0: Consecutive, 1 to 999: times
Range assigned Stream		○	1	31		
Range assigned Peak		○	1	999		
Range number		○	1	31		
Cal/Val number		○				Cal 1, Cal 2, Cal 3, Cal 4, Cal 5, Cal 6, Val 1, Val 2, Val 3, Val 4, Val 5, Val 6
Operation mode		○				0: Run, 1: Stop, 2: Pause
Alarm level		○				2 or 3
	Alarm number	○				201 to 232 (in the case of alarm level 2), 401 to 432 (in the case of alarm level 3)
Message						Alphanumeric: 22 characters

5.4.17 AO Setup

When #1 Output stream is set at 99, the analyzed value of all streams belonging to GCM are read out. In this case, the setup for #2 Output stream and #2 Output peak become invalid. This setup can be done independently for each AO.

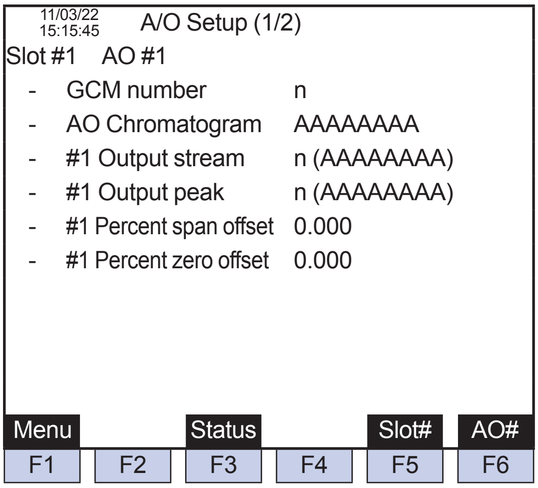


Figure 5.125 Example of AO setup (1/2) screen

F1 (Menu): Displays the Table menu screen.
F3 (Status): Displays the AO status screen.
F5 (Slot #): Sets a Slot number.
F6 (AO #): Sets a AO number.

- When AO chromatogram output is set, other items are displayed with * (asterisk).
- #1 Output stream and #2 Output stream cannot be set in the same Stream. If this setup is attempted, the error message “Already assigned in request stream” is displayed.
- If a detector that does not exist is selected in the setting of the AO chromatogram, the error message “Not load the detector” is displayed.

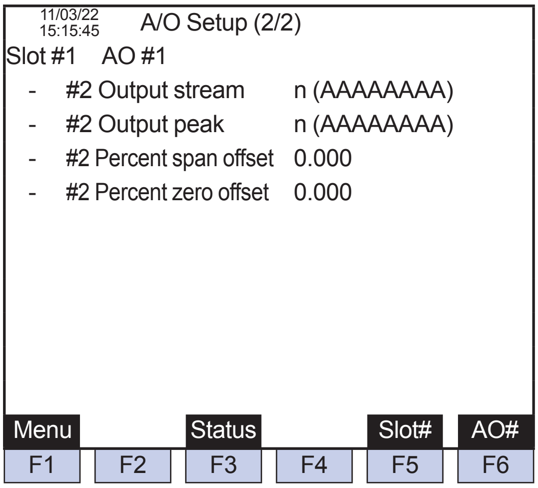


Figure 5.126 Example of AO setup (2/2) screen

Table 5.80 Display data list

Display Item	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot#	Slot number		1	5		
AI #	AO channel number		1	8		
GCMNumber		○	1	6		
AO Chromatogram		○				Normal output, Det1-1, Det1-2, Det2-1, Det2-2, Det3-1, Det3-2 * Multiple OA channels can be assigned to the same detector. However, up to a maximum of 8 channels.
#1 Output stream		○	(0), 1	(99), 31		Lower Limit (0) cancels the output of the relevant peak. Upper Limit (99) gives output of analyzed values of all streams.
#2 Output stream		○	(0), 1	31		Lower Limit (0) cancels the output of the relevant peak.
#1, #2 Output peak		○	(0), 1	999		Lower Limit (0) cancels the output of the relevant peak.
#1, #2 Partial hi		○	0.001	1.000		
#1, #2 Partial low		○	0.000	0.999		

5.4.18 AI Setup

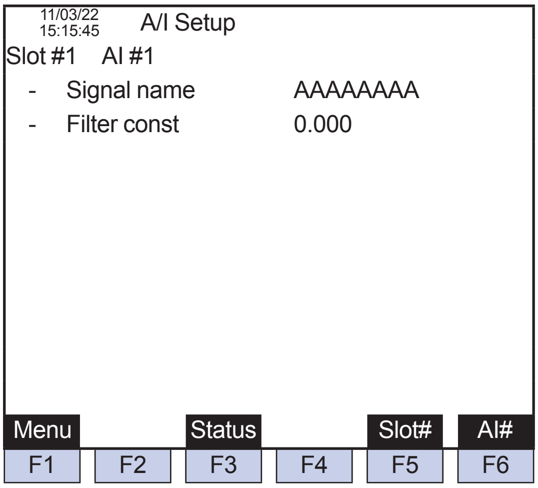


Figure 5.127 Example of AI setup screen

F1 (Menu): Displays the Table menu screen.
F3 (Status): Displays the AI status screen.
F5 (Slot #): Sets a Slot number.
F6 (AI #): Sets an AI number.

Table 5.81 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Slot #	Slot number		1	5		
AI #	AI input number		1	4		
Signal Name	AI signal name					Alphanumeric: 8 characters
Filtering const	AI filtering constant		0.001	1.000		

5.4.19 Network Setup

Set up IP addresses and networks.

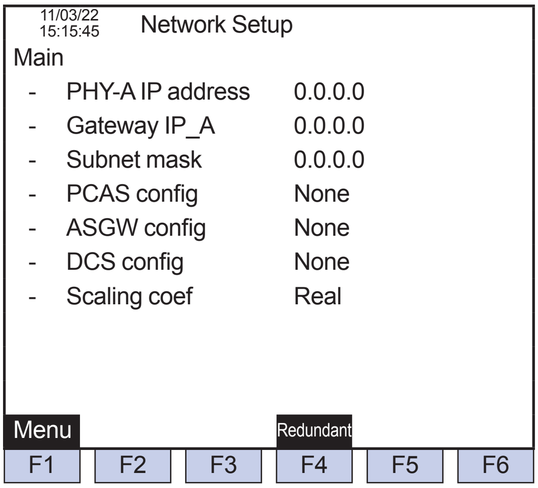


Figure 5.128 Example of network setup (Main) screen

F1 (Menu): Displays the Table menu screen.
F4 (Redundant): Displays the Redundant setup screen.

- F4 (Redundant) is valid only when the Ethernet (ch2) is installed.

● Redundant setup screen

Execute the redundant setup.

Press F4 (Redundant).

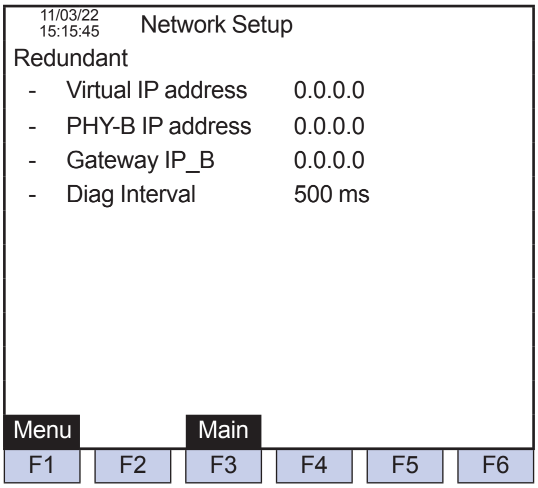


Figure 5.129 Example of network setup (Redundant) screen

F1 (Menu): Displays the Table menu screen.
F3 (Main): Displays the Main screen.

* The redundant application will launch only when the Ethernet (ch2) is installed.

Table 5.82 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
PHY-A IP address		○				
Gateway IP_A		○				
Subnet mask		○				
PCAS config		○				0: NA, 1: single, 2: dual * 2: dual can be selected only when Ethernet (ch2) is installed.
ASGW config		○				0: NA, 1: single, 2: dual * 2: dual can be selected only when Ethernet (ch2) is installed.
DCS config		○				0: NA, 1: single, 2: twin * 2: twin can be selected only when Ethernet (ch2) is installed.
Scaling coef		○				0: Real, 1: 9999, 2: 65535
Virtual IP address		○				
PHY-B IP address		○				
Gateway IP_B		○				
Diag Interval		○	500	3000	ms	

5.4.20 GCM SETUP

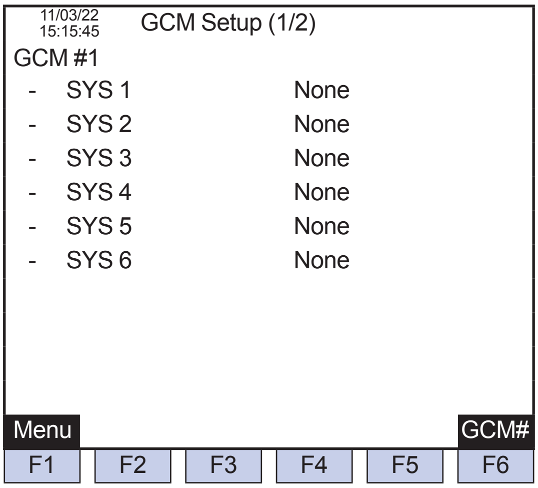


Figure 5.130 Example of GCM setup (1/2) screen

F1 (Menu): Displays the Table menu screen.

F6 (GCM #): Specifies a GCM number.

When F6 (GCM #) is pressed, GCM No. appears in the second line below.

When the numeric keypad is used to select the GCM number and Set/Ent is pressed, the GCM setup of that number is selected.

The following ovens can be set by SYS.

Up to 2 SYSs can be set for one oven.

Up to 4 SYSs can be set for two ovens.

Up to 6 SYSs can be set for three ovens.

Once one of SYSs is set to Yes and you move to other GCM numbers, ***** is displayed, and “Already set in other GCM” is displayed in the second line below and it cannot be set for any other GCM even though the SYS is about to be selected again. When more than the maximum amount of SYSs is about to be selected, “Cannot select any more” is displayed in the second line below and any more SYS cannot be selected.

On the fundamental system set screen, when the stream valve kind is set to Binary Output (Air), only GCM 1 can be set.

When the ATM valve number area is selected and the Set/Ent key is pressed, an ATM valve number is displayed in the second line below (1-1 to 3-2).

Use the up and down key to select it and press the Set/Ent key, and the number is reflected.

On the ATM valve setup screen, when an ATM valve that has not been set to installed is selected, “Not installed” is displayed.

When the stem identifying area is selected and the Set/Ent key is pressed, a strm identifying set number is displayed in the second line below (from none up to Stream 31).

Use the up and down key to select the number and press the Set/Ent key, and the number is reflected.

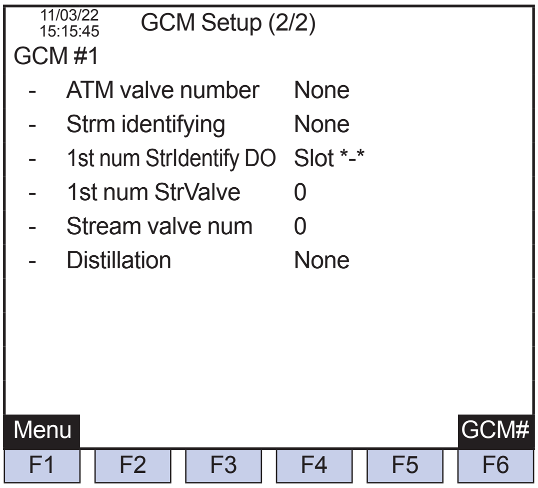


Figure 5.131 Example of GCM setup (2/2) screen

- Setup for Distillation (setting possible per GCM) is as shown below.
  (1) When distillation is set to Yes for more than one GCM, the SimDis Setup items on the Table Menu (3/4) screen is shown.
  (2) Distillation is added to the stream peak process (type) for the GCM with the Yes distillation.
  (3) Setting in the distillation screen is enabled for the GCM with the Yes distillation.
- When an over limit value is set as a GCM number, “Over limit” is displayed in the line below and the set value is not reflected.
- ATM valve selection is only possible for an ATM valve that can be set by GCM from oven that belongs to SYS and which belongs to GCM. When an ATM valve that is set by another GCM is specified, the error message “Already set in another GCM” is displayed.

Table 5.83 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #						
SYS1 to 6		○				None (default), Yes
ATM valve number		○				None, 1-1, 1-2, 2-1, 2-2, 3-1, 3-2 * On the ATM valve setup screen, only the number set to Installed is selected and displayed.
Strm identifying		○				None, up to 3 streams, up to 7 streams, up to 15 streams, up to 31 streams
DO first number for stream identification		○				(Slot number) − (relative DO number), (0), 1 to 5, When 0 is entered in slot number and relative DO number, 0 is set in the database and asterisk is displayed.
Stream valve first number		○				0 to total of stream valves, the total stream valves are set on the fundamental system settings screen.
Number of stream valves		○				0 to total of stream valves, the total stream valves are set on the fundamental system setting screen. It is necessary that stream valve first number + the number of stream valves is less than or equal to the total number of stream valves.
Distillation		○				NA, Yes

(Example)

GCM 1 = up to 7 streams, stream identification read signal of 1-bit, 3-bit (111) DO first number 1 for stream identification

DO 1: GCM 1 stream identification read signal

DO 2 to 4: GCM 1 stream identification signal

GCM 2 = up to 15 streams, stream identification read signal of 1-bit, 4-bit (1111) DO first number 1 for stream identification

DO 1: GCM 1 stream Identification read signal

DO 2 to 5: GCM 1 stream identification signal

5.4.21 SYS Setup

● Valve set

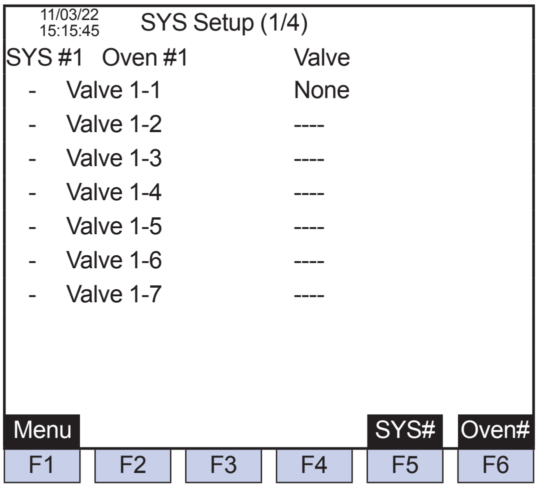


Figure 5.132 Example of SYS setup (1/4) screen

F1 (Menu): Displays the Table menu screen.
F5 (Sys #): Specifies a SYS number.
F6 (Oven #): Specifies an Oven number.

Press F5 (SYS#), and "SYS No.:" is displayed in the second line below.

Use the numeric keypad to input the number and press the Set/Ent key, and the SYS contents of the number is shown.

Press F6 (Oven#), and "Oven No." is displayed in the second line below.

Use the numeric keypad to select the number and press the Set/Ent key, and it is reflected in the second line above, and the valve set of the specified oven is completed.

Point a cursor to the valve and press the Set/Ent key, and options are displayed in the second line below.

Select either Yes or NA (NA is default)

Not installed valves are displayed as ----.

When any of the Not installed valves is used by other SYS, **** is displayed.

In some SYSs, when a valve is set to Yes and other SYS is selected, **** is displayed, "Already set in other SYS" is displayed in the second line below and it cannot be set again even though it is selected.

- Any SYS number that does not exist in F5 (SYS#) cannot be entered.
- Any oven number that does not exist in F6 (Oven#) cannot be entered.

● Detector Setup

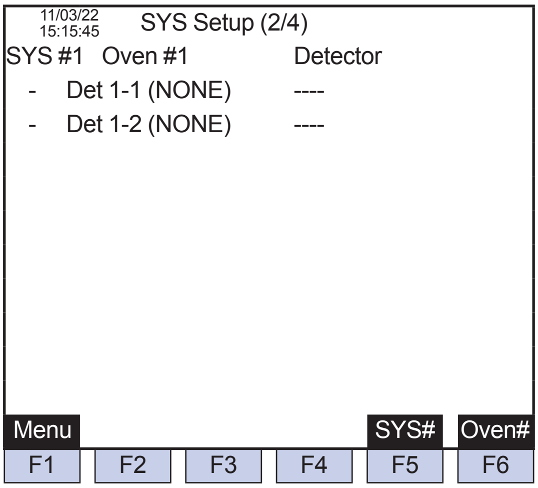


Figure 5.133 Example of SYS setup (2/4) screen

Press F5 (SYS#), and “SYS No.” is displayed in the second line below.

Use the numeric keypad to input the number and press the Set/Ent key, and it is reflected in the second line above and the SYS contents of the number is shown.

Press F6 (Oven#), and “Oven No.” is displayed in the second line below.

Use the numeric keypad to select the number and press the Set/Ent key, and it is reflected in the second line above, and the valve set of the specified oven is completed.

Point a cursor to a detector and press the Set/Ent key, and options are displayed in the second line below.

Select either Yes or NA.

Not installed detectors are displayed as ----.

When any of the Not installed detectors is used by other SYS, **** is displayed.

In some SYSs, when a detector is set to Yes and other SYS is selected, **** is displayed, “Already set in other SYS” is displayed in the second line below and it cannot be set again even though it is selected.

● EPC Setup

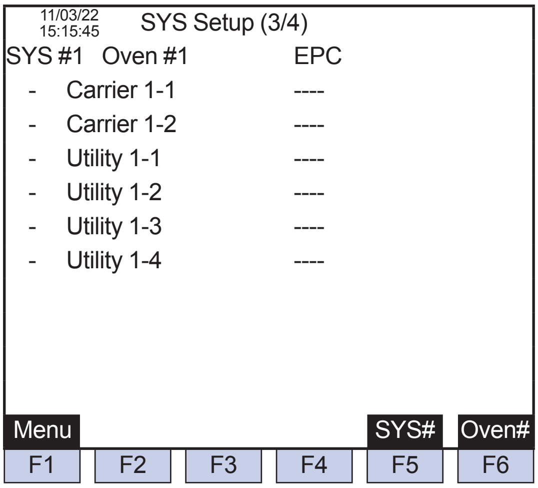


Figure 5.134 Example of SYS setup (3/4) screen

Press F5 (SYS#), and “SYS No.:” is displayed in the second line below.

Use the numeric keypad to select the number and press the Set/Ent key, and the SYS contents of the number is shown.

Press F6 (Oven#), and “Oven No.:” is displayed in the second line below.

Use the numeric keypad to select the number and press the Set/Ent key, and it is reflected in the second line above and the valve set of the specified oven is completed.

Point a cursor to EPC and press the Set/Ent key, and options are displayed in the second line below.

Point a cursor to an item and press the Set/Ent key, and options are displayed in the second line below. Select either Yes or NA and press the Set/Ent key, and the setting is done.

When Yes is selected for either EPC: CarrierN-1 or CarrierN-2 that is set in the Program on the EPC setup screen, EPC program set in the SYS method set is available.

(When Yess are selected for EPC: CarrierN-1, CarrierN-2, and Utility N-1 to N-4 that are set to Constant in the EPC setup screen Yes, enter set values in the Operating Parameters.)

Not installed EPCs are displayed as ----.

When any of the Not installed EPC is used by other SYS, **** is displayed.

In some SYSs, when an EPC is set to Yes and other SYS is selected, **** is displayed, “Already set in other SYS” is displayed in the second line below and it cannot be set again even though it is selected.

- Up to 2 carrier gases set in the program can be set for one SYS.

Oven Setup

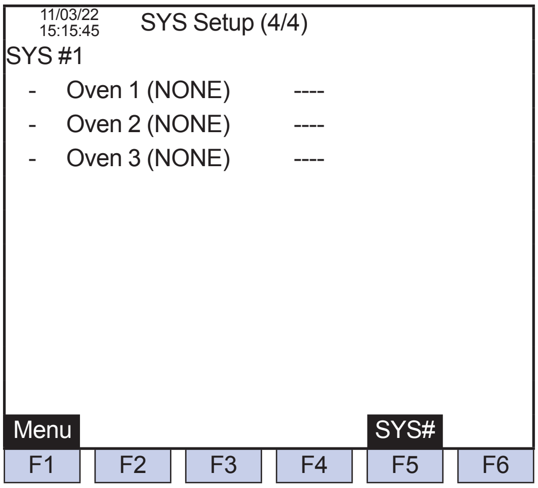


Figure 5.135 Example of SYS setup (4/4) screen

Press F5 (SYS#) and “SYS No.:” is displayed in the second line below.

Use the numeric keypad to select the number and press the Set/Ent key, and the SYS contents of the number is shown.

Point a cursor to selection and press the Set/Ent key, and options are displayed in the second line below.

Select either Yes or NA.

When a programmed temperature oven (Oven) is set to Yes and other SYS is selected, the programmed temperature oven (Oven) is displayed with ****, “Already set in other SYS” is displayed in the second line below and it cannot be set again even though it is selected.

- One programmed temperature oven can be set for one SYS. One SYS cannot accept two programmed temperature ovens.

Table 5.84 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
SYS #			1	6		
Oven #			1	3		
Valve	Valve set	○				NA (default), Yes Some inputs disabled
detector	Detector type Display					
	Detector Setup	○				NA (default), Yes Some inputs disabled
Carrier	EPC Setup	○				NA (default), Yes Some input disabled

5.4.22 User Programming

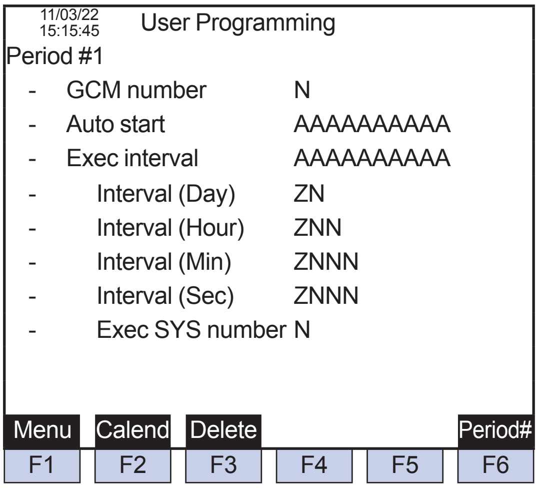


Figure 5.136 Example of User Programming screen (Period script)

F1 (Menu): Displays the Table menu screen.
F2 (Calend): Displays the User Programming screen (End of peak detection script).
F3 (Delete): Displays the period script delete screen.
F6 (Period #): Specifies a Period script number.

- If a peak is not assigned to the stream set for the specified GCM number, an error occurs when period script is executed.
- When a GCM number is 0, all set values including the GCM number are displayed as * (asterisk).

Table 5.85 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Period #	Period script Number		1	64		
GCM Number		○	0	6		
Auto Start		○				Not done (not executable) Done (executable)
Exec Interval		○				Date Hour Minute Second Ana end
Interval (Date)		○	1	31	Date	When not selected by Cycle Time Unit, please display with asterisk. However, leave internal data as they are.
Interval (Hour)		○	1	148	Hour	
Interval (Minute)		○	1	1440	Minute	
Interval (Second)		○	1	3600	Second	
Exec SYS Number		○	1	6		Only SYS numbers belonging to relevant GCM can be selected. When Ana end is not selected in the Cycle Time Unit, display * (asterisk). * When Exec interval is Ana end, the relevant period script is executed at the time of Ana end for the specified SYS number.

User Program Delete Screen (Period script)

Press F3 (Delete).

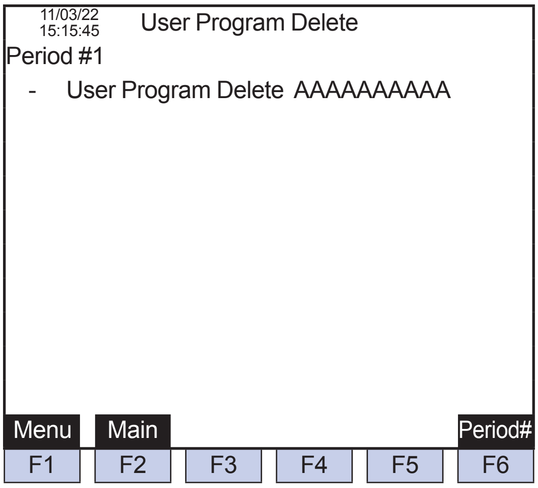


Figure 5.137 Example of User Program Delete (Period script) screen

F1 (Menu): Displays the Table menu screen.
F2 (Main): Displays the User Programming screen (Period script).
F6 (Period #): Specifies a Period script number.

- The operation accepts user level above C only.
- When Delete is selected in the User Program Delete, the relevant period script file is deleted. When a script is deleted, the auto start of the script is automatically changed to NA. Any period script in the status Enable cannot be deleted (an error message is displayed).
- When the execution status is Enable and the user program is about to be deleted, the error message “No execution because of executing” is displayed.

- Even when the user program is deleted, the script file in the SD card is not deleted. However, the script on the user program is deleted.

Table 5.86 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Period #	Period script Number		1	64		
User Program Delete		○				Do not delete Delete

User Programming Screen (End of peak detection script)

Press F2 (Calend).

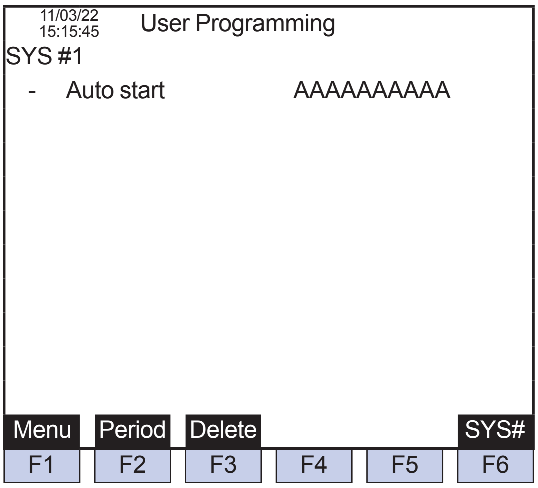


Figure 5.138 Example of User Programming screen (end of peak detection script)

F1 (Menu): Displays the Table menu screen.
F2 (Period): Displays the User programming screen (Period script).
F3 (Delete): Displays the end of peak detection script delete screen.
F6 (SYS #): Specifies an End of peak detection script number

- Any SYS # number that does not exist in F6 (SYS #) cannot be entered.

Table 5.87 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
SYS #						
Auto Start		○				Not done (not executable) Done (executable)

● User Program Delete Screen (End of peak detection script)

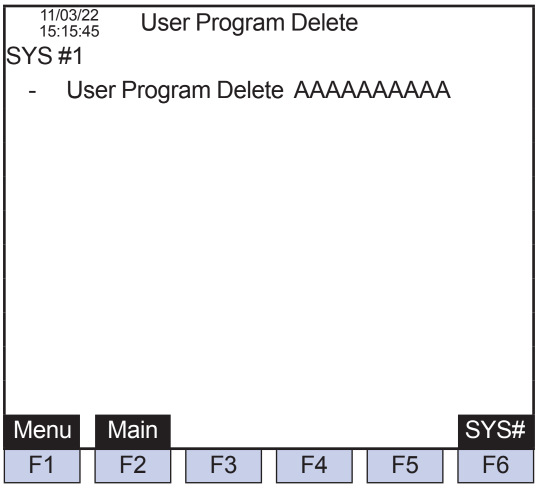


Figure 5.139 Example of User Program Delete screen (End of peak detection script)

F1 (Menu): Display the Table menu screen.
F2 (Main): Display the User Programming screen(period script).
F6 (SYS #): Specifies an End of peak detection script number

- The operation accept user level above C+ only.
- When Delete is selected for User Program Delete, the relevant end of peak detection script file is deleted. When a script is deleted, the auto start of the script is automatically changed to NA. Any peak detection script in the status Enable cannot be deleted (an error message is displayed).
- When the execution status is Enable and the user program is about to be deleted, the error message “No execution because of executing” is displayed.
- Even when the user program is deleted, the script file in the SD card is not deleted. However, the script on the user program is deleted.

Table 5.88 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
SYS #						
Delete User Program		○				0) Do not delete 1) Delete

5.4.23 SimDis Setup

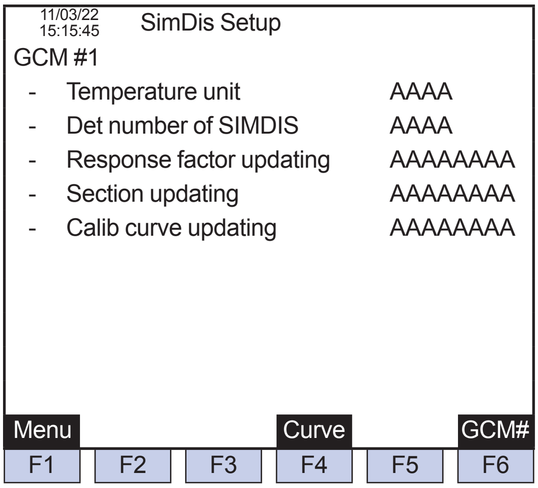


Figure 5.140 Example of SimDis Setup screen

F1 (Menu): Displays the Table menu screen.
F4 (Convert): Displays the SimDis Calib Data Set screen.
F6 (GCM #): Specifies a GCM number.

When setting an over limit value as a GCM number, the message “Over limit” is displayed in the bottom line and the set value is not reflected. For GCM set as NA for distillation on the GCM setup (2/2) screen, “No distillation analysis” is displayed at the bottom line and setting is not reflected.

When the response factor updating is set to Yes, the response factor f on the peak setup-specific screen of the cal run stream used by the set GCM is automatically updated.

When the section updating is set to Yes, the Section set start on the peak set-up specific screen of the cal run stream used by the set GCM is automatically updated.

When the calib curve updating is set to Yes, the calib curve coef a and the calib curve coef b on the SYS method set (2/4) screen are automatically updated.

- Det number of SIMDIS
  Only detectors assigned to relevant GCM can be set up. On the GCM setup screen, the SYS number belonging to each GCM is detectable and the detector number belonging to each SYS on the SYS setup screen (2/5) can be detected.

Table 5.89 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM Number					
Temp Unit		○				0) °C 1) Fahrenheit (Refer to SI unit limitation)
Det number of SIMDISM		○				0) NA 1) 1-1 2) 1-2 3) 2-1 4) 2-2 5) 3-1 6) 3-2 Only detectors assigned to relevant GCM can be set up.
Response factor updating		○				Not done, Done
Section updating		○				Not done, Done
Calilb curve updating		○				Not done, Done

SimDis Calib Data Set

Press F4 (Convert).

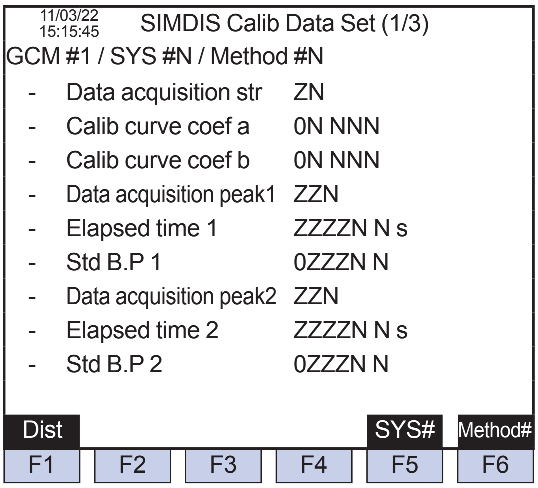


Figure 5.141 Example of SimDis Calib Data Set (1/3) screen

F1 (Dist): Displays the SimDis Setup screen.
F5 (SYS #): Specifies a SYS number.

When F5 (SYS #) is pressed, “SYS No.:” is displayed on the second line below. Use the numeric keypad to enter the number and press the SET/ENT key, and a cursor jumps to the SYS number. Only the SYS numbers set in GCM is selectable. When any other number is entered, “Over limit” is displayed on the second line below.

- F6 (Method #): Specifies a Method number.

- The GCM number displayed on the second line above is the same as the one set on the SimDis Setup screen.
- Data acquisition streamSet the cal run stream number acquired for acquiring data to compile a SimDis calib curve. On the stream setup screen, when a stream number with other stream type than Cal run is about to be set, the error message “No cal run stream” is displayed on the second line below.
- Calib curve coef a & b
  Linear ramp a & slice b of a SimDis Calib curve. Auto updating and manual entry are possible.
- Data acquisition peak 1 to 8
  Set peak number of the cal run stream to acquire data used to compile a SimDis calib curve.
- Elapsed Time 1 to 8, Standard B.P. 1 to 8
  Curve data of a SimDis Calib curve. Auto updating and manual entry are possible.
- When GCM cal run stream set to Yes for calib curve updating on the SimDis Setup screen is executed, the peak retention time acquired by executing cal run stream and Standard B. P. data on the corresponding peak set-up specific screen are used to calculate time date beyond Elapsed Time 6 set in the SYS method (from cal setup screen the corresponding stream number can identify SYS method number) to update the calib curve coef a and the calib curve coef b. Again, the retention time acquired through the activated cal run stream is set to Elapsed Time and the standard B.P. set in Peak Setup-Specific is updated to the Standard B.P.

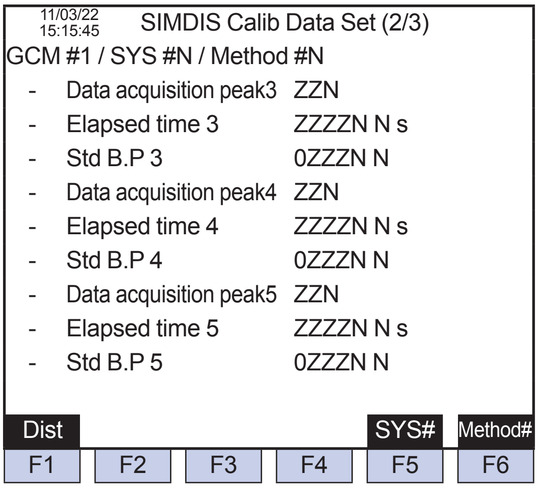


Figure 5.142 Example of SimDis Calib Data Set (2/3) Screen

F1 (Dist): Displays the SimDis setup screen.

F5 (SYS #): Specifies a SYS number.

When F5 (SYS #) is pressed, “SYS Number:” is displayed on the second line below. Use the numeric keypad to enter the number and press the SET/ENT key, and a cursor jumps to the SYS number. However, only SYS numbers set in GCM are selectable, when any other number is entered, “Over limit” is displayed on the second line below.

F6 (Method #): Specifies a Method number.

Table 5.90 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
GCM #	GCM Number					
SYS #	SYS Number	○				
Method #	Method number	○				
Data acquisition stream		○	0	31		
Calib curve coef a		○	−9.999	9.999		
Calib curve coef b		○	−999.999	999.999		
Data acquisition peak 1 to 8		○	0	999		
Elapsed Time1 to 8		○	0.0	21600.0		
Standard B.P.1 to 8		○	−9999.9	9999.9		

5.4.24 User Setup (User Defined)

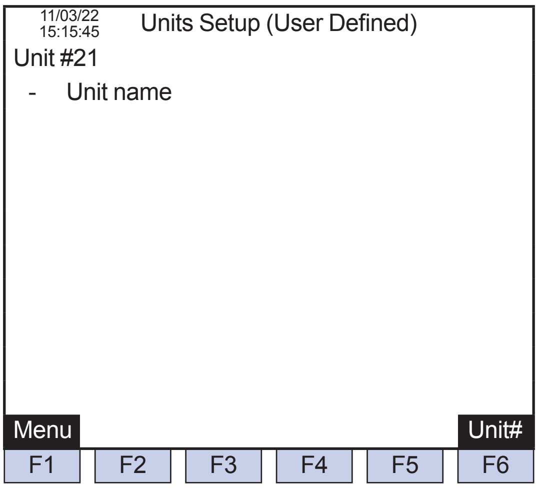


Figure 5.143 Example of User Setup (User Defined) screen

F1 (Menu): Displays the Table menu screen.
F6 (Unit #): Enters User defined unit numbers.

Table 5.91 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
Unit #	User defined unit number	○	21	100		
Unit Name	Unit name	○				8 one-bite alphanumeric characters

5.4.25 MODBUS Client Setup

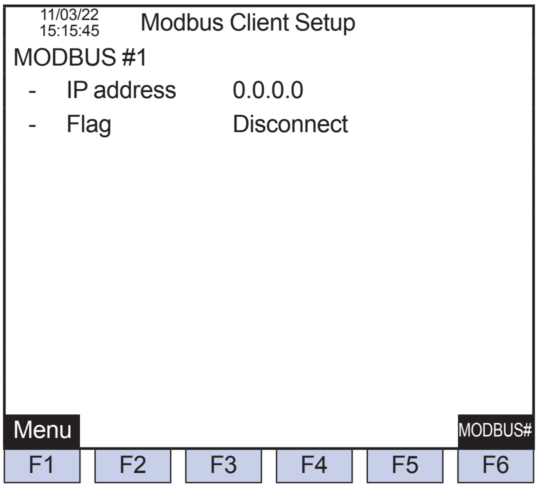


Figure 5.144 Example of MODBUS Client Setup screen

F1 (Menu): Displays the Table menu screen.
F6 (MODBUS): Sets a MODBUS number.

Up to 20 GCs which enable communication between GC are able to be registered on the LCD screen. The procedure is as follows.

1. Press F6 (Modbus #), and the setup screen is selected.
2. Set the IP address of the GC of the connection destination and change the flag to Connect.

Note: While the GC of the connection destination remains Connect, it cannot be re-registered on another setup screen. A message advising that the same GC cannot be registered is displayed.

Table 5.92 Display data list

Display	Name	Set	Lower Limit	Upper Limit	Unit	Remarks
MODBUS #	MODBUS Number	○	1	20		
IP address		○				
Flag		○				Disconnect, Connect

6. Maintenance

Instrument modification or part replacement must be conducted by the personnel of Yokogawa or its assigned representative only. The contents of this chapter must be conducted by Yokogawa service staff or a person with a proper training.

6.1 Maintenance and Inspection

6.1.1 Explosion-protection Structure

When performing maintenance, first inspect the system according to the instructions given in Table 6.1 before operating, in order for the explosionproof performance to be maintained.

If the following damages occurred, contact Yokogawa service center:

(1) Damage around the screws on the protection system (flameproof structure).

(2) Damage to any enclosure surface or transparent part.

(3) Any crack or excessive deformation to any of the gaskets.

Table 6.1 Maintenance and Inspection

Item	Method	Criterion	Corrective Action
Enclosure	Visual	No damage	Contact YOKOGAWA
Touch panel surface	Visual	No damage	Contact YOKOGAWA
Setscrew	Visual and by touch	No looseness, dust or rust	Retighten and clean, and contact YOKOGAWA
Gaskets	Visual	No cracks or excessive deformation	Contact YOKOGAWA
Cable inlet	Visual and by touch	No damage, deterioration or looseness	Retighten or replace
Terminal	Visual and by touch	No looseness or dirt on insulators	Retighten , parts change and clean

6.1.2 Stopping the system

Unless in case of an emergency, stop the system according to “3.3.4 Stopping operation” and then turn off the power.

6.1.3 Routine Inspection

The routine maintenance inspection must be done according to Table 6.2. In the inspection, confirm that all of the readings are consistent with the values indicated in the operation data. These readings, if previously entered on the Operation Condition display menu, can also be confirmed on the screen as well.

Since these inspection items vary depending on the instrument specifications, select as required according to the specifications.

Table 6.2 Inspection Items

Item	Recommended Interval
Reading of pressure gauge on carrier gas cylinder	24 hours
Reading of carrier-gas pressure gauge	24 hours
Reading of sample-gas pressure gauge	24 hours
Reading of sample-gas flowmeter	1 to 7 days
Reading of sample-gas bypass flowmeter	1 to 7 days
Reading of purge-air pressure gauge	24 hours
Readings of pressure gauges on the hydrogen gas for combustion and nitrogen gas cylinders	1 to 7 days
Readings of pressure gauges for hydrogen gas for combustion and nitrogen gas	1 to 7 days
Reading of pressure gauge for combustion air	24 hours
Current temperatures of isothermal and programmed-temperature ovens, etc.	1 to 7 days
Calibration coefficient	1 to 7 days
LSV sample leak	7 days
Steam temperature adjustment at the sampling section	7 days

6.1.4 Cylinder

After replacing the cylinders for carrier gas, FID or FPD hydrogen gas for combustion, air, or standard gas, always perform a leak test on the couplings around the regulators on the cylinder. The leak test must be conducted two or three times every day, for the three days after replacing a cylinder.

Ensure that the air is discharged from the system when replacing a cylinder. The installation of a valve for discharging air is recommended.

6.1.5 Leak Test

After replacing or repairing any of the parts for pipes located inside or outside the instrument, always check the connections for possible leaks. This checkup procedure is called a leak test.

During a leak test, keep the pipes pressurized, apply soap water (Snoop or equivalent) to the connections and check for possible leaks.

If a leak is found, retighten the connection or replace any defective parts and conduct leak test again.

Wipe off soap water after the test.

Please note that any leak in the plumbing parts or connections may not only cause bad analysis results or increase the gas consumption, but also could result in safety issues.

6.1.6 Checking Chromatograms

After replacing any of the parts of the system, resume operation, record chromatograms several times and compare the results with those shown in the Operation Data to ensure that the system continues normal operations.

6.1.7 Recommended Parts List for Periodical Replacement

Table 6.3 is a list of parts that will require periodical replacement and their standard replacement interval. The replacement interval differs depending on the process sample specifications and the condition of use. Replace parts according to the adequate cycle to your GC8000. The replacement interval is just a guide line. The actual replacement timing should be determined by the customer’s experience in operating the system. The replacement interval does not mean that the system is under warranty during the interval.

Table 6.3 Recommended Parts List for Periodical Replacement

Item	Name	Part Number	Replacement Interval	Note
Rotary Valve	Valve Seat	K9409ZA	100,000 cycles	CSW (Rulon) (2xK9034DN)
		K9034FF		0.33 μL (Rulon)
		K9409ZE		1 μL (Rulon) (2xK9034DS)
		K9409ZD		2 μL (Rulon) (2xK9034DR)
		K9409ZC		3 μL (Rulon) (2xK9034DQ)
		K9409ZB		Over 10 μL (Rulon) (2xK9034DP)
		K9034FR		CSW (Teflon)
		K9402XX		0.33 μL (Teflon)
		K9034FL		1 μL (Teflon)
		K9034FK		2 μL (Teflon)
		K9034FJ		3 μL (Teflon)
		K9034FH		Over 10 μL (Teflon)
	Valve Gland	K9034BA	5-years	CSW (SUS316)
		K9034BP		0.33 to 3 μL (SUS316)
		K9034BJ		10 μL (SUS316)
		K9034BH		25 μL (SUS316)
		K9034BG		50 μL (SUS316)
		K9034BB		360 μL or more (SUS316)
		K9034GX		CSW (Hastelloy C)
		K9034GV		0.33 to 3 μL (Hastelloy C)
		K9034GS		25 μL (Hastelloy C)
		K9034GR		50 μL (Hastelloy C)
		K9034GN		360 μL or more (Hastelloy C)
Liquid Sampling Valve	Seal Element	K9402VG	50,000 cycles	Rulon
		K9402VH		Teflon
	O-ring	K9402UN	2-years	
Filter	Element	L9862AG	1-year	
	Gasket	L9862AC	1-year	
		L9862AD		
Stream Switching Valve	Diaphragm	K9192WL	3-years	Viton + Teflon
		K9192WV		Silicone + Teflon
Oven	Heater	K9409GE	5-years	Isothermal Oven, 100 V, 110 °C or below
		K9409GN		Isothermal Oven, 100 V, over 110 °C
		K9409GF		Isothermal Oven, 110 V, 110 °C or below
		K9409GP		Isothermal Oven, 110 V, over 110 °C
		K9409GG		Isothermal Oven, 115 V, 110 °C or below
		K9409GB		Isothermal Oven, 115 V, over 110 °C
		K9409GH		Isothermal Oven, 120 V, 110 °C or below
		K9409GC		Isothermal Oven, 120 V, over 110 °C
		K9409GS		Isothermal Oven, 200 V
		K9409GT		Isothermal Oven, 220 V
		K9409GU		Isothermal Oven, 230 V
		K9409GV		Isothermal Oven, 240 V
	Turbine	K9400FA	5-years	
	Packing	K9803SX	5-years	For large isothermal oven
		K9803SW		For standard isothermal oven
	Vortex tube	K9803HE	5-years	For FPD

6.2 Procedure for Replacing Parts

● Precautions for Parts Replacement

(1) Always observe the instructions in this manual when replacing parts.

(2) When disconnecting pipes, do not allow any oil or moisture to get inside the pipes.

(3) When cleaning inside of a pipe, do not use any solvent containing non-volatile impurities, as they will contaminate inside of the pipe and will prevent normal analysis. This contamination might necessitate parts replacement to restore the system to normal.

When the pipes need to be cleaned, use highly-pure acetone.

(4) After replacing piping parts, always perform leak tests.

This section shows the replacement procedures for the maintenance (replacement) parts that are used in the following sections of GC8000.

1. Protection system
2. Electronics section
3. Pressure and flow control section
4. Isothermal oven
5. Sample processing section (GCSMP)

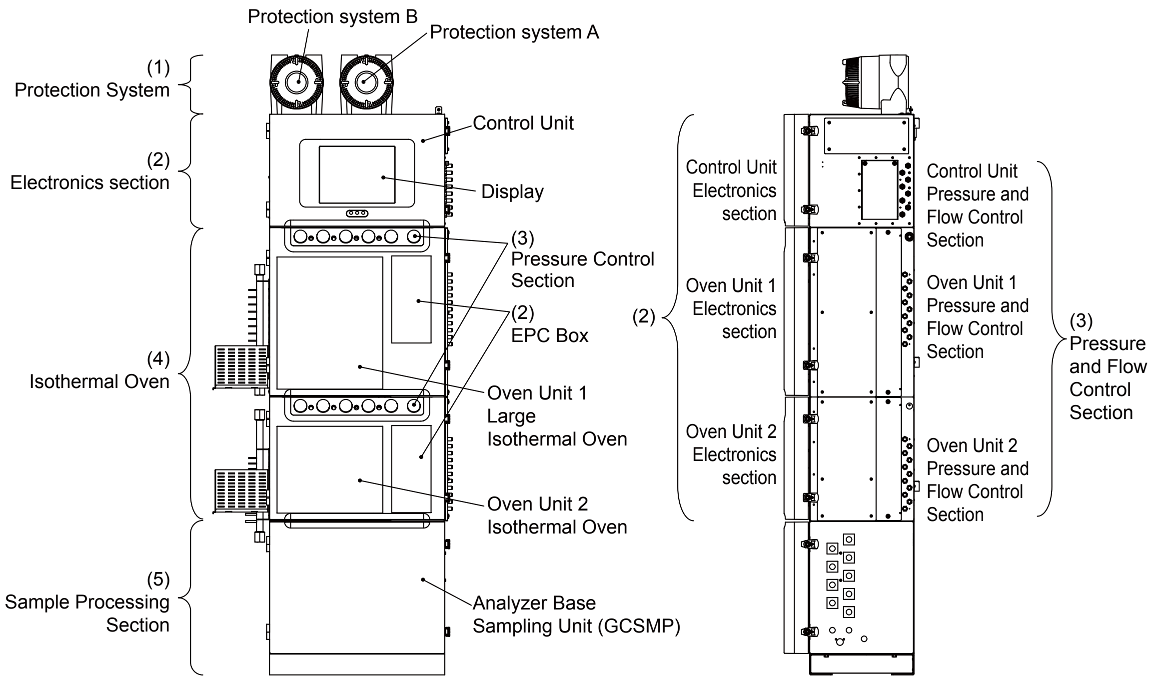


Figure 6.1

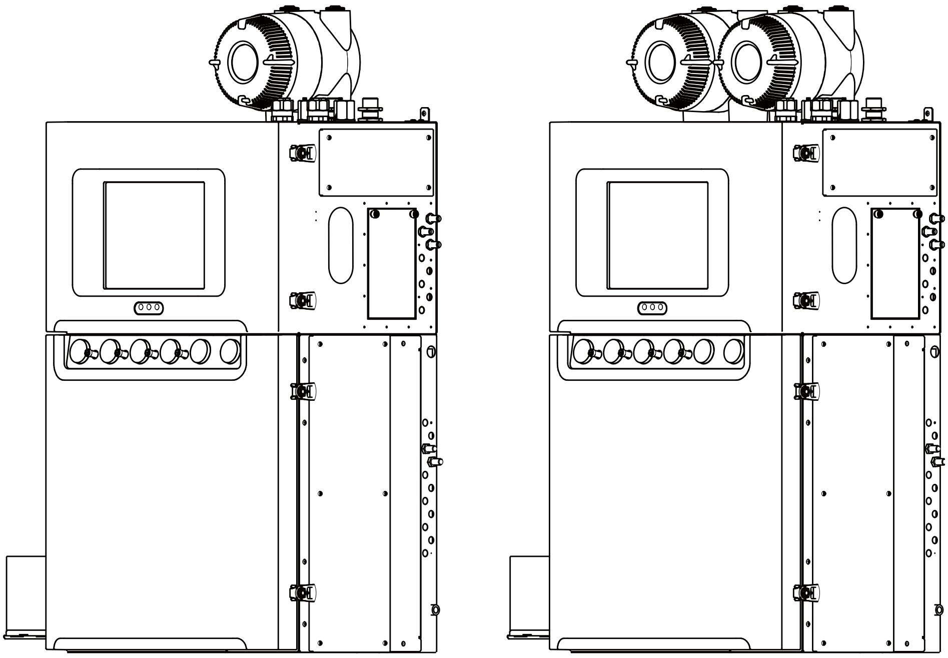
Confirm the location of each replacement part referring to Figure 6.1.

6.2.1 Parts for the Protection system

The instructions for replacing parts in the protection system are explained.

(1) Pressure switch
(2) Fuse
(3) Relay and Relay board

There are 2 types of protection systems depending on type of GC8000, as shown in Fig. 6.2. No enclosure is mounted for FM/CSA explosionproof Y-purge type.



(a) One enclosure (b) Two enclosures

Figure 6.2

(1)Pressure Switch for Detecting Internal Pressure

This pressure switch detects the pressure inside the electronics section. The pressure switch is installed on the protection system and set to turn off at 392 ±20 Pa.

(1) Stop the operation (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

(3) Confirm that the LED (Green) of “POWER” is OFF.

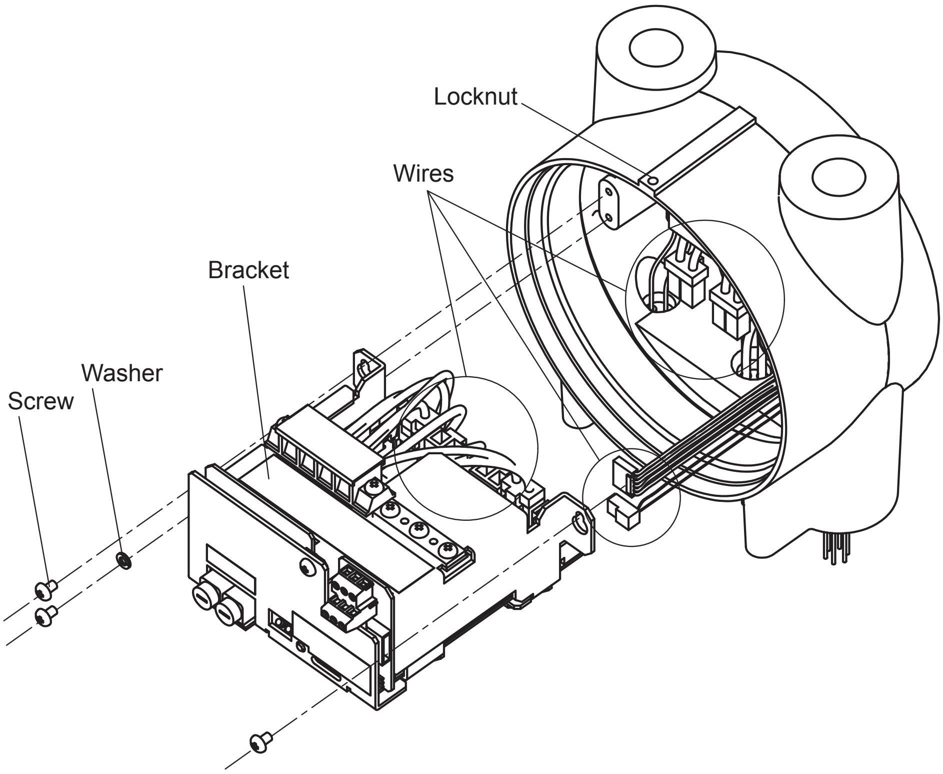
CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

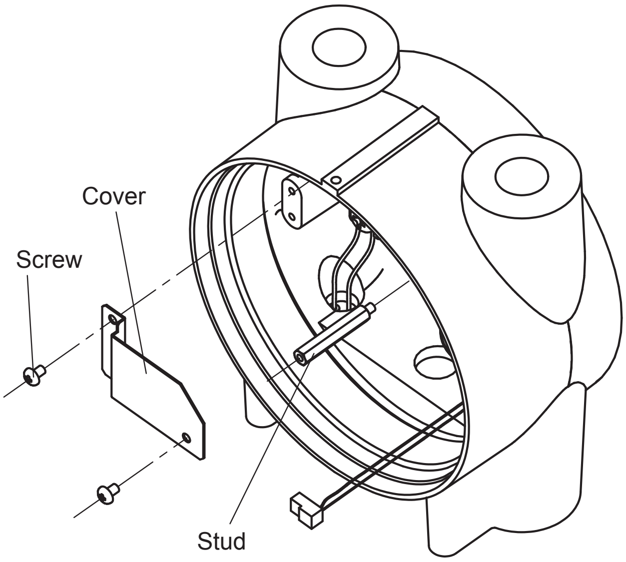
(4) Turn off the purging air.

(5) Loosen the locknuts on the cover for the protection system A of the right side and remove the cover.

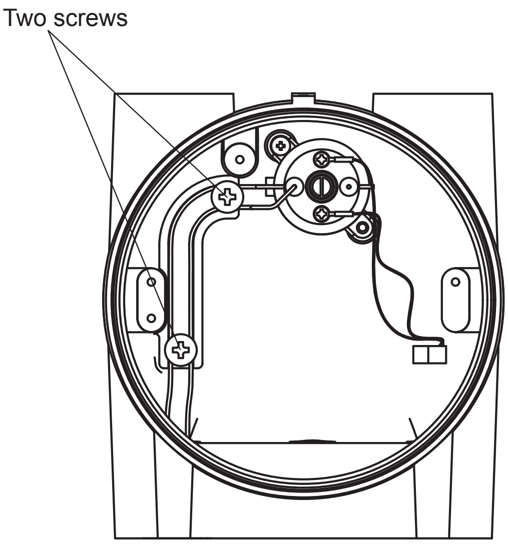
(6) Disconnect the customer wiring. Then remove screws and washers, disconnect the wires, and remove the bracket.



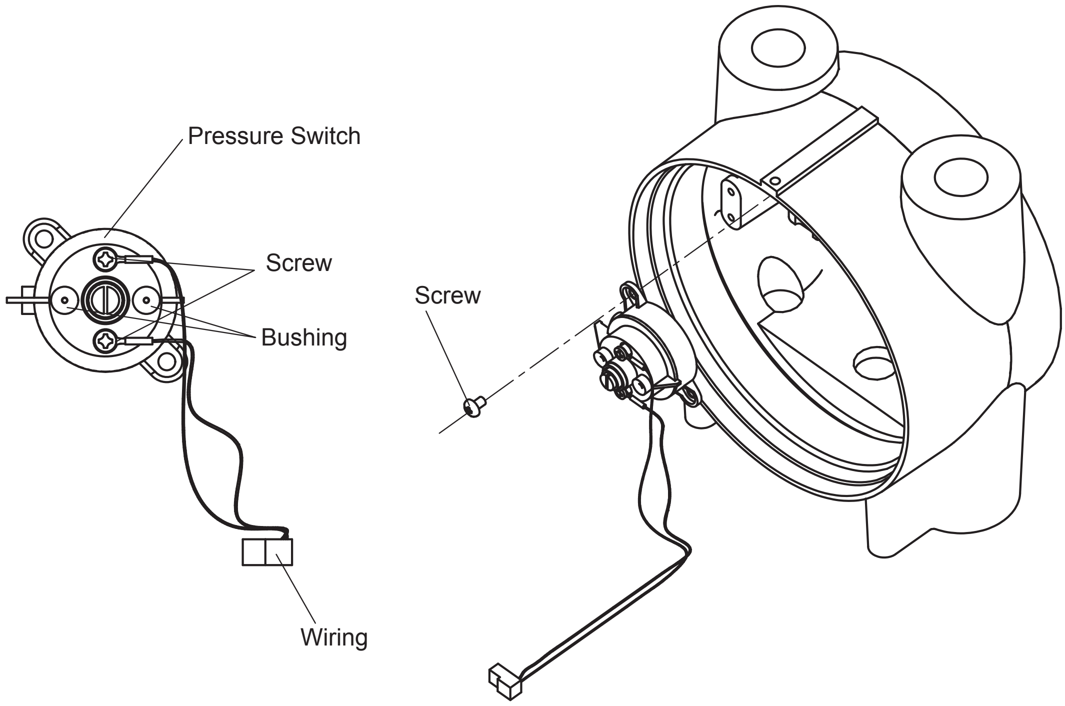
(7) Remove the cover, stud, and screws as shown below.



(8) Remove the screws shown below.



(9) Remove the two screws shown below to disconnect wiring from the pressure switch. Remove the screw, the pipe, and then the pressure switch.



(10) Replace the pressure switch, and follow directions (6) to (9) in the reverse order.

(11) Remove a pin from the bushing of the pressure switch to install a new pressure switch. Insert the pipe straight into the bushing so as not to deform it.

Confirm that the piping and wiring are correct.

(12) Install the cover on the protection system. Rotate the cover until it stops, and then tighten the locknut.

<Replacement Parts>

K9401JG

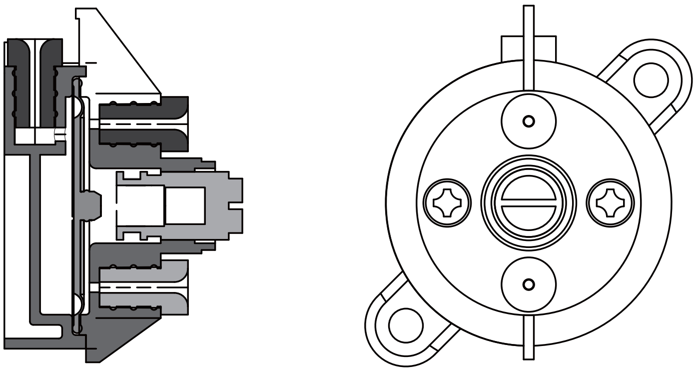


Figure 6.4 Pressure Switch for Detecting Internal Pressure

(2)Fuses

The fuses discussed here are installed in the power line to the protection system. They are housed in the container of the protection system A on the right side.

(1) Stop the operation (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

(3) Confirm that the LED (Green) of “POWER” is OFF.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(4) Loosen the locknut on the cover for the protection system A on the right side and remove the cover.

(5) The fuses are located on the front side, as shown in Figure 6.5.

(6) Use a flathead screwdriver to rotate the fuse holder cap counterclockwise and remove it from the fuse holder.

(7) Replace the fuse in the fuse holder cap with a new one.

Fuse rating	Dimensions:	ø5.2 × 20 mm
	Rated voltage:	250 V AC
	Rated current:	1.25 A
	Fusing time:	Time-delay fusing type

(8) Confirm that the fuses are securely installed in the cap.

(9) Push the cap into the fuse holder until secured.

(10) Confirm that the cap is firmly installed on the fuse holder.

(11) Install the cover on the protection system. Rotate the cover until it stops, then tighten the locknut.

<Replacement Parts>

A1423EF

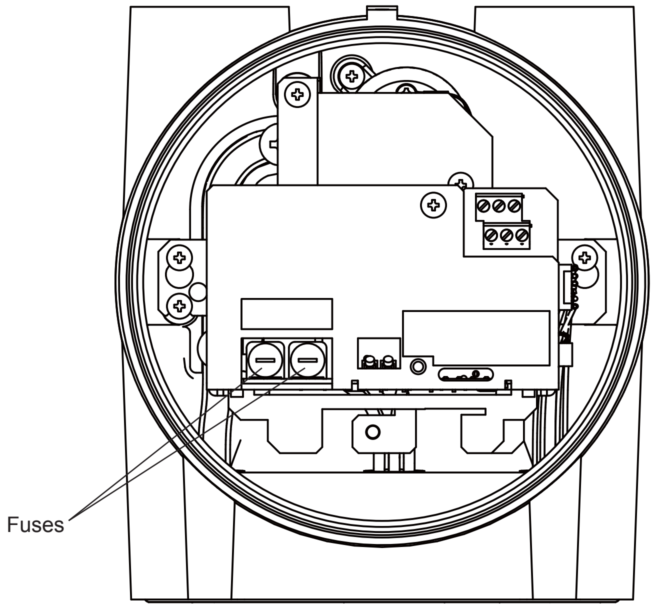


Figure 6.5

(3)Relays and Relay boards

There are two types of relays depending on the specifications.

- **One protection system (see Figure 6.2 (a))**
  The relays are installed on the relay board in the protection system A. See “A. Relay board” below to replace the relay board.
- **Two protection systems (see Figure 6.2 (b))**
  The relays are installed inside the protection system B on the left side. See “A. Relay board” and “B. Relays” below to replace the relay board and the relay.

A. Relay board

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

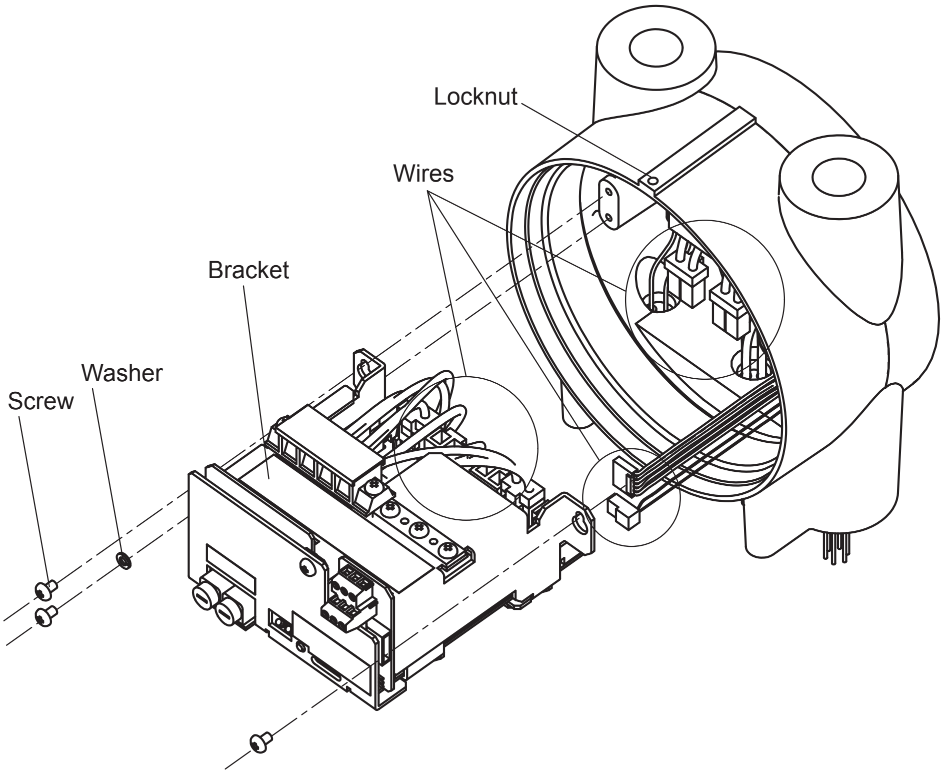
(3) Confirm that the LED (Green) of “POWER” is OFF.

CAUTION

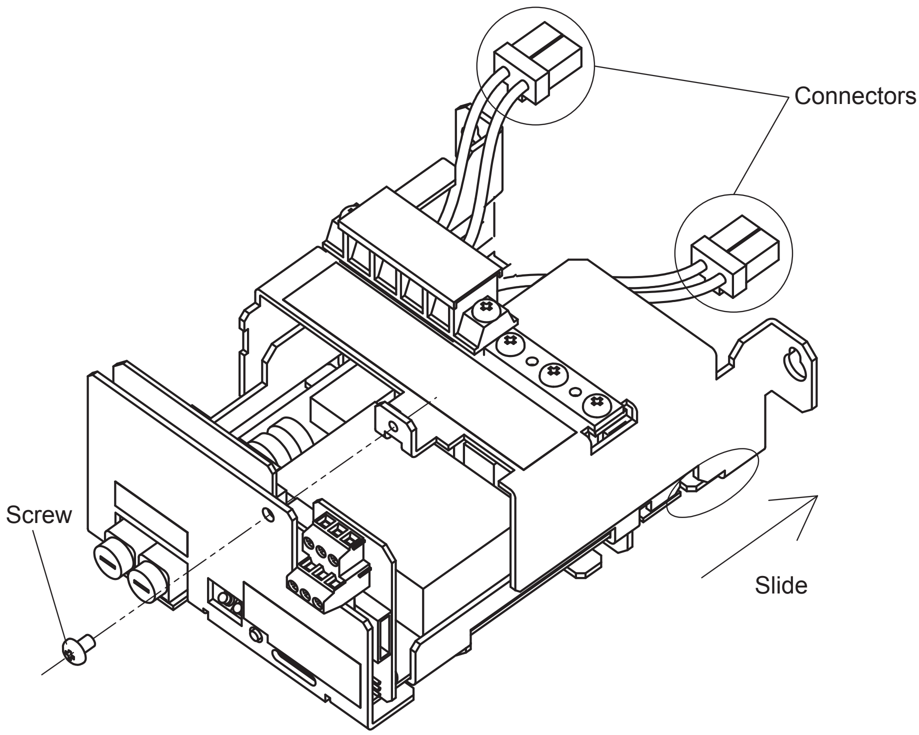
The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(4) Loosen the locknut on the cover for the protection system A on the right side and remove the cover.

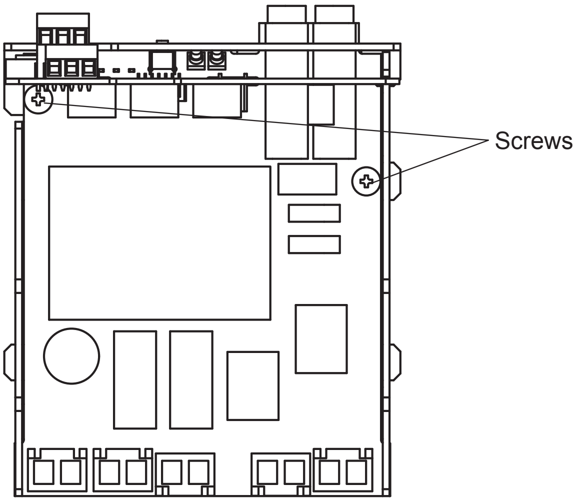
(5) Disconnect the customer wiring. Remove the screws shown below. Disconnect the wires and remove the bracket.



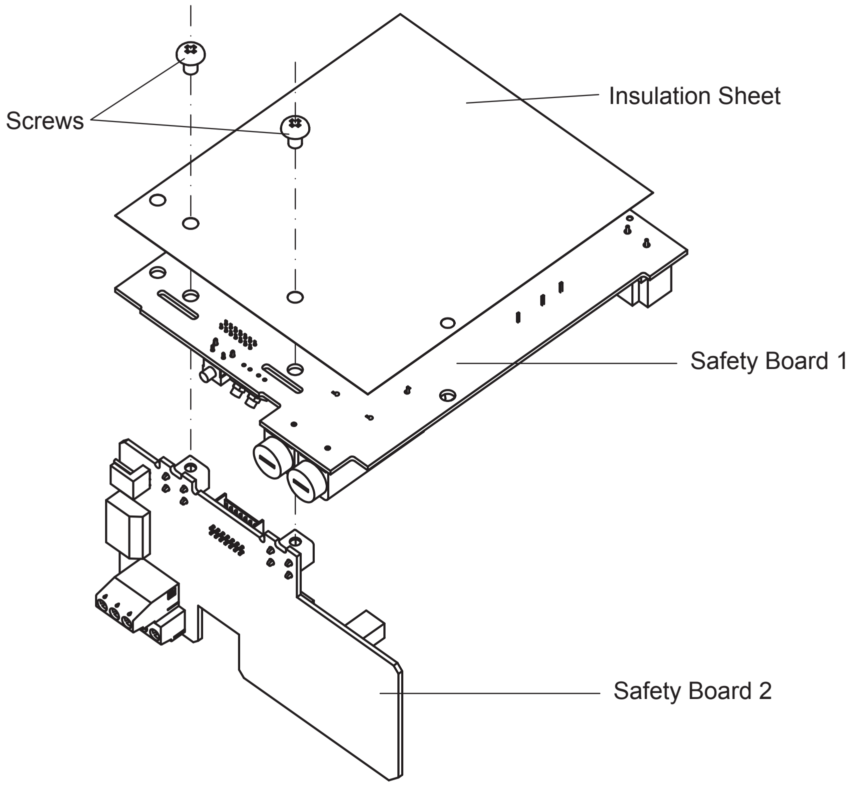
(6) Disconnect the connectors from the board. Remove the screws. Slide out the sheet metal part to remove.



(7) Remove the screws shown below and remaining connecters, if any, to remove the board from the assembly.



(8) Remove the two screws shown below to disconnect the connectors between the boards.



(9) After replacing the board, follow steps (5) to (8) in the reverse order.

(10) Confirm that the connectors are placed in the correct locations.

(11) Install the cover on the protection system. Rotate the cover until it stops, then tighten the locknut.

<Replacement Parts>

K9800SB	100 V Specification (Safety board 1)
K9800TB	100 V/200 V Specification (Safety board 2)
K9800SD	200 V Specification (Safety board 1)

B. Relays

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

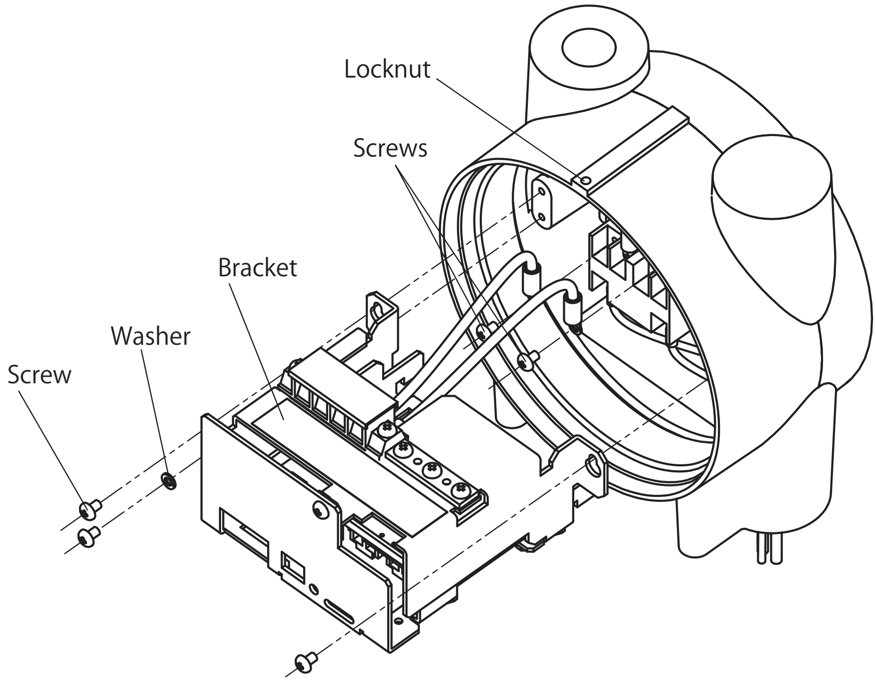
(3) Confirm that the LED (Green) of "POWER" is OFF.

⚠ CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

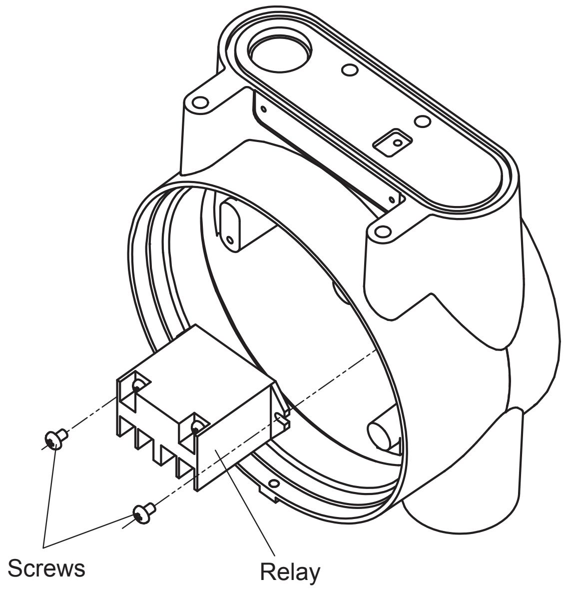
(4) Loosen the locknut on the cover for the protection system B on the left side and remove the cover.

(5) Remove the screws shown below. Disconnect the wires and remove the bracket.



(6) Remove the wires for the relays and the bracket.

(7) Remove the screws shown below and replace the relay.



(8) Follow steps (5) and (6) in the reverse order, and install wires on the bracket.

(9) Install the cover on the protection system. Fully rotate the cover until it stops, then tighten the locknut.

<Replacement Parts>

A1852MR (100 V)

A1853MR (200 V)

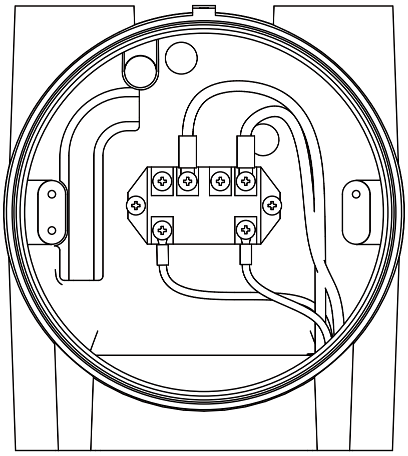


Figure 6.7

6.2.2 Components for Electronics section

The instructions for replacing parts in the electronics section are explained.

(1) Miscellaneous cards
(2) HMI unit
(3) Fuse
(4) Solenoid valve
(5) Pressure switch
(6) EPC

(1)Miscellaneous Cards

Replacement cards are pre-adjusted before shipment and should be installed as received.

Follow the procedures below when replacing cards.

(1) Stop the operation (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

(3) Open the control unit door or the cover for the electronics section for the oven unit, depending on the card to be replaced.
Use a key or hexagon wrench included in the accessory kit to open the door or the cover.

CAUTION

- Never remove or insert cards while the power is ON, as it may cause malfunctions.
- Always hold the handle of the card when removing or inserting it.

Note

Cards are installed within the pressurized enclosure. They must be installed in the original condition to ensure explosionproof functionality.

(4) Disconnect the cables to the card, if any.
(5) Loosen the two screws to remove the card stopper.
(6) Hold the handle of the card and pull it out from the rack.

Note

- Always install a new card in the place of the card being replaced.
- The name of the card is labeled on the upper section of the rack. Insert the card into the correct slot.
- Never customize by replacing with different function cards etc.

(7) Install a new card in the place of the card being replaced.
(8) Mount the card stopper and tighten the two screws.
(9) Close the control unit door and the electronics section cover for the oven unit.
(10) Reconnect cables, if any.

<Replacement Parts>

Item	No.	Board Name	Part Number (AS)	Note
Control Section	1	CTRL CPU Card	K9802AA	Control CPU (Ether × 1) * SHDSL
			K9802AB	Control CPU (Ether × 2)
			K9802AC	Control CPU (Ether × 1, Media Converter × 1)
			K9802AD	Control CPU (Ether × 2, Media Converter × 2)
			K9802AE	Control CPU without batteries (Ether × 1) * SHDSL
			K9802AF	Control CPU without batteries (Ether × 1, Media Converter × 1)
			K9802AG	Control CPU without batteries
			K9802AK	Control CPU without batteries (Ether × 2, Media Converter × 2)
	2	COM Card	K9802CA	COM (2Port)
			K9802CB	COM (1Port)
	3	UP Card	K9802DA	UP
	4	AI Card	K9802EA	AI(V)
			K9802EB	AI(I)
	5	AO Card	K9802FA	AO(Separate)
			K9802FB	AO(All)
	6	DIO Card	K9802GA	DIO (DC)
			K9802GB	DIO (AC)
	7	DI Card	K9802HA	DI
	8	DO Card	K9802JA	DO (DC)
			K9802JB	DO (AC)
	9	Safety 3 Board	K9802LA	Safety 3 (Type 3, X Purge)
			K9802LB	Safety 3 (Type 3, Y Purge)
			K9802LC	Safety 3 (Type 2, X Purge)
			K9802LD	Safety 3 (Type 2, Y Purge)
			K9802LE	Safety 3 (Type 1, X Purge)
			K9802LF	Safety 3 (Type 1, Y Purge)
	10	Status Board	K9802MA	Status Board
	11	EV Board	K9802NA	CTRL EV Board

Item	No.	Board Name	Part Number (AS)	Note
Oven	12	Oven CPU Card	K9804AA	I. Oven CPU T1
			K9084AB	I. Oven CPU T2
			K9804AC	I. Oven CPU T3
			K9804AD	I. Oven CPU T4
			K9804AE	C. Oven CPU T1
			K9804AF	C. Oven CPU T2
			K9804AG	C. Oven CPU T3
			K9804AK	C. Oven CPU T4
	13	TCD Card	K9804BA	TCD Card
	14	FID Card	K9804CA	FID + MC (6M)
			K9804CB	FID + MC (20M)
			K9804CC	FID + MC (60M)
			K9804CD	FID + MC (200M)
			K9804CE	FID + MC (600M)
			K9804CF	FID + MC (1G)
			K9804CG	FID + MC (2G)
			K9804DA	FID (6M)
			K9804DB	FID (20M)
			K9804DC	FID (60M)
			K9804DD	FID (200M)
			K9804DE	FID (600M)
			K9804DF	FID (1G)
			K9804DG	FID (2G)
	15	TEMP Card	K9804FA	TEMP Card (T1)
			K9804FB	TEMP Card (T2)
			K9804FC	TEMP Card (T3)
			K9804FD	TEMP Card (T4)
	16	FPD Card	K9804GA	FPD Card
	17	Oven EV Board	K9804JA	Oven EV Board (I)
			K9804JB	Oven EV Board (O)
	18	Safety 4 Board	K9804LA	Safety Board4 (+LSV, FPD)
			K9804LB	Safety Board4 (Oven only)
			K9804LC	Safety Board4 ATEX (+LSV, FPD)
			K9804LD	Safety Borad4 ATEX (Oven only)
Pressurized	19	Safety 1 Board	K9800SA	Safety Board1 (100 V, ATEX)
			K9800SB	Safety Board1 (100 V, TIIS·FM)
			K9800SC	Safety Board1 (200 V, ATEX)
			K9800SD	Safety Board1 (200 V, TIIS·FM)
	20	Safety 2 Board	K9800TA	Safety Board2 (ATEX)
			K9800TB	Safety Board2 (TIIS·FM)
	21	Surge Protector Board	K9800QM	Surge Protector Board

Replacement cards locations are shown in Figures 6.8 to 6.11.

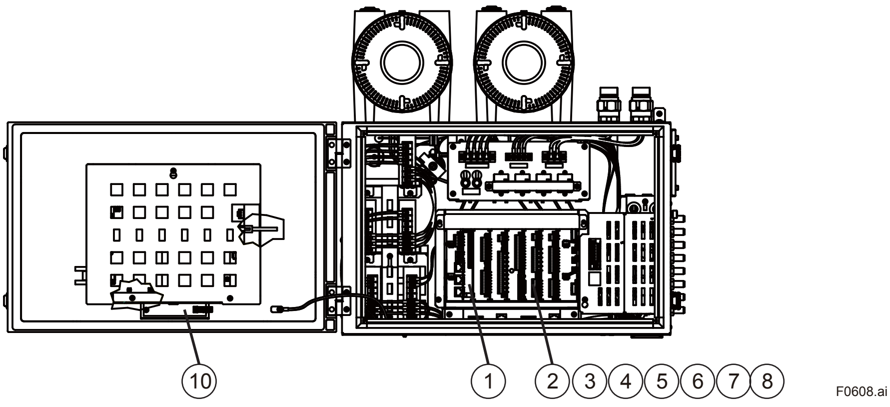


Figure 6.8

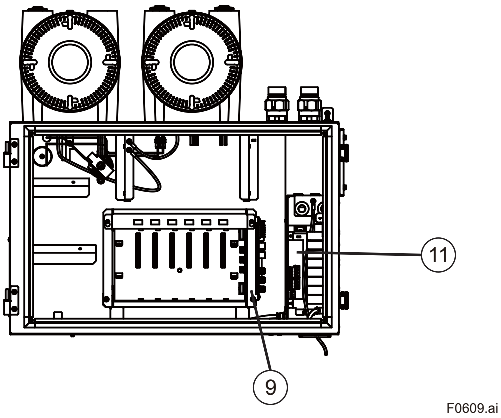


Figure 6.9

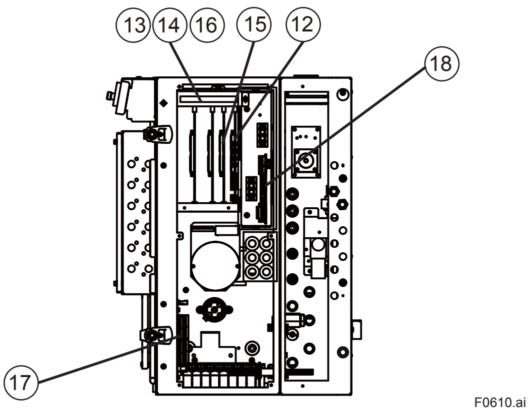


Figure 6.10

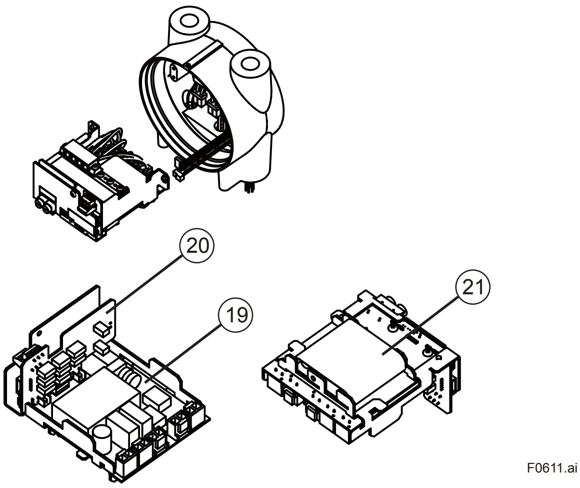


Figure 6.11

6

(2)HMI Unit

(1) Stop the operation and the supply of power.

(2) Open the door of the electronics section using a key included in the accessory kit.

(3) Loosen a screw of the HMI unit cover on the back of the door to remove the cover.
Remove three cable connectors attached to the HMI unit and one connector attached to the status board.

(4) Remove eight screws around the HMI unit, and remove it with the bracket.
Confirm that the rubber is securely fitted in the groove on the door.

(5) Install a new HMI unit by following steps (2) to (3) in the reverse order.
(6) Plug the three cable connectors back in their original positions.
(7) Close and lock the door of the electronics section.

<Replacement Parts>

K9802QA (for TIIS)
K9802QB (except for the TIIS specification)
K9802QC (for Y purge system)

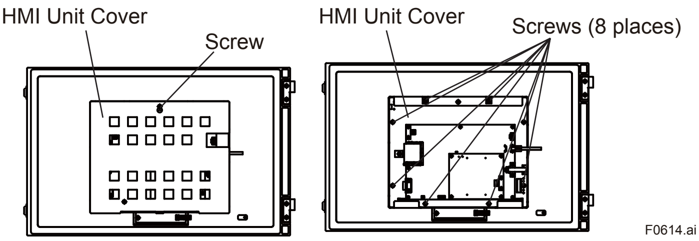


Figure 6.14

(3)Fuses

As shown in Figure 6.15, there are two types of fuses in the electronics section. The ratings for both fuses are listed in Table 6.1.

Table 6.1 Fuse of electronics section

Part Number	Rated Voltage	Rated Amperage	Fusing Characteristics	Notes
A1463EF	250 VAC	6.3 A	Time-delay	
A1598EF		30 A	Normal	

Follow the procedures below to replace.

● For A1463EF

(1) Stop the operation and the supply of power.
(2) Confirm that the LED (Green) of “POWER” is OFF.
(3) Open the door of the electronics section, using a key included in the accessory kit.
(4) Remove the fuse holder cap by rotating it counterclockwise.
(5) Remove the fuse from the cap and install a new one.
(6) Push and rotate a cap equipped with a fuse clockwise to install it in the fuse holder.
(7) Close and lock the electronics section door.

● For A1598EF

(1) Stop the operation and the supply of power.
(2) Confirm that the LED (Green) of “POWER” is OFF.
(3) Open the door of the electronics section, using a key included in the accessory kit.
(4) Replace the fuse. Fuse can be pulled out. For Y purge type, the locking bracket must be removed. After replacing the fuse, attach the locking bracket.
(5) Close and lock the electronics section door.

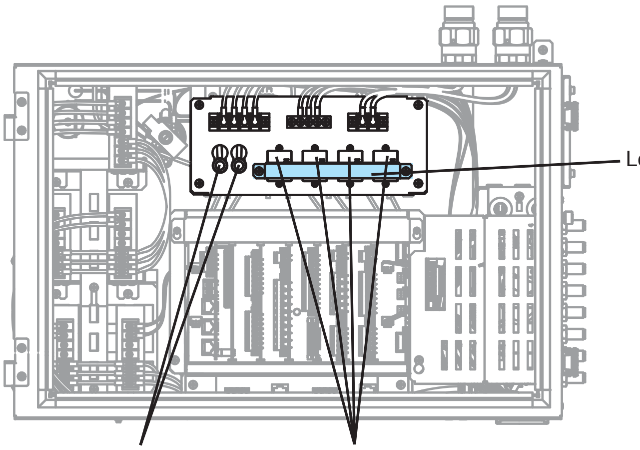


Figure 6.15

(4)Solenoid Valves

(1) Stop the operation and the supply of power.

(2) Turn off the purging air.

(3) When replacing a solenoid valve for the control unit, open the control unit door using a key included in the accessory kit. Remove the two screws to remove the cover.

When replacing the solenoid valve for the electronics section for the oven unit, remove the cover of the electronics section located to the right side of the oven unit by removing the six screws using a hexagon wrench included in the accessory kit.

Disconnect the tube from the solenoid valve by pulling it while pressing the black part of the connector.

(4) Disconnect the connector at the end of the cable of the solenoid valve from the terminal.

(5) Label the new solenoid valve with the number of the replacing solenoid valve. Place a marking decal on the connector at the end of the cable.

(6) Remove the two screws on the front side of the solenoid valve and remove the solenoid valve.

(7) Replace the solenoid valve and gasket with new ones.

(8) Confirm that the two screws on the front side of the solenoid valve are securely fastened.

(9) Securely reconnect the connector at the end of the cable of the solenoid valve to its original location.

Note

When connecting the connector to the terminal, check the polarity of red (+) and black (–) cables.

(10) Perform the reverse order of step (3).

<Replacement Parts>

K9630TU

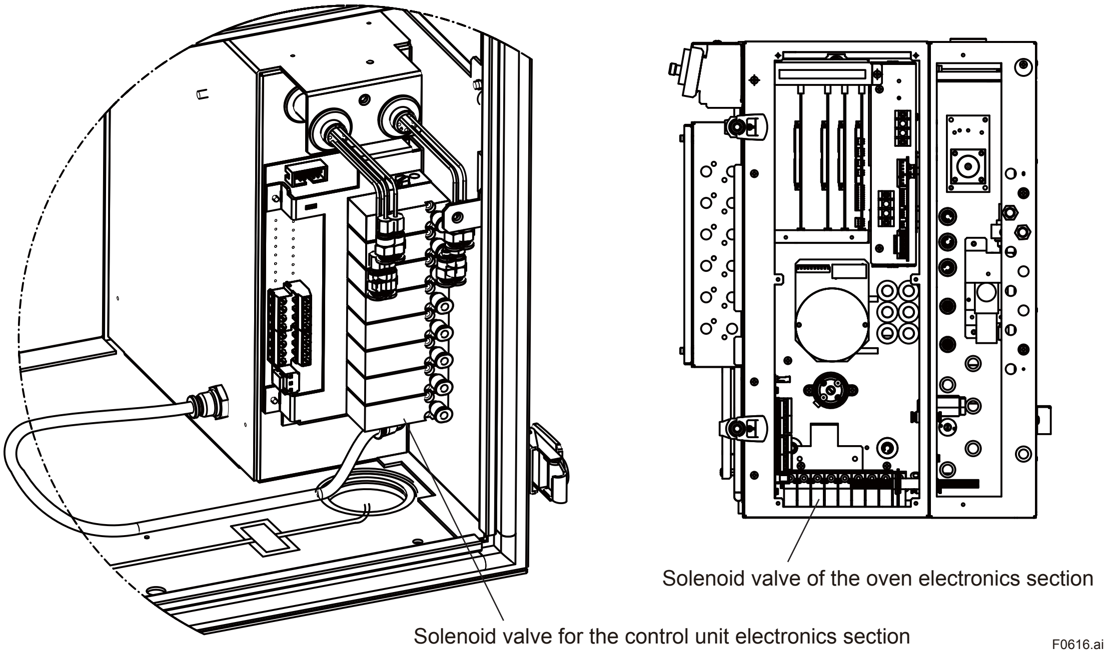


Figure 6.16

(5)Pressure Switch for Carrier Gas

(1) Stop the operation and the supply of power.
(2) Stop the supply of carrier gas.
(3) Remove the cover of the electronics section located at the right side of the oven unit by removing the six screws with a hexagon wrench included in the accessory kit (Take care not to get the cover upside down).
(4) Disconnect the connector at the end of the cable for the pressure switch from the oven CPU board.
(5) Remove the cover by removing the two screws of the pressure/flow control section.
(6) Pull the carrier gas line (1/16″ piping) off the pressure/flow control section side of the oven unit.
Then, remove the nut on the electronics section side of the oven unit and remove the pressure switch.
(7) Install a new pressure switch in the reverse order of step (6).
(8) Reconnect the connector at the end of the cable of the pressure switch to its original location.
(9) Firmly tighten all the six screws for the cover of the electronics section of the oven unit to maintain explosionproof condition.
(10) Close the over of the pressure/flow control section of the oven unit.

<Replacement Parts>

K9630LA

K9803VJ (for ATEX)

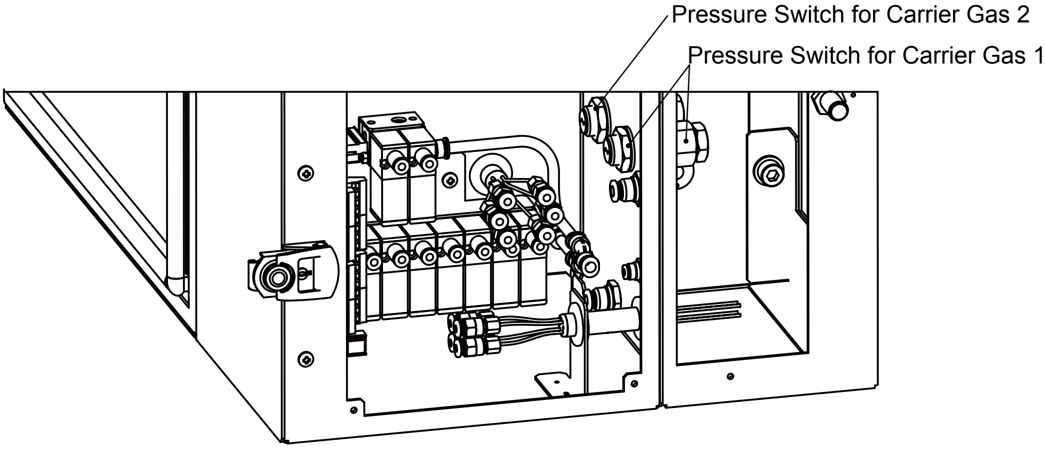


Figure 6.17

6

(6)EPC

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.
(3) Turn off the supplies of the carrier gas, utility gases (FID hydrogen gas (or nitrogen) for combustion, FID combustion air) and supply of samples.
(4) Open the door for the isothermal oven of the oven unit.
(5) Loosen the four screws on the EPC container cover (front right side of the isothermal oven) using a hexagon wrench and remove the cover.
(6) Remove the couplings to the inlet (IN) and outlet (OUT) of the EPC (see Figure 6.18).
Label the couplings for ease of identification later.
(7) Disconnect the connector of the cable for EPC from the EPC card.
(8) Remove the two screws which fix the EPC.
(9) Install a new EPC in the reverse order of steps (6) to (8).
(10) Reinstall the EPC box cover. Firmly tighten all of the four screws on the EPC box cover to maintain the explosionproof condition.
(11) Close the door to the isothermal oven.
(12) Turn on the power.
(13) Start supplying FID hydrogen (or nitrogen) for combustion, FID combustion air, and carrier gas. Perform a leak test around the couplings.

<Replacement Parts>

K9630KS

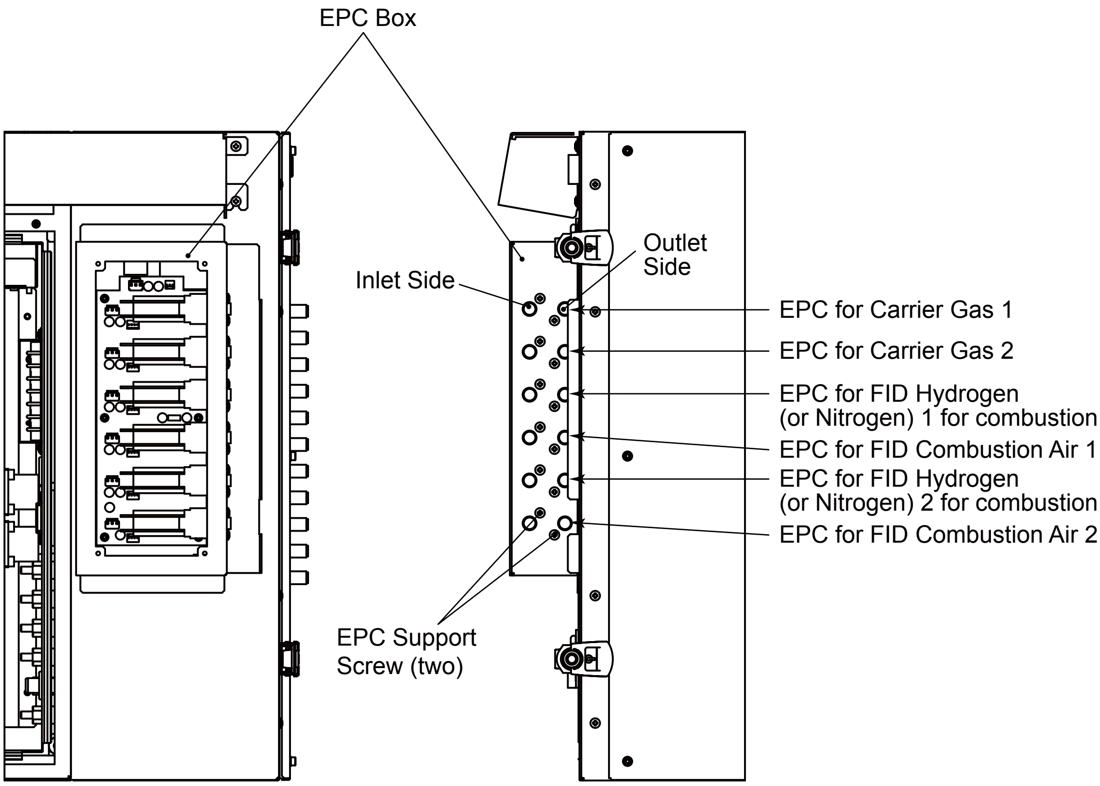


Figure 6.18

6.2.3 Components for Pressure/Flow Control Section

The instructions for replacing the following parts in the Pressure/Flow Control section are explained.

(1) Regulator valve for carrier gas
(2) Regulator valve for utility gas
(3) Regulator valve for purge air and solenoid valve air
(4) Vortex tube
(5) Hydrogen Limiting Unit

(1)Regulator for Carrier Gas

This regulator is installed in the isothermal oven and used to control the carrier gas pressure (see Figure 6.19).

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off supplies of carrier gas, utility gases (FID hydrogen gas for combustion and FID combustion air) and samples.
(4) Open the control unit door using a key included in the accessory kit. And remove the cover by removing the two screws of the pressure/flow control section.

(5) Remove the couplings connected to the inlet (IN) and outlet (OUT) of the regulator. See Figure 6.19. Label the couplings with “IN” and “OUT” for ease of identification later.

Note

Remove any metal flakes off the couplings.

(6) Remove the stem lock.
(7) Remove the mounting locknut and the regulator.
(8) Install a new regulator in the reverse order of steps (5) through (7).
(9) Start supplying the carrier gas and other gases and perform a leak test around the couplings.
(10) Set the carrier gas pressure to the value indicated in the operation data. Adjust and set the pressure by loosening the stem lock nut and rotating the stem. After completing the setting, fix the stem with the locknut.
(11) Close the isothermal oven door and the cover of the pressure/flow control section.

IMPORTANT

After the temperature of the isothermal oven in the oven unit becomes substantially stable, set the pressure of the carrier gas again according to the Operation data.

<Replacement Parts>

	Applicable Temperature Range	O-ring Material
K9409AW	180 °C or less	Viton
K9409AV	225 °C or less	Kalrez

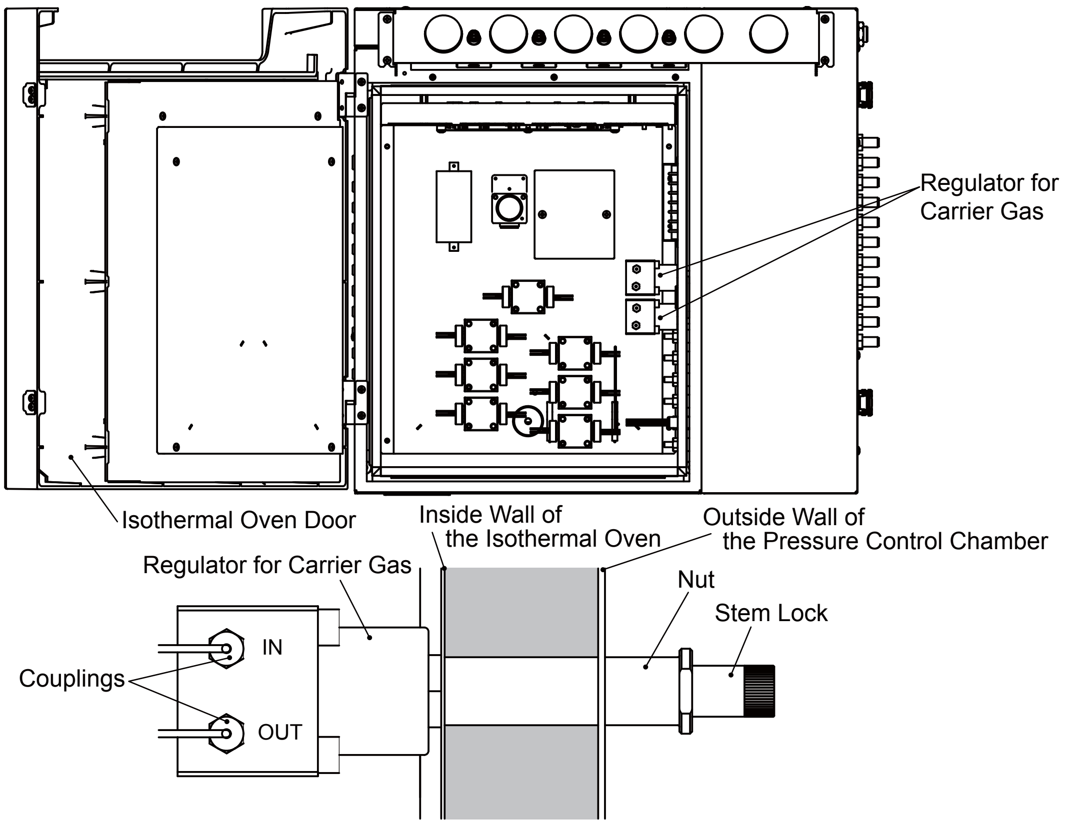


Figure 6.19 Regulator for carrier gas

(2)Regulator for Utility Gases

These regulators are installed in the upper front side of the isothermal oven for the respective oven unit and used to control the pressures of the FID hydrogen (or nitrogen) for combustion and FID combustion air (see Figure 6.20).

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the FID hydrogen (or nitrogen) gas for combustion, FID combustion air, and carrier gas.

(4) Open the door of the isothermal oven section in the oven unit as well as the door above it.

(5) Remove the front panel of the regulator by loosening the two screws.

(6) Remove the couplings connected to the inlet (IN) and outlet (OUT) of the regulator. See Figure 6.18. Label the couplings with “IN” and “OUT” for ease of identification later.

Note

Remove any metal flakes off the couplings.

(7) Remove the stem lock.

(8) Remove the mounting locknut.

(9) Remove the upper two screws and loosen the lower two screws of the board on which the gauge and regulator are mounted.

(10) Slide the board to remove the regulator.

(11) Install a new regulator in the reverse order of steps (6) to (10).

(12) Reinstall the front panel of the regulator in its original position.

(13) Start supplying the FID hydrogen (or nitrogen) gas for combustion, FID combustion air and carrier gas, then perform a leak test around the couplings.

(14) Set the pressure of the line where the regulator has been replaced to the value indicated in the operation data (attached).

Adjust and set the pressure by loosening the stem lock and rotating the stem.

After completing the setting, fix the stem with the locknut.

(15) Close the door of the isothermal oven for the oven unit.

IMPORTANT

After the temperature of the isothermal oven in the oven unit becomes substantially stable, set the pressure of the carrier gas again according to the Operation data.

<Replacement Parts>

K9409AW

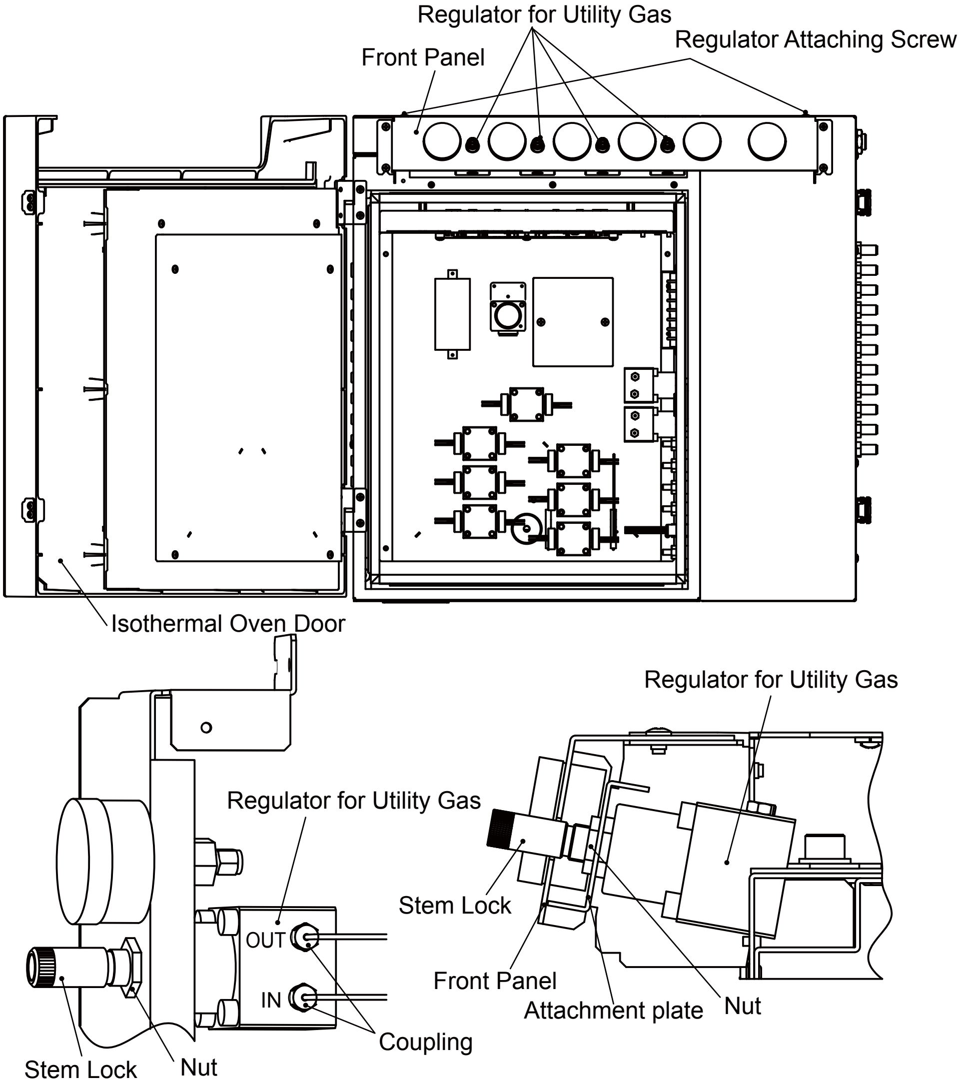


Figure 6.20 Regulator for Utility Gases

(3)Regulator for Purge Air and Air for Solenoid Valves

This regulator is a manifold style regulator used to adjust pressure of purging air and air for solenoid valves, and is located in the pressure/flow control section (see Figure 6.21).

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supply of the purging air.

(4) Remove the cover by removing the two screws of the pressure/flow control section.

(5) Disconnect all of the tubes connected to the manifold regulator. When disconnecting the tubes, label those for ease of identifying the connections later. Disconnect the tubes by pulling them while pressing the black part of the connector.

(6) Remove the two screws on the mounting bracket which fix the manifold regulator.

(7) Remove the two screws on the backside of the mounting bracket which fix the manifold valve to the mounting bracket.

(8) Install a new regulator in the reverse order of steps (5) to (7).
When reinstalling the conversion coupling, always use a sealing tape.

(9) After confirming that the pipe connections are correct, check the piping for leaks.

(10) Set the pressures of the purging air and the solenoid-valve air to the values indicated in the operation data. Adjust and set the pressure by unlocking the knob and then rotating it. The knob locks when it is pressed in, and unlocks when it is pulled out.

(11) Install the cover which has been removed in step (4).

<Replacement Parts>

K9801JP 3-valves

K9801JQ 4-valves

K9801JR 5-valves

Mounting bracket

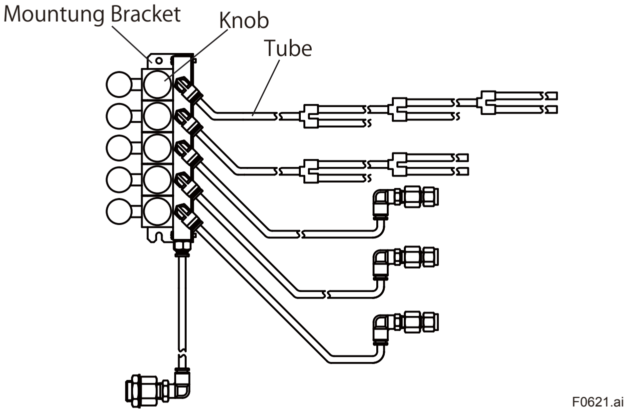


Figure 6.21 Regulator for Purge Air and Solenoid-Valve Air

(4)Vortex Tube (for FPD)

See Figure 6.24.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supply of the purging air.

(4) Remove the cover by removing the two screws of the pressure/flow control section.

(5) Pull out the two tubes connected to the vortex tube assembly.

(6) If a regulator is attached to the mounting bracket of a vortex tube, remove the two tubes connected to the regulator.

(7) Remove the two screws from the mounting bracket.

(8) Remove the two screws which fix the vortex tube to the mounting bracket.

(9) Remove the conversion couplings attached to the IN and OUT side of the vortex tube at the adapter coupling section.

(10) Install a new vortex tube in the reverse order of steps (3) to (7).
When reinstalling the adapter coupling and conversion coupling, always use a sealing tape.

(11) Confirm that there are no leaks.

(12) Install the front panel which has been removed in step (4).

<Replacement Parts>

K9803HE

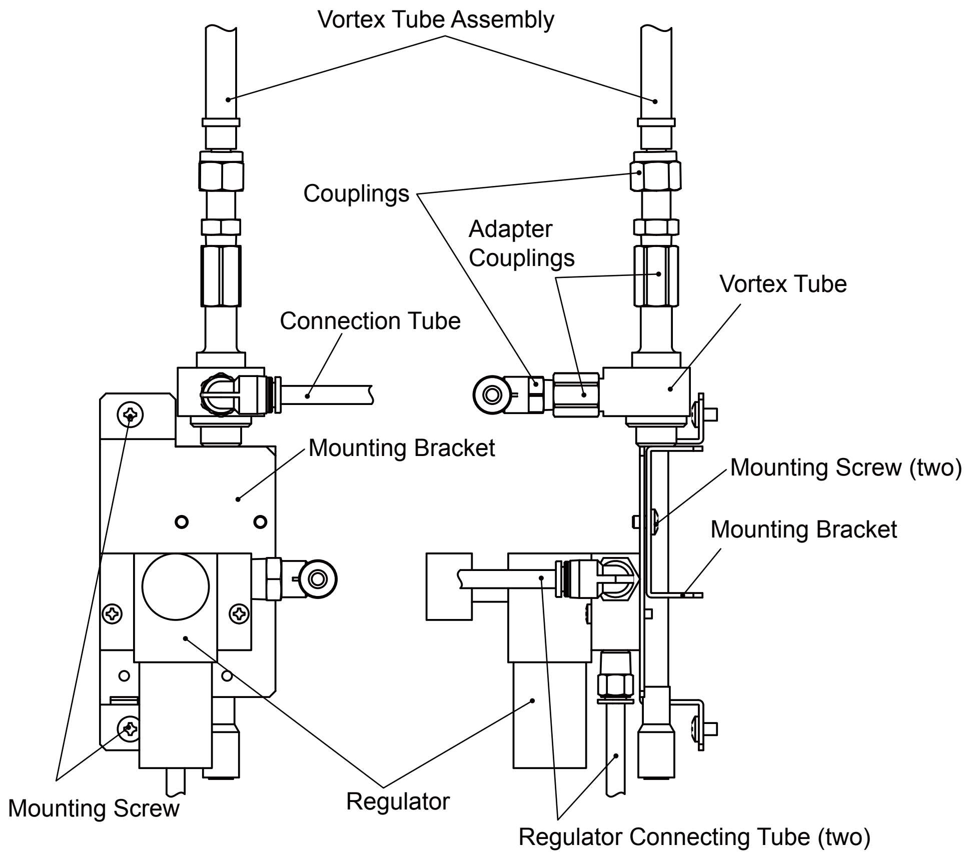


Figure 6.24 Vortex Tube

(5)Hydrogen Limiting Unit

The hydrogen limiting unit comprises of a mass-flow controller and pneumatic valve. This unit can regulate or completely shut off the flow of hydrogen. The flow of hydrogen is regulated to 300 ml/min by the mass-flow controller. In addition, if the system cannot maintain the required protection (if the internal pressure cannot be maintained at the specified level), it actuates the pneumatic valve per signal from the main unit and shut off the hydrogen supply.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the FID hydrogen (or nitrogen) gas for combustion, FID combustion air, and carrier gas.
(4) Remove the cover by removing the two screws of the pressure/flow control section.
(5) Remove two coupling nuts connected to the IN and OUT ports of hydrogen limiting unit, as well as the tube connected to the pneumatic valve.
(6) Remove the two screws which fix the hydrogen limiting unit.
(7) Install a new hydrogen limiting unit in the reverse order of steps (3) and (4).
Replace the entire hydrogen limiting unit (part number: K9803WA).
(8) Confirm that the pipe connections are correct. Then check the piping for leaks.
(9) Set the pressure of hydrogen fed into the hydrogen limiting unit to 490 kPa.

<Replacement Parts>

K9803WA

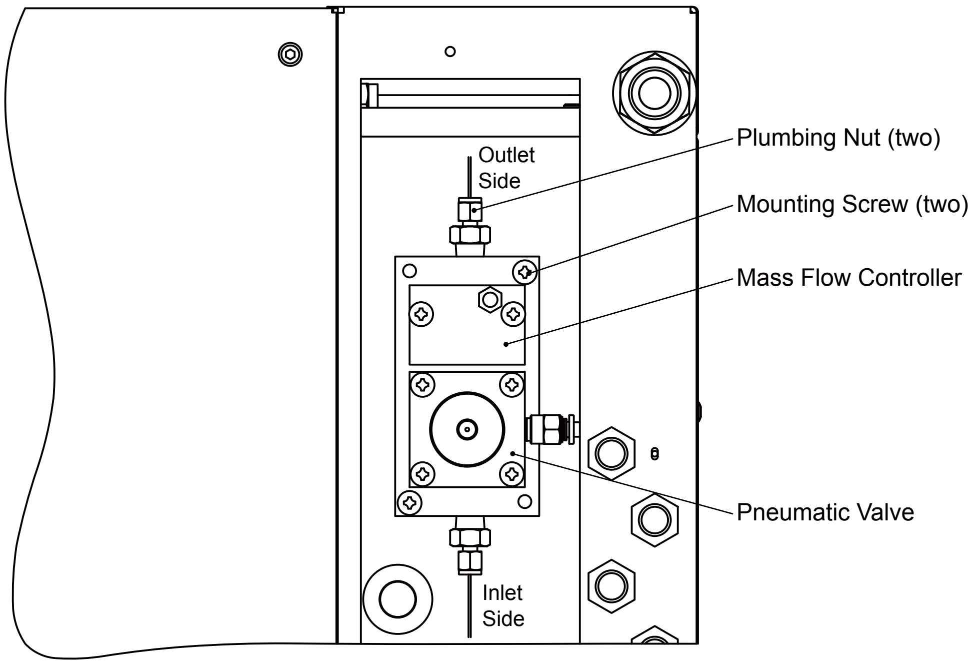


Figure 6.25 Hydrogen Limiting Unit

6.2.4 Components for Isothermal Oven

The instructions for replacing the following parts in the isothermal oven are explained.

(1) Heater
(2) Sensor
(3) TCD
(4) FID
(5) Methanizer
(6) Rotary valve and valve seat
(7) LSV
(8) Restrictor
(9) Column
(10) Flame Arrestor
(11) Gasket
(12) Air Turbine

(1)Heater for Isothermal Oven

The heater uses a nichrome wire to control the temperature of the isothermal oven.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.
(3) Confirm that the LED (Green) of “POWER” is OFF.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(4) Turn off the purging air supply.
(5) Open the door of the isothermal oven section using a key included in the accessory kit.
(6) Disconnect the wiring to the heater from the terminal block on the right side in the isothermal oven.
(7) Remove the four screws to remove the heater cover.

IMPORTANT

- Do not touch the end of two temperature sensors.
- Do not bend the wiring to the heater.

(8) Remove the two nuts mounting the end terminals on both ends of the heater. Then, pull out the heater from the heater guide while removing two temperature sensors.

IMPORTANT

When securing and removing the nuts, do not apply any load to the ceramic plate on which the terminals of the heater are fixed.

(9) Pull both ends of the new heater and stretch it to about 500 mm long. Ensure that the heater is stretched evenly (see Figure 6.26).
(10) Confirm that the heater is not sagging and is stretched evenly.
(11) Reinstall the heater cover with the four screws. Confirm the temperature sensors are in place.
(12) Reconnect the wiring which has been disconnected in step (5) to the terminal block.
(13) Close the door of the isothermal oven.

<Replacement Parts>

	Supply voltage
K9409GN	100 V AC (for isothermal oven temperature of over 110°C)
K9409GE	100 V AC (for isothermal oven temperature of 110°C or below)
K9409GP	110 V AC (for isothermal oven temperature of over 110°C)
K9409GF	110 V AC (for isothermal oven temperature of 110°C or below)
K9409GB	115 V AC (for isothermal oven temperature of over 110°C)
K9409GG	115 V AC (for isothermal oven temperature of 110°C or below)

K9409GC	120 V AC (for isothermal oven temperature of over 110°C)
K9409GH	120 V AC (for isothermal oven temperature of 110°C or below)
K9409GS	200 V AC
K9409GT	220 V AC
K9409GU	230 V AC
K9409GV	240 V AC

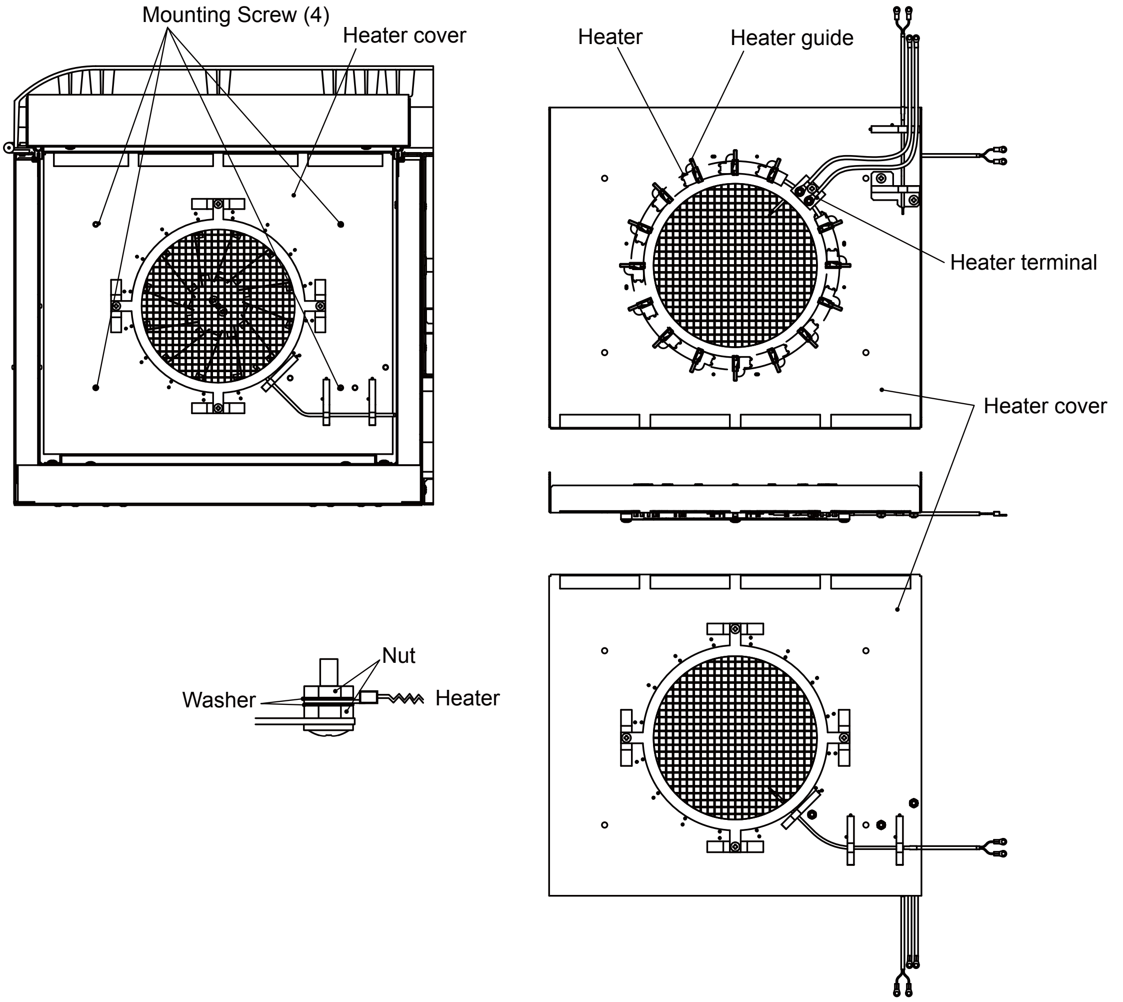


Figure 6.26 Heater for Isothermal Oven

(2)Temperature Sensor for Isothermal Oven

A single oven unit has two temperature sensors:

For control: controlling the temperature of the isothermal oven

For protection: detecting abnormally high temperature

The temperature sensor for the isothermal oven is a platinum resistance temperature detector (Pt100 ohm).

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the purging air supply.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the terminals for the temperature sensor from the terminal block.
(6) To replace the temperature sensor for protection, the heater cover must be removed by unscrewing the four screws on it. The temperature sensor for control can be removed from the heater cover simply by sliding it.
(7) Reinstall a new sensor.
(8) Reinstall the fan cover and the heater cover in the reverse order of steps (4) to (6) and rewire as before. Ensure that the temperature sensor is in the correct location, before reinstalling the heater cover.

IMPORTANT

Do not touch the end of the two temperature sensors.

<Replacement Parts>

K9803VC	For control
K9803VD	For temperature protection

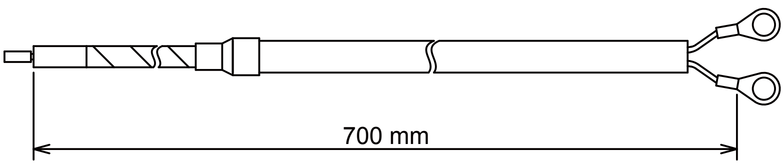


Figure 6.27 Temperature Sensor

(3) Thermal Conductivity Detector (TCD)

There are two types of thermal conductivity detector: the low temp. type (for 135 °C max. isothermal oven temp.) and the high temp. type. The low temp. type comes in four types depending on the material and sensitivity. Figure 6.28 shows the external view of a thermal conductivity detector.

● Low-temp. type TCD

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier and sample gas.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the two screws to remove the TCD cover.
(6) Remove the insulator.
(7) Remove the four couplings connected to the TCD. When removing the couplings, label them for ease of identifying the connections later.
(8) Remove the four wires connected to the TCD terminals.

IMPORTANT

The direction of the TCD depends on the type of carrier gas. See the inscription on the TCD.

Carrier gas	Inscription
H_2, He	H N
N_2, Ar	N H

(9) Remove the two screws which fix the TCD.
(10) Install a new TCD.
(11) Reconnect the wires and pipes in the reverse order of steps (4) to (9). Confirm wiring and perform a leak test.

● High-temp. type TCD

(1) Stop the operation. (See "3.3.4 Stopping operation" for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier and sample gas.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the two screws to remove the TCD cover.
(6) Remove the insulator.
(7) Remove the wires connected to the TCD card from the connectors, and pull into the isothermal oven through the bushing holes.
(8) Remove the six screws from the cover of the electronics section in the oven unit by using a hex wrench (an accessory) and open the cover.
(9) Remove the four couplings connected to the TCD. When removing the couplings, label them for ease of identifying the connections later.
(10) Remove the two screws which fix the TCD.
(11) Install a new TCD.
(12) Reconnect the wires and pipes in the reverse order of steps (4) to (8). Confirm wiring and perform a leak test.

<Replacement Parts>

Low temp. type	K9192QA	For normal usage (Aluminum)
	K9192QB	Corrosion-resistant type (SUS316)
	K9192QJ	High-sensitivity type (Aluminum)

	K9192QL	High-sensitivity and corrosion-resistant type (SUS316)
High temp. type	K9803UA	For DET1 (SUS316)
	K9803UB	For DET2 (SUS316)

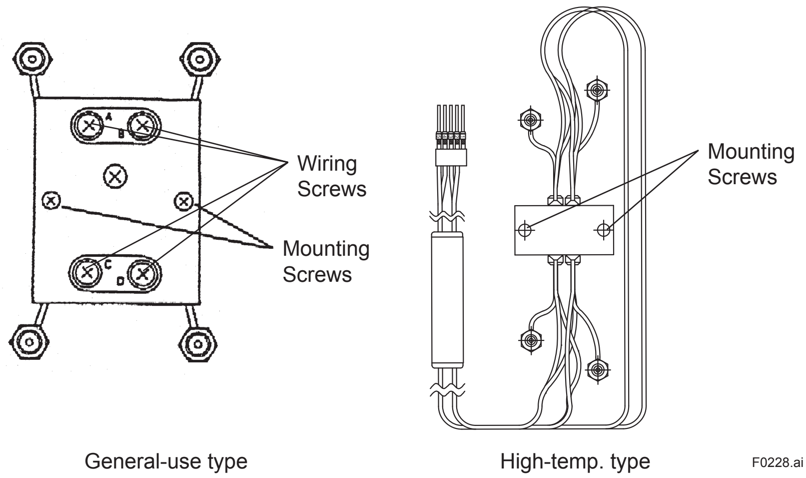


Figure 6.28 TCD

(4)Flame Ionization Detector (FID)

There are two types of flame ionization detector, low temp. type (145 °C max. isothermal oven temp.) and high temp. type. Both types have the corrosion-resistant variants. Figure 6.29 shows the external view of a low temp. type flame ionization detector.

● Low-temp. type FID

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier gas, hydrogen (or nitrogen) gas for combustion, combustion air, and sample gas.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the three couplings connected to the FID. When removing the couplings, label them for ease of identifying the connections later.
(6) Remove the four wires connected to the FID.
(7) Remove the two setscrews which fix the FID.
(8) Install a new FID.
(9) Reconnect the wires and pipes in the reverse order of steps (4) to (7). Confirm wiring and perform a leak test.

● High-temp. type of FID

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier gas, hydrogen (or nitrogen) gas for combustion, combustion air, and sample gas.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the three couplings connected to the FID. When removing the couplings, label them for ease of identifying the connections later.
(6) Remove the six screws from the cover of the electronics section in the oven unit by using a hex wrench (an accessory) and open the cover.
(7) Remove the wires connected to the FID card from the connectors, and pull into the isothermal oven through the bushing holes.
(8) Remove the two screws which fix the FID.
(9) Install a new FID.
(10) Reconnect the wires and pipes in the reverse order of steps (5) to (8). Confirm wiring and perform a leak test.

<Replacement Parts>

Low temp. type	K9194XA	For normal usage	(SUS316)
	K9194XB	Corrosion-resistant type	(Hastelloy C)
High temp. type	K9803UN	For normal usage	(SUS316)
	K9803UQ	Corrosion-resistant type	(Hastelloy C)

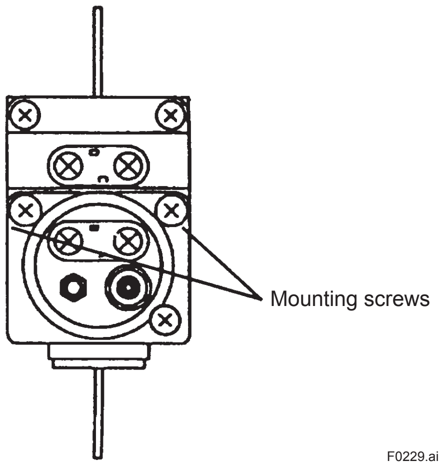


Figure 6.29 FID

(5)Methanizer

The methanizer is used in conjunction with the FID to measure low-concentration carbon monoxide or dioxide. See Figure 6.30.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier gas, hydrogen (or nitrogen) gas for combustion, combustion air, and sample gas.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the two couplings connected to the methanizer. When removing the couplings, label them for ease of identifying the connections later.
(6) Remove the two wires connected to the terminals of the methanizer.
(7) Remove the two screws to remove the methanizer.
(8) Install a new methanizer.
(9) Reconnect the wires and pipes in the reverse order of steps (4) to (7). Confirm wiring and perform a leak test.

<Replacement Parts>

K9192TG

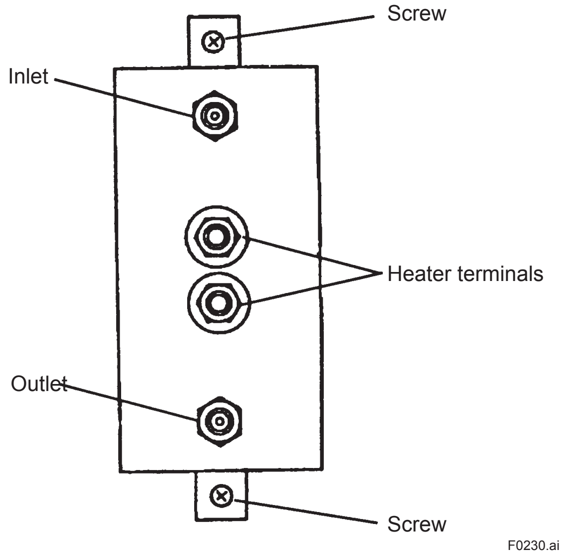


Figure 6.30 Methanizer

(6)Rotary Valve and Valve Seat

The rotary valve located in the isothermal oven is used as a sampling valve and a column switching valve. The valve has two types: general type and high temp. type. The specifications for the rotary vale used are listed in the parts list in the operation data. Check against the code chart (Table 6.2) and replace as required.

Table 6.2

Model	Suffix code	Option code	Description
GCRV			Rotary valve
Bellows material	-G		Rubber
	-M		Metal
O-Ring material	B		Viton
	K		Kalrez
Valve material	A		Gas sampling
	B		Liquid sampling
	C		Back flash & column switching
	D		Gas sample (for GC6)
	E		Liquid sample (for GC6)
	F		Back flash & column switching (for GC6)
Sheet material	R		Rulon
	T		Teflon
Grand material	S		SUS316
	H		Hastelloy C
Sample volume of B side	N		Not provided
	C		Switching valve
	1		Liquid sample: 0.33 μl
	2		Liquid sample: 1 μl
	3		Liquid sample: 2 μl
	4		Liquid sample: 3 μl
	5		Gas sample: 10 μl
	6		Gas sample: 25 μl
	7		Gas sample: 50 μl
	8		Gas sample: more than 100 μl
Sample volume of A side	N		Not provided
	C		Switching valve
	1		Liquid sample: 0.33 μl
	2		Liquid sample: 1 μl
	3		Liquid sample: 2 μl
	4		Liquid sample: 3 μl
	5		Gas sample: 10 μl
	6		Gas sample: 25 μl
	7		Gas sample: 50 μl
	8		Gas sample: more than 100 μl
Purge/Suction Yes/No	N		Not provided
	P		Purge
	E		Suction

● Rotary valve

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Turn off the supply of the sample.

(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.

  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(5) Stop the supply of power.

⚠ CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(6) Turn off the supply of the purging air and carrier gas. For a detection system with an FID, turn off the supply of hydrogen (or nitrogen) gas and combustion air as well.
(7) Open the control unit door using a key included in the accessory kit.
(8) Remove the couplings connected to the rotary valve. When removing the couplings, label them for ease of identifying the connections later. The rotary valve is either a single-sleeve or double-sleeve type, depending on the specifications. Each type comprises four to six pipes extending from the sleeve.
(9) Remove the two screws which are not painted with red enamel to disassemble the rotary valve. Do not touch the two screws which are painted red.
(10) Install a new rotary valve. When installing it, it is necessary to bend pipes as shown in Figure 6.31. When bending a pipe, use another pipe that is approximately 10mm in diameter to support it and avoid excessive force applied on the root of the pipe. The cap nuts at the tip of the pipes are inscribed with numbers. Engage these cap nuts according to the pre-labeled numbers or per column system diagram in the operation data.
(11) Perform a leak test on the piping.

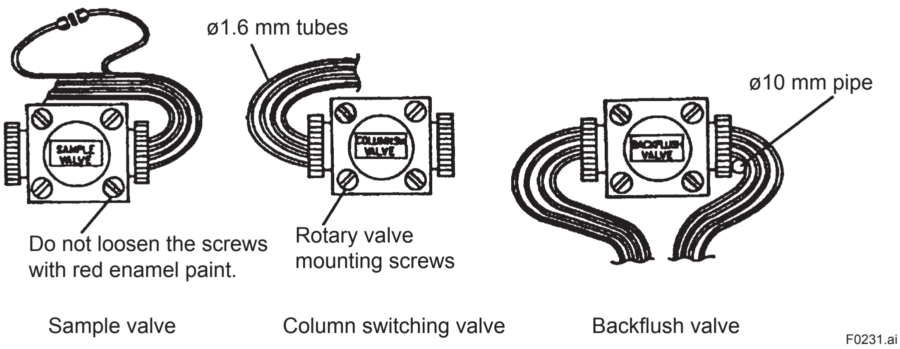


Figure 6.31 Replacing rotary valves

● Gland assembly

See Figure 6.32.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Turn off supply of the sample.
(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).
- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(5) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(6) Turn off the supply of the purging air and the carrier gas. For a detection system with an FID, turn off the supply of hydrogen (or nitrogen) gas and the combustion air as well.
(7) Open the control unit door using a key included in the accessory kit.
(8) Remove the coupling connected to the rotary valve. When removing the couplings, label them for ease of identifying the connections later. The rotary valve is either a single-sleeve or double-sleeve valve, depending on the specifications. Each type comprises four to six pipes extending from the sleeve.
(9) Remove the two screws which are not painted with red enamel in order to disassemble the rotary valve. Do not touch the two screws which are painted red.
(10) Remove two nuts to remove the gland assembly.
(11) Install a new gland assembly.
(12) Reinstall the rotary valve in the reverse order of steps (8) and (9). Reconnect the pipes.
(13) Perform a leak test on the piping.

<Replacement Parts>

K9034BP	for liquid samples (sample volume: 3 μl or less), SUS316
K9034BJ	for gas samples (sample volume: 10 μl), SUS316
K9034BH	for gas samples (sample volume: 25 μl), SUS316
K9034BG	for gas samples (sample volume: 50 μl), SUS316
K9034BB	for gas samples (sample volume: 360 μl or more), SUS316
K9034BA	for switching valve, SUS316
K9034AW	for plug
K9034GV	for liquid samples (sample volume: 3 μl or less), Hastelloy C
K9034GS	for gas samples (sample volume: 25 μl), Hastelloy C
K9034GR	for gas samples (sample volume: 50 μl), Hastelloy C
K9034GN	for gas samples (sample volume: 360 μl or more), Hastelloy C
K9034GX	for switching valve, Hastelloy C

For the following glands, contact Yokogawa.

1. When replacing gland with the nut and the sleeve (The glands listed above do not have a nut and a sleeve).

2. When replacing the gland with sample volume of less than 360μl.
3. When gland with engraving is required (Replacement glands do not have the engravings).

● Valve seat for rotary valve

See Figures 6.32 and 6.33.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Turn off the supply of the sample.

(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(5) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(6) Turn off the supply of the purging air and the carrier gas. For a detection system with an FID, turn off the supply of hydrogen (or nitrogen) gas and the combustion air as well.

(7) Open the control unit door using a key included in the accessory kit.

(8) Manually loosen the nut and remove the gland assembly.

IMPORTANT

The gland assembly is a vulnerable part. Please handle it with care.

(9) Remove the two screws not coated with red enamel and then remove the rotary valve. Do not loosen the screws coated with red enamel.

(10) Remove the gasket, gland assembly, and the valve seat, in this sequence. Do not remove the washer and the coil spring (see Figure 6.32).

(11) As shown in Figure 6.33, the valve seat and gland assembly have a specific location to install. Insert these components in the correct location using the location notch.

(12) Reassemble the components in the reverse order of steps (7) to (9). Firmly tighten the nut by fingers. Do not allow oil or grease to adhere to the seat.

<Replacement Parts>

K9034FF	sample volume: 0.33 µl, Rulon
K9034DS *	sample volume: 1 µl, Rulon
K9034DR *	sample volume: 2 µl, Rulon
K9034DQ *	sample volume: 3 µl, Rulon
K9034DP *	sample volume: 10 µl or more, Rulon
K9034DN *	for switching valve, Rulon
K9034DM	for plug
J9201HY	sample volume: 0.33 µl, Teflon
K9034FL	sample volume: 1 µl, Teflon
K9034FK	sample volume: 2 µl, Teflon
K9034FJ	sample volume: 3 µl, Teflon
K9034FH	sample volume: 10 µl or more, Teflon
K9034FR	for switching valve, Teflon

* When ordering * items, the following P/N should be specified.
K9409ZE (2 pcs. of K9034DS)
K9409ZD (2 pcs. of K9034DR)
K9409ZC (2 pcs. of K9034DQ)
K9409ZB (2 pcs. of K9034DP)
K9409ZA (2 pcs. of K9034DN)

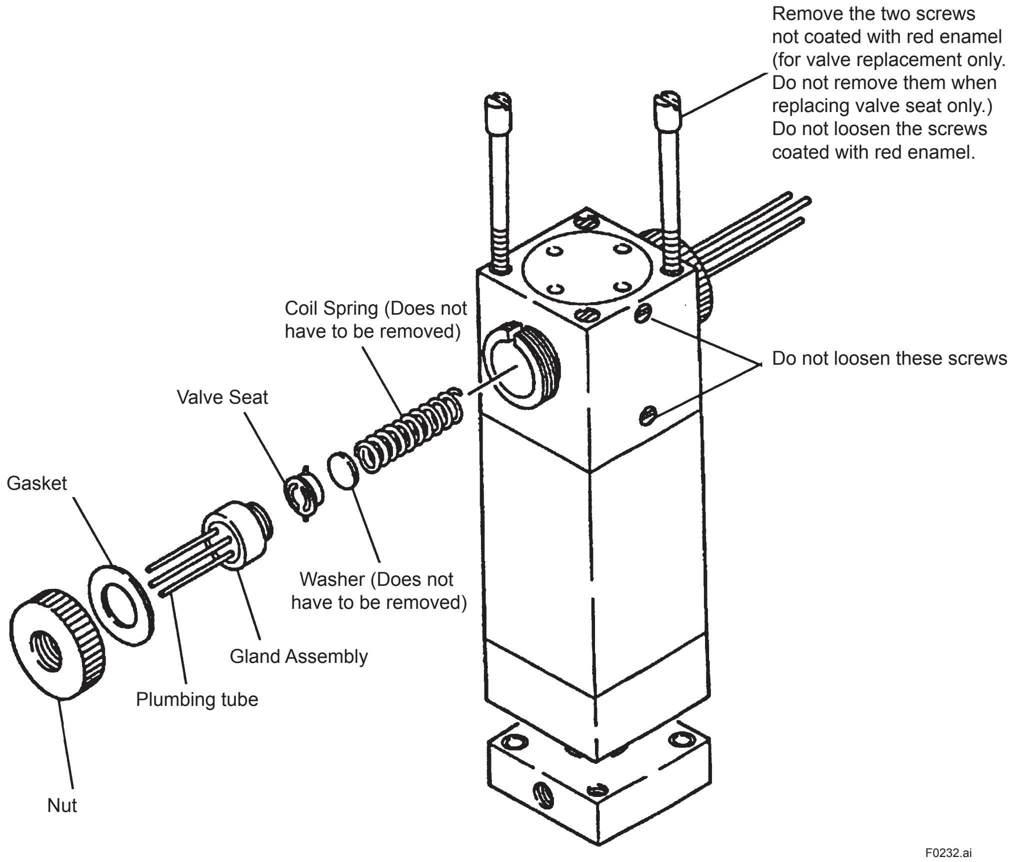


Figure 6.32 Rotary Valve

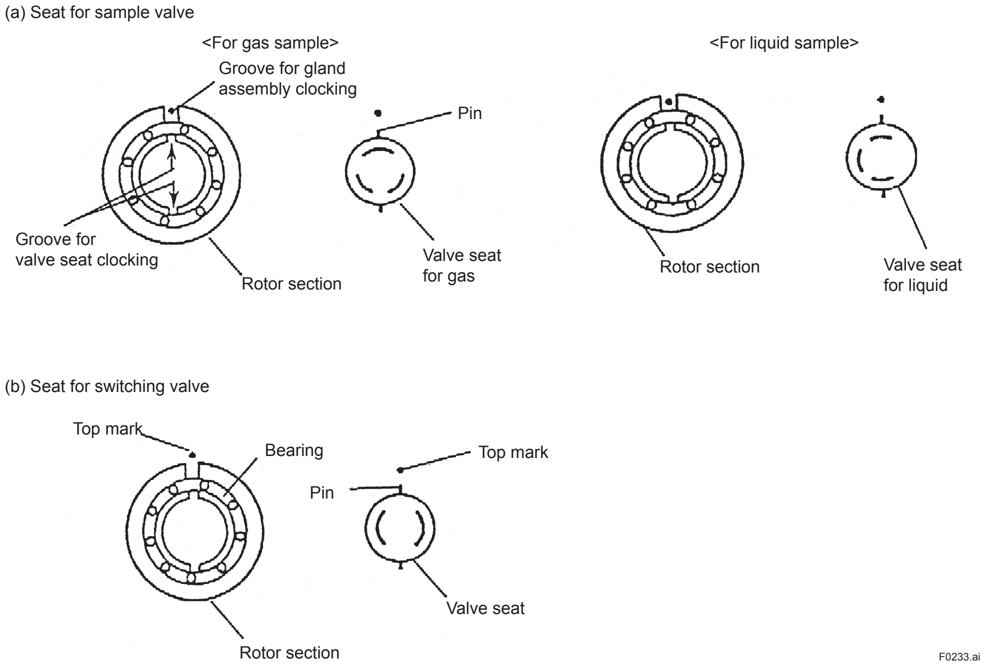


Figure 6.33 Valve Seat

(7) Liquid-sample Valve (LSV)

The liquid-sample valve is used when the sample is a liquid. See Figure 6.34. The specifications for the liquid sample valve used are listed in the parts list in the operation data.

Check against the code chart (Table 6.3) and replace as required.

Table 6.3

Model	Suffix code	Option code	Description
GCLV	••••••••••••••••••••••••••••••••	••••••••••••••	Liquid sampling valve
Sample volume	-1	••••••••••••••	0.1 µl
	-2	••••••••••••••	0.25 µl
	-3	••••••••••••••	0.5 µl
	-4	••••••••••••••	1 µl
	-5	••••••••••••••	2 µl
	-6	••••••••••••••	3 µl
Wetted material	S	••••••••••••••	SUS316
	H	••••••••••••••	Hastelloy C
Insert material	M	••••••••••••••	SUS316
	G	••••••••••••••	Glass (straight)
	C	••••••••••••••	Glass (cup)
	J	••••••••••••••	Glass (with neck)
Sealing material	R	••••••••••••••	Rulon
	T	••••••••••••••	Teflon
Column connection	A	••••••••••••••	1/8"
	B	••••••••••••••	1/16"
	C	••••••••••••••	Capillary
	D	••••••••••••••	Mega-bore
Split/Leakage back flash	N	••••••••••••••	None
	1	••••••••••••••	1/8"
	2	••••••••••••••	1/16"

● Seal unit

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Turn off the supply of the sample.

(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(5) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(6) Turn off the supply of the purging air and the carrier gas. For a detection system with an FID, turn off the supply of hydrogen (or nitrogen) gas and the combustion air as well.
(7) Remove the cover or insulator attached to LSV, if any.
(8) Remove the four couplings connected to the outside of the isothermal oven. When removing the couplings, label them for ease of identifying the connections later.
(9) Turn the locknut to LSV counterclockwise with the coil over wrench for LSV to remove it. Slowly pull off the cylinder of LSV.
(10) Remove the seal unit. When it is difficult to remove the seal unit, first remove the four screws on the locknut-clamp fitting.
(11) Install a new seal unit. Then reinstall the cylinder part in the reverse order of step (9).

Note

- If any deposit cannot be removed from the stem, replace the stem with a new one.
- Take care not to damage the stem.
- Disc springs of the spring assembly should be stacked face-to-face.
- Manually fasten the locknut of LSV. Then give it a 1/4 clockwise turn with the coil over wrench for LSV.

(12) Reconnect the pipes in the reverse order of step (8).
(13) Perform a leak test on the piping.

Note

After the isothermal oven temperature become stable at the preset level, rotate the locknut by another 1/8 turn to fasten it.

Heater or temperature sensor

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Open the control unit door using a key included in the accessory kit.

(4) Remove the terminal block cover and disconnect the wires (two for the heater and four for the temperature sensor) connected to the component from the terminal block.

(5) Remove the screws on the heater and the temperature sensor.

(6) Pull out the parts to replace.

(7) Install a new component and fix it with the screws.

(8) Reconnect the wires. Reinstall the terminal cover in its original location.

LSV

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Turn off the supply of the sample.

(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.

  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(5) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(6) Turn off the supply of the purging air and the carrier gas. For a detection system with an FID, turn off the supply of hydrogen (or nitrogen) gas and the combustion air as well.

(7) Open the control unit door using a key included in the accessory kit.

(8) Remove the terminal block cover and disconnect the wires (two for the heater and four for the temperature sensor) connected to the component from the terminal block.

(9) Remove the fittings and nuts from IN and OUT pipes for carrier gas in the isothermal oven.

(10) Remove the cover or insulator attached to LSV, if any.

(11) Remove the six couplings connected to the LSV. When removing the couplings, label them for ease of identifying the connections later.

(12) Remove the four screws which fix the LSV to the outside of the isothermal oven.

(13) Install a new LSV.

(14) Reconnect the pipes in the reverse order of step (7) and (12). Confirm the wiring and perform a leak test on the piping.

<Replacement Parts>

1	K9402WA	Stem (sample volume: 0.1μl, material: SUS316)
	K9402WB	Stem (sample volume: 0.25μl, material: SUS316)
	K9402WC	Stem (sample volume: 0.5μl, material: SUS316)
	K9402WD	Stem (sample volume: 1μl, material: SUS316)
	K9402WE	Stem (sample volume: 2μl, material: SUS316)
	K9402WF	Stem (sample volume: 3μl, material: SUS316)
	K9402WG	Stem (sample volume: 0.1μl, material: Hastelloy C)
	K9402WH	Stem (sample volume: 0.25μl, material: Hastelloy C)
	K9402WJ	Stem (sample volume: 0.5μl, material: Hastelloy C)
	K9402WK	Stem (sample volume: 1μl, material: Hastelloy C)
	K9402WL	Stem (sample volume: 2μl, material: Hastelloy C)
	K9402WM	Stem (sample volume: 3μl, material: Hastelloy C)
2	K9402VG	Seal element (Rulon)
	K9402VH	Seal element (Teflon)
3	K9402VA	Insert (SUS16)
	K9402VB	Insert (Glass, straight)
	K9402VC	Insert (Glass, with cup)
	K9402VD	Insert (Glass, with neck)
4	K9402QA	Temperature Sensor (PT100Ω, oven temp.: 145 °C or less)
	K9402QB	Temperature Sensor (PT100Ω, oven temp.: 145 °C or more)
5	K9402QG	Heater (for 100V)
	K9402QH	Heater (for 110V)
	K9402QJ	Heater (for 115V or 120V)
	K9402QK	Heater (for 200V)
	K9402QL	Heater (for 220V)
	K9402QM	Heater (for 230V or 240V)
6	K9402UG	Sample Tube (SUS316)
	K9402UH	Sample Tube (Hastelloy C)
7	K9402UN	O-Ring (Kalrez)
8	K9400XU	Connector (for Mega-bore column or capilary column)
	K9400XX	Connector (for 1/8”)
	K9400XY	Connector (for 1/16”)
9	K	Spring assembly

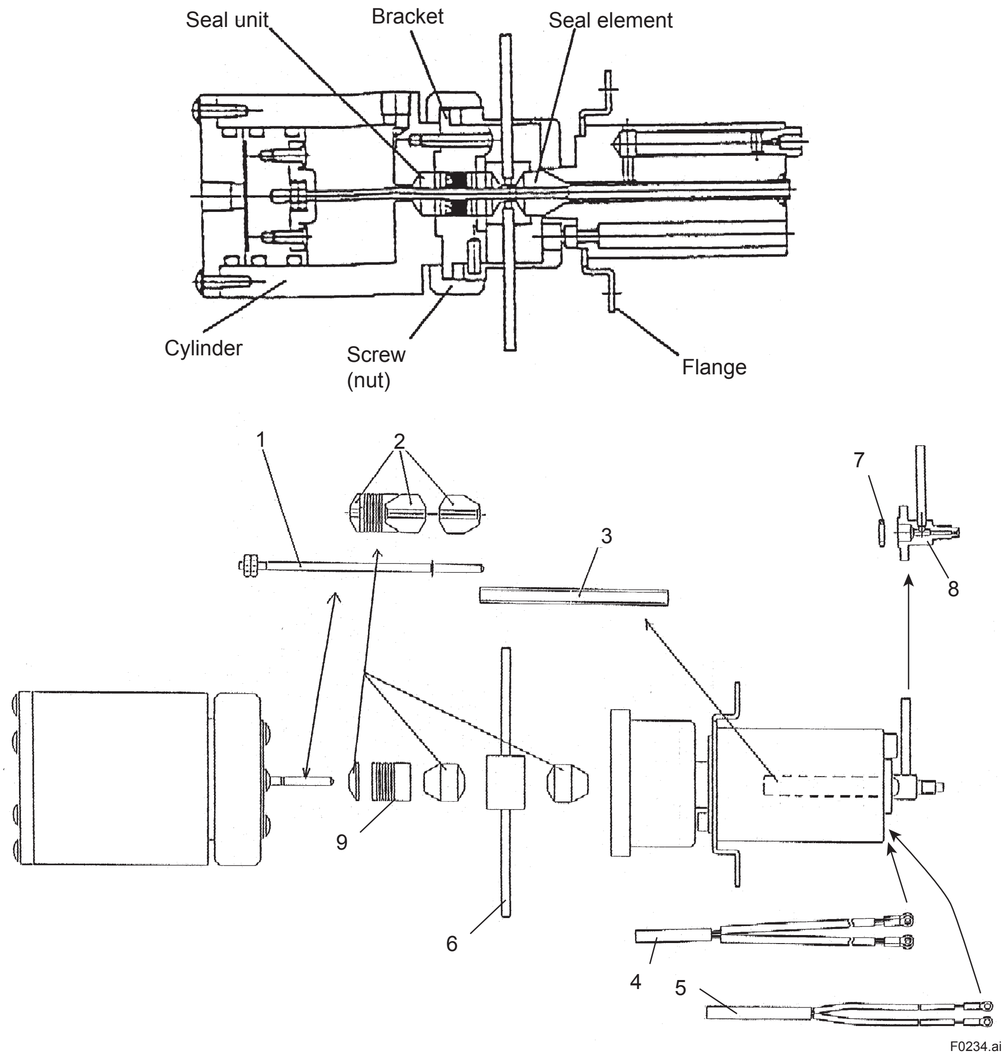


Figure 6.34 Liquid Sampling Valve (LSV)

(8)Restrictors

There are two types of restrictors: low temp. type for isothermal oven temperature of 145 °C max. and high temp. type. for over 145°C. Between these two types, the O-ring material for the restrictor is different.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier gas, hydrogen (or nitrogen) gas for combustion, combustion air, and sample gas.

(4) Open the control unit door using a key included in the accessory kit. And remove the cover by removing the two screws of the pressure/flow control section.

(5) Remove the two couplings connected to the restrictor. When removing the couplings, label them for ease of identifying the connections later.

(6) Remove the two screws on the end of nuts at the pressure control chamber side and pull out its fixture.

(7) Hold the restrictor both from inside the isothermal oven and from the pressure controller side using a set of tools, and remove the locknuts on the pressure controller side, then the restrictor itself.

(8) Install a new restrictor in the reverse order of step (4) to (7). Set the values described in the Operation data by using the control knob of the restrictor and perform the leak test on the piping.

IMPORTANT

After the isothermal temperature of the oven unit becomes substantially stable, again set the flow rate of the restrictor according to the Operation data.

<Replacement Parts> The nuts and sleeves are not included.

K9409CA For low-temperature applications

K9409CB For high-temperature applications

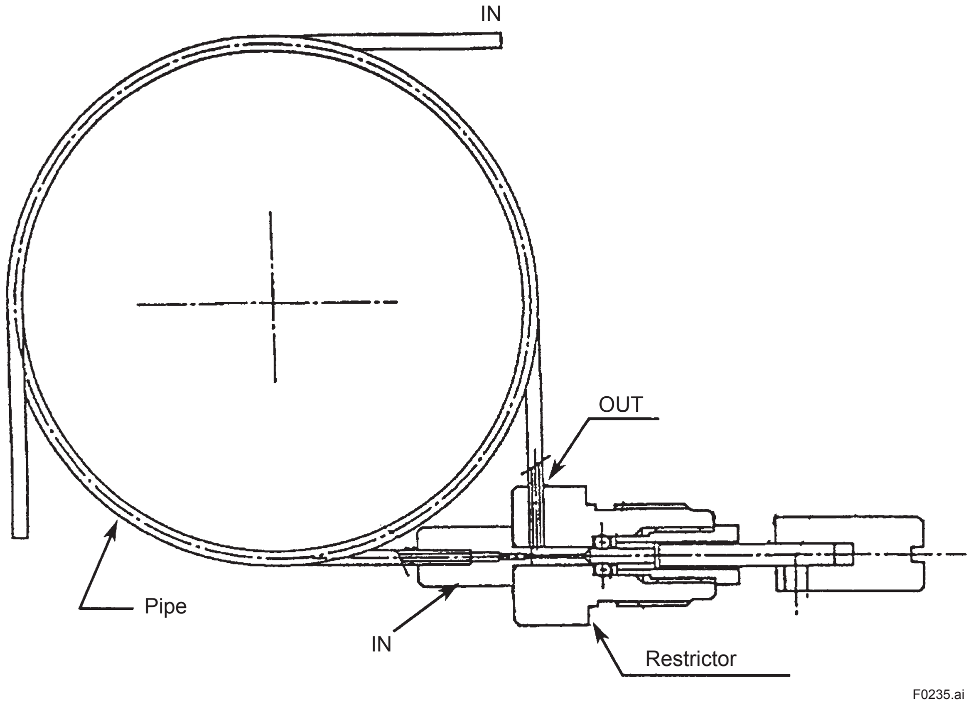


Figure 6.35 Restrictor

(9)Columns in Isothermal Oven

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Turn off the detector.

- TCD: Turn off the detector on Manual operation display.
- FID, FPD: When using hydrogen as the carrier gas, turn off the supplies of combustion air and nitrogen or helium gas for make-up.

  When using carrier gas other than hydrogen, turn off the supply of hydrogen gas for combustion.

(3) Turn off the heater.

Turn off the heaters for the isothermal oven, programmed-temperature oven, LSV and FPD, from the Manual operation display. (See “3.3.4 Stopping operation” for this procedure).

Wait until the PV (Present Value) on the Temperature Status display decreases to ambient temperature.

(4) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(5) Turn off the supply of the purging air, carrier gas. Wait until the pressure of carrier gas decreases to 0 kPa.

(6) Open the control unit door using a key included in the accessory kit.

(7) Remove the screw and then remove the fixture for the column.

(8) Remove the column by loosening two locknuts on both ends of the column. When removing it, it is recommended to keep a note of the numbers labeled on the column and pipes to avoid mixing up during installation.

(9) Remove the plug and install the new column. When installing it, check the numbers of the column and pipes listed in the operation data (column system) or the note taken at step (8).

When treating mega-bore or capillary columns made from fused silica or metal, handle it with care as follows and see How to Attach Fused Silica (or Metal) Capillary Column in the operation data.

(A)
- Do not pull the column hard.
- Do not twist the column.
- Do not scratch the column surface.
- Do not apply an impact on the column.

(B) When mounting on the gas chromatograph, keep at least 10 cm of curvature radius. Bending at a smaller radius could result in column breakage.

Pay extra attention when connecting to LSV. The curvature radius tends to be less than 10 cm.

See Figure 6.36

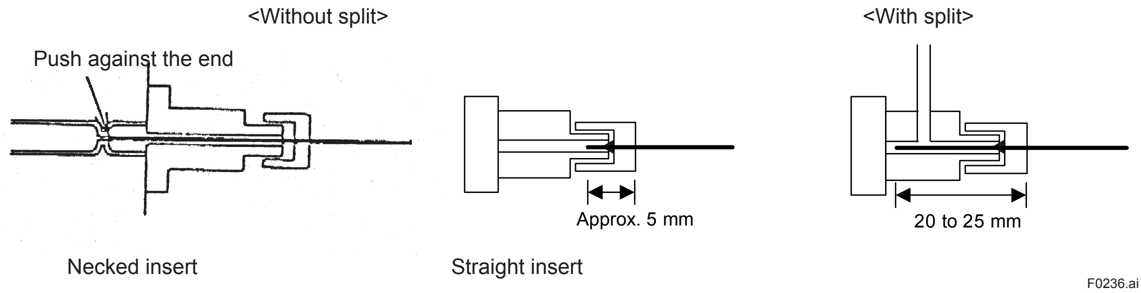


Figure 6.36

(C) When connecting to rotary valves, insert the tip of the column approximately 5 mm into the connector.

(D) When connecting a column, adjust the direction of the column ring on the column hanger or the position of SUS piping to prevent the column from getting undue stress.

After passing the column tip through the column nut and the graphite ferrule, cut off the column tip by 2 to 3 mm to avoid graphite dust from attaching to the tip.

(E) When cutting a column, use the dedicated column cutter and avoid squashing the cut end. Make sure that the metal flakes will not get inside the column. For the fused silica column, make sure that the cut end is smooth.

(10) Supply the carrier gas.

(11) Confirm that there is no carrier gas leakage from the column fittings.

(12) In order to remove air and water that entered inside the column, flow the carrier gas through the column for about one hour at room temperature. Calibration must be conducted after the oven temperature has stabilized.

■ Cautions for storage

IMPORTANT

- Store columns in a desiccator where temperature can be controlled. The desiccator must be placed in a location where temperature will not drop below 0 °C.
- For a long-term storage, check for the following once every month.
  - Packed column: sealed plugs are secured.
  - Mega-bore or Capillary columns: silicone rubber plugs are in place.

(10) Flame Arrester

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supplies of the purging air, carrier gas, hydrogen (or nitrogen) gas for combustion, combustion air, and sample gas.

(4) Open the control unit door using a key included in the accessory kit.

(5) Remove all of the couplings (two to eight) connected to the flame arrester. When removing the couplings, label them for ease of identifying the connections later.

(6) Remove the flame arrester. If the flame arrester is threaded through the wall of the isothermal oven, pull it out.

(7) Install a new flame arrester in the reverse order of steps (5) and (6).

(8) Perform a leak test on the piping.

<Replacement Parts> The nuts and sleeves are not included.

K9407QN	For normal usage (SUS316)
K9404QS	Corrosion-resistance type (Hastelloy C)

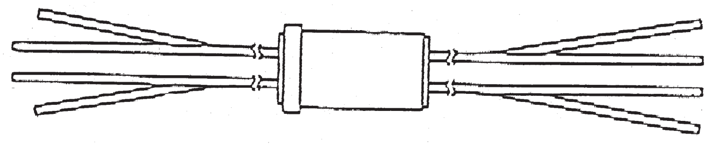


Figure 6.37

(11) Isothermal Oven Gasket

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supply of the purging air.
(4) Open the control unit door using a key included in the accessory kit.
(5) The gasket lines the edges of the inner walls of the isothermal oven. Separate the gasket from the edges and gently pull it away from the oven walls.
(6) Line a new gasket along the edges of the inner walls, gently pressing its grooves to fit over the edges.
(7) After replacement, confirm that the gasket is fitting over the edges properly without any gaps.

<Replacement Parts>

K9803SX	For large isothermal oven
K9803SW	For isothermal oven

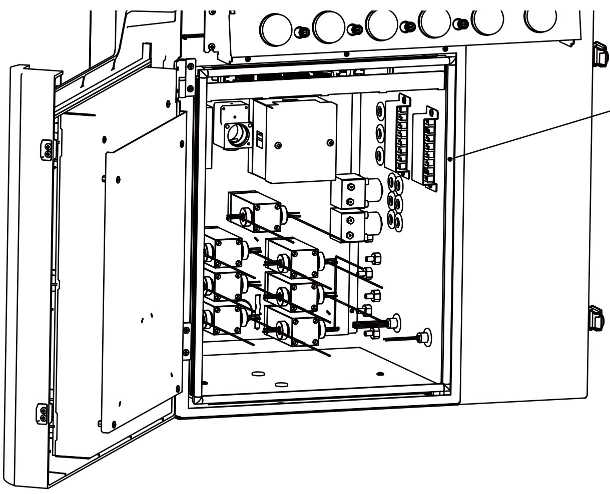


Figure 6.38

(12) Air Turbine for Agitator Fan

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supply of the purging air.
(4) Open the control unit door using a key included in the accessory kit.
(5) Remove the wiring to the heater from the terminal block on the right side of the isothermal oven.
(6) Remove the four screws, two temperature sensors, and heater cover.
(7) Remove the four screws to remove the heater cover.
(8) Remove the two screws to remove the fan.
(9) Remove twelve screws to remove the gasket and the gasket-holding plate.
(10) Remove three screws to remove the air turbine for the agitator fan.
(11) Install a new air turbine for the agitator fan.
(12) Reinstall the gasket, gasket-holding plate, fan and heater cover in the reverse order of steps (4) to (9). Before installing the heater cover, confirm that the temperature sensor is in place.

<Replacement Parts>

K9400FA	Turbine
K9400FU	Gasket

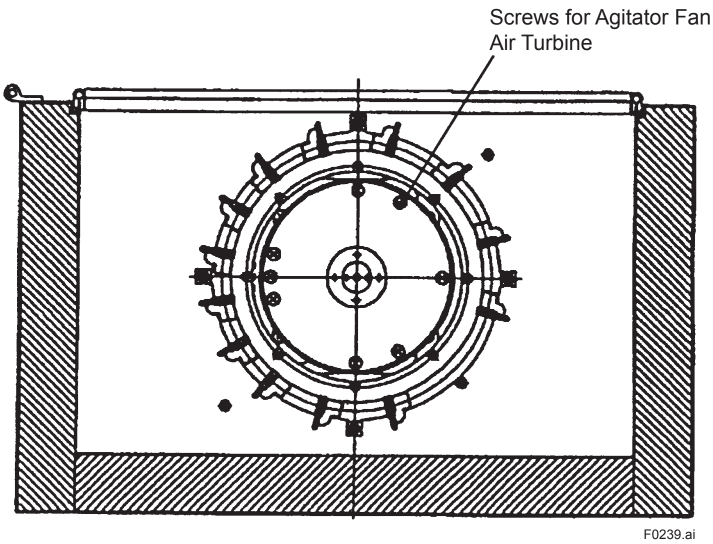


Figure 6.39 Air Turbine for Agitator Fan

6.2.5 Components in the Sample Processing System

The instructions for replacing parts in the sample processing system are explained.

(1) Sample processing system
(2) Atmospheric pressure balancing valve or flow rate control needle valve

(3) Flowmeter
(4) Pressure gauge
(5) Pneumatic valve for actuating external air supply
(6) Stream switching valve or pneumatic valve for atmospheric balance

(1)Sample Processing System

The sample processing system is a train of filter, regulator for samples, stop valve, stream switching valve and needle valve.

Some systems may not comprise all of these components depending on the specifications. To replace any of these components, follow the steps below.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Turn off the supply of the sample.
(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).
- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(5) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(6) Remove the two pipes connected to the needle valve shown on the far left of Figure 6.44.
(7) Remove the nut on the outside of the analyzer unit.
(8) Remove the sample processing system from the analyzer.
(9) Remove the component and install a new component.
(10) Reassemble the sample processing system in the reverse order of steps (7) to (9).
When installing a replacement component, always use sealing tape.
(11) Confirm that there are no leaks in the piping.

<Replacement Parts>

K9193HH	Needle valve
K9192WA	Stream switching valve (Diaphragm: Teflon, Wetted surface: Viton)
K9192WB	Stream switching valve (Diaphragm: Teflon, Wetted surface: Silicone)

L9805ZF	Regulator valve for samples (Diaphragm: Teflon, Liner: SUS)
L9862AB	Filter

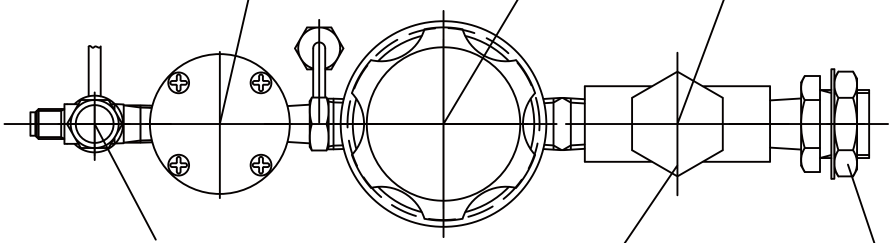


Figure 6.44 Example of Sample Processing System (May contain a Stop Valve depending on the system)

● Filter element

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Turn off the supply of the sample.
(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).
- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(5) Remove the cap nut (see Figure 6.45).
(6) Replace the internal filter element and the gaskets with a new one.
(7) Firmly tighten the cap nut.
(8) Confirm that there are no leaks.

<Replacement Parts>

L9862AG	Filter element
L9862AC	Gasket 1

L9862AD Gasket 2

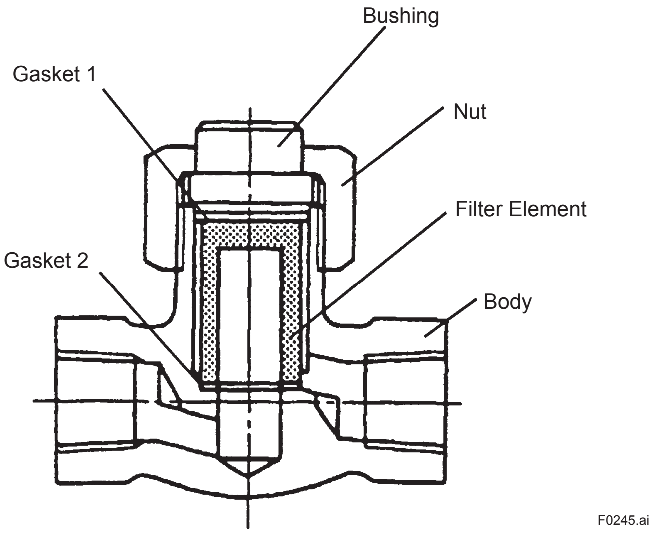


Figure 6.45

(2)Atmospheric Pressure Balancing Valve and/or Needle Valve for Controlling Flow Rate

See Figure 6.46.

(1) Stop the operation. (See "3.3.4 Stopping operation" for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supply of the purging air.

(4) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(5) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.

  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

(6) Remove the pipes connected to the atmospheric pressure balancing valve and needle valve for controlling the flow rate.
(7) Remove the four screws holding the bracket.
(8) When replacing atmospheric pressure balancing valve, remove two screws on the back side of the bracket. When replacing flow rate control needle valve, remove the nuts on the front side of the bracket.
(9) After replacing each components with new ones, reassemble in the reverse order of steps (6) to (8).
(10) Confirm that the piping is correct and there are no leaks.

<Replacement Parts>

L9853AA	Needle valve
K9192WP	Atmospheric pressure balancing valve (Diaphragm: Teflon, Wetted surface: Viton)
K9192WQ	Atmospheric pressure balancing valve (Diaphragm: Teflon, Wetted surface: Silicone)

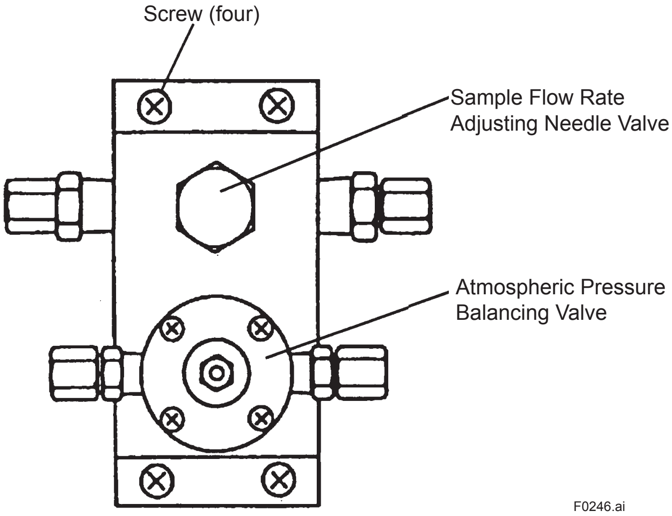


Figure 6.46 Atmospheric Pressure Balancing Valve and Sample Flow Rate Adjusting Needle Valve

(3)Flowmeter

See Figure 6.47.
(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Turn off the supply of the sample.
(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).
- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(5) Remove the four pipes connected to the flowmeter.
(6) Loose the mounting screws at the base and remove the flowmeter.
(7) Replace the flowmeter in the reverse order of steps (5) and (6).
(8) Confirm that there are no leaks in the piping.

<Replacement Parts>

K9805WA, K9805WC	for gas samples (Gasket: Viton)
K9805WE	for liquid samples (Gasket: Teflon)
K9805WB, K9805WD	for gas samples (Gasket: Teflon)
K9805WF	for liquid samples (Gasket: Daiel Par-Flour)

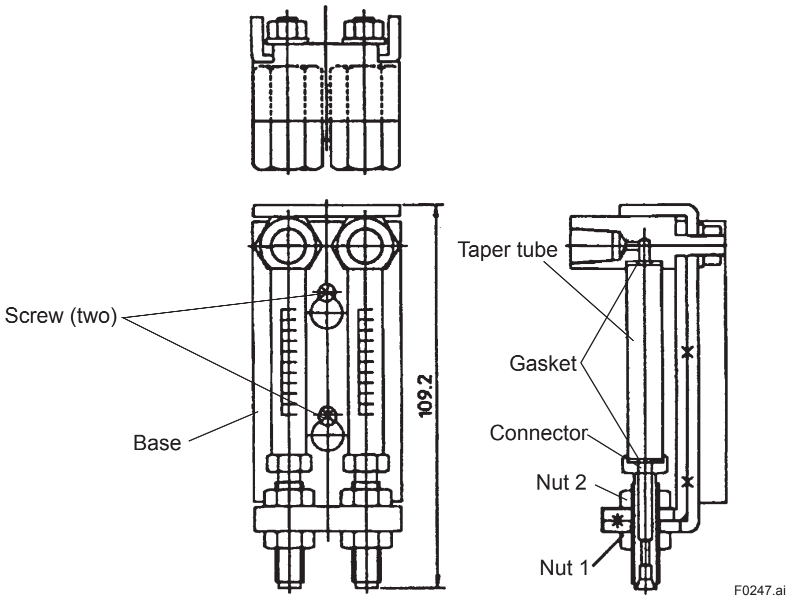


Figure 6.47 Taper Tube

When replacing only the taper tube, follow the procedure below (see Figure 6.47).

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Turn off the supply of the sample.
(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(5) Remove the lower pipe connected to the flowmeter assembly.
(6) Hold the connector and loosen nut 1 and nut 2.
(7) Gently move the connector downward and remove the taper tube. Replace the gasket if any damage is found.
(8) Install a new taper tube in the reverse order of steps (5) to (7).
(9) Confirm that there are no leaks in the piping.

<Replacement Parts>

L9866AK	Taper tube (for gas sample, 1.1 l/min)
L9866AP	Taper tube (for gas sample, 150 ml/min)
L9866AR	Taper tube (for liquid sample, 100 ml/min)
L9866AS	Taper tube (for liquid sample, 20 ml/min)
K9193GQ	Gasket (for gas sample, Viton)
K9193GR	Gasket (for liquid sample, Teflon)
K9805ZA	Gasket (for liquid sample, Daiel Par-flour)

(4)Pressure Gauge

See Figure 6.48 for the replacement procedure.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).
(2) Turn off the supply of the sample.
(3) If the sample is liquid, purge the sample line with the purge gas (nitrogen gas or instrument air).

- When the stream switching valve is a pneumatic valve, change the analyzer status to Manual and turn on the stream switching valve on the sample line to let the purge gas flow in.
- When the stream switching valve is a stop valve, close all the stop valves and open the stop valve on the sample line to let the purge gas flow in.

(4) Close all the stream switching valves.

IMPORTANT

- During the purge, purge gas may flow into the sample return line, causing pressure fluctuation.
  Prepare the sample return line and collection tank, if necessary.
- Prepare the sample return line so that the sample does not return.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(5) Remove the pipe connected to the elbow on the rear of the pressure gauge.
(6) Remove the two screws on the fitting.
(7) Remove two nuts and two washers that fix the pressure gauge to the fitting.
(8) Remove the elbow connected to the pressure gauge.
(9) Install a new pressure gauge in the reverse order of steps (5) to (8). When attaching the elbow, always apply sealing tape to the connection of the pressure gauge.
(10) Confirm that there are no leaks.

<Replacement Parts>

L9867AG	0 to 0.2 MPa
L9867AJ	0 to 0.6 MPa

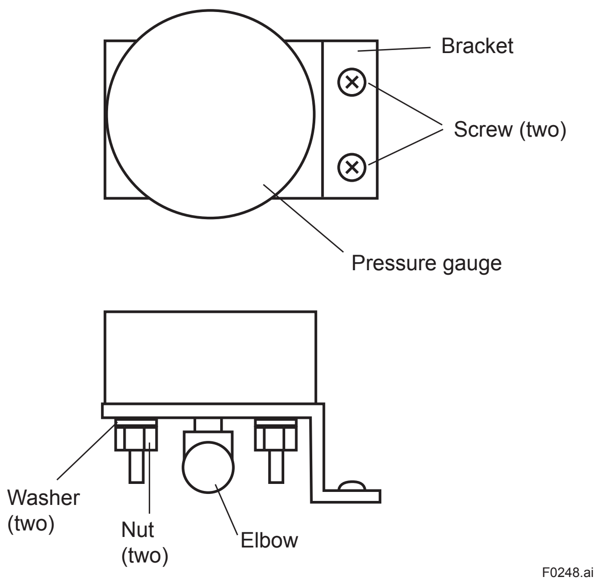


Figure 6.48 Pressure Gauge

(5)Pneumatic Valve for Actuating External Air Supply

See Figure 6.49 for the replacement procedure.

(1) Stop the operation. (See “3.3.4 Stopping operation” for this procedure).

(2) Stop the supply of power.

CAUTION

The isothermal oven is extremely hot after turning off the power immediately. Keep the purging air supplied for more than an hour after turning off the power. Keep hands away from the oven components.

(3) Turn off the supply of the purging air. Remove the tubes connected to ports IN, OUT1, OUT2, and OPEN. When removing the tubes, put labels on them for ease of identifying the connections later (see Figure 6.49 and Figure 6.50).

(4) Remove the two screws.

(5) Install a new pneumatic valve for actuating the external air supply in the reverse order of steps (3) and (4).

(6) Confirming that the piping is correct and there are no leaks.

(7) After completing the piping, follow the steps below.

(a) After fully opening each of the needle valves, rotate it back two turns and lock them.

(b) Feed air and make sure that air comes out from point (1) but not from point (2).

(c) Actuate valve SV11 and make sure that air comes out from (2) but not from (1).

(d) Repeat steps (b) and (c) and confirm that the reaction times at (1) and (2) do not take more than 0.5 seconds, with respect to the actuation of SV11.

(e) If the reaction time at (1) was more than 0.5 seconds as a result of step (d), open the EHX1 needle valve by 1/4 turns and check the delay again. If the reexamination still shows the same result, repeat this step.

(f) If the reaction time at (2) was more than 0.5 seconds as a result of step (d), open the EHX2 needle valves by 1/4 turns and check the delay again. If the reexamination still shows the same result, repeat this step.

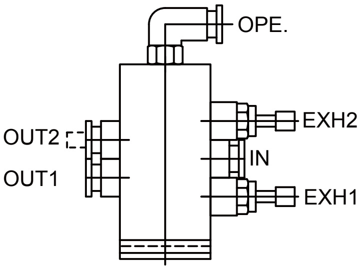
<Replacement Parts>

K9193NX

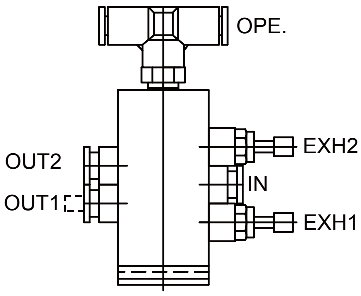
K9193NY

K9193NT

K9193NU



K9193NX (K9193NY)



K9193NT (K9193NU)

Figure 6.49 Pneumatic Valve for Actuating External Air Supply

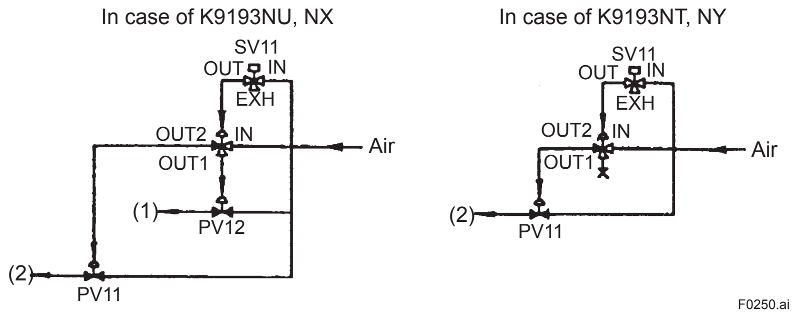


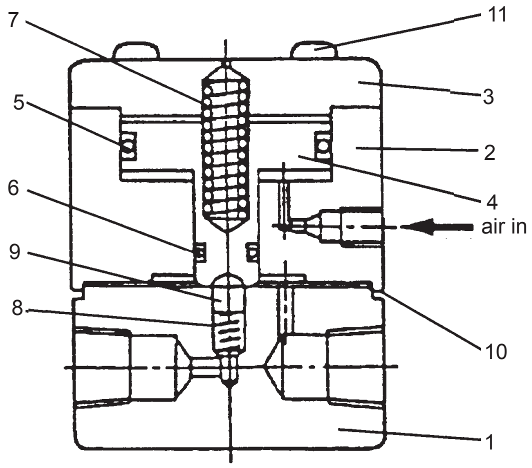
Figure 6.50

(6) Diaphragm of Pneumatic Valve for Atmospheric Pressure Balancing or Stream Switching

(1) Remove the pipe for air.

(2) Remove the four screws on the upper section of the stream switching valve (see Figure 6.51) or the atmospheric-pressure balancing valve (see Figure 6.52) to remove the upper section of the valve itself.

(3) Replace the diaphragm with a new one and reassemble the valve. Install the new diaphragm in the same orientation. Exercise care to avoid losing the adjusting pin and spring at the lower section of the valve.



No.	Part name	Part number	Quantity K9192WA	Quantity K9192WB
1	BASE	K9192WD	1	1
2	BODY	K9192WE	1	1
3	CAP	K9192WF	1	1
4	PISTON	K9192WG	1	1
5	O-RING	K9142QU	1	1
6	O-RING	L9817FK	1	1
7	SPRING	K9192WH	1	1
8	SPRING	K9035AW	1	1
9	PIN	K9192WK	1	1
10	DIAPHRAGM	K9192WL	1	
		K9192WV		1
11	SCREW	Y9335JU	4	4

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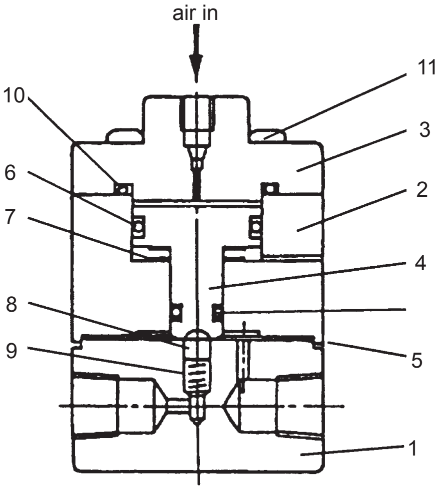
Figure 6.51 **Stream Switching Valve**



No.	Part name	Part number	Quantity	
1	BASE	K9192WD	1	1
2	BODY	K9192WR	1	1
3	CAP	K9192WS	1	1
4	PISTON	K9192WT	1	1
5	DIAPHRAGM	K9192WL	1	
		K9192WV		1
6	O-RING	L9817FP	1	1
7	SPRING	K9192WU	4	4
8	PIN	L9192WK	1	1
9	SPRING	K9035AW	1	1
10	O-RING	L9817MY	1	1
11	SCREW	Y9335JU	4	4
			K9192WP	K9192WQ

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Figure 6.52 Atmospheric-Pressure Balancing Valve

7. Troubleshooting

An alarm is displayed when a malfunction occurs.

In the alarm display, possible causes and corrective actions are shown. Fix the problems referring to them.

Even if alarms are not activated but analysis results show a malfunction, fix the problem referring to 7.2 “Troubleshooting in Malfunctions in Analysis Result.”

7.1 Alarm

When an alarm is occurred, fix the problem referring to possible causes and corrective actions shown in it.

7.1.1 Alarm Type

There are three types of alarm.

- GC8000 system-fixed alarm
- User-set alarm which can be defined by the user (Component Alarm)
- DI alarm which can be assigned to contact inputs by the user

(1)Fixed Alarm

These alarms has been set to GC8000.

(2)User-set Alarm (Component Alarm)

The maximum of 32 upper and lower limit check alarms can be set for calculation results.

Such calculation items are

(1) concentration,

(2) retention time,

(3) variation coefficient, and

(4) tailing coefficient.

Make the settings to define the user-set up alarm in Alarm Setup screen of the EtherLCD.

To delete a user-set alarm, set both the stream number and peak number to zero.

Stream and Peak Numbers

Select streams and peak numbers to perform the upper and lower limit check.

Check Items

Set upper and lower limits in concentration, retention time, variation coefficient and tailing coefficient.

Upper and Lower Limits

Set the upper and lower limits to be checked.

(3)DI Alarm

An alarm is activated when signals are fed into a contact input. There are up to 32 contact inputs.

The alarm number is 200 + contact number for alarm level 2, and 400 + contact number for alarm level 3.

For the alarm, do the following settings.

To set or delete a DI alarm, select “Alarm process” in the Process assign from the DI Setup Screen in the EtherLCD.

Alarm Level

Set to level 2 or 3.

Alarm Message

The alarm message can be defined with up to 22 alphanumeric characters.

7.1.2 Alarm Process

There are four alarm levels which are processed as follows.

● Level 1

This alarm is activated when malfunctions in the system or hardware occur. Once activated, the alarm status is maintained until released.

When a level 1 alarm is activated during Process status with Run mode, Run mode moves to Stop at the end of the measurement being performed at the time.

● Level 2

This alarm is activated when malfunctions in measurement conditions, etc. occur.

Once activated, the alarm status is maintained until released.

● Component

This alarm is activated when measurement results for concentration, retention time, etc. fall out of range.

Once activated, the alarm status is maintained until released.

● Level 3

This alarm is activated for minor malfunctions or information.

The alarm status is not maintained.

7.1.3 Alarm Number

The alarm number is assigned for each alarm level as follows.

● Alarm 1 to 174: Level 1 Alarm

1 to 174: Fixed Alarm

● Alarm 201 to 294: Level 2 Alarm

201 to 232: DI Alarm (200 + contact number)

251 to 294: Fixed Alarm

291 to 294: Composition Alarm

● Alarm 401 to 562: Level 3 Alarm

401 to 432: DI Alarm (400 + contact number)

450 to 562: Fixed Alarm

471 to 474: Composition Alarm

7.1.4 Alarm Contents

The alarm type and contents are as the following tables.

In the alarm display, possible causes and corrective actions are shown. Fix the problems referring to them.

The thresholds to activate alarms are shown in the table below.

DI alarm of level 2 and 3 are set from the DI Setup Screen in EtherLCD.

■ Level 1

● Fixed Alarm

No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
1	SYS ERR	System error	Launch task Send message Other	Error to launch task Error to send message, etc	N/A
2	OVEN 1 SYS ERR	Oven 1 system error			
3	OVEN 2 SYS ERR	Oven 2 system error			
4	OVEN 3 SYS ERR	Oven 3 system error			
14	DATABASE INIT ERR	Database init error	Initialize DB	Error to initialize DB	N/A
15	CONC CALC ERR	Conc calc error	Calculation time	Calculation was not concluded before the start of the next analysis	Method setting screen
16	OVEN1 INIT ERR	Oven1 init error	Launch task Send message Other – initialize DB	Error to launch task Error to send message Error to initialize DB	N/A
17	OVEN2 INIT ERR	Oven2 init error			
18	OVEN3 INIT ERR	Oven3 init error			
26	FILE INIT ERR	File initialization error	Initialize File system	Error to initialize File system	N/A
27	ETHER INIT ERR	Ethernet initialization error	Initialize Ethernet	Error to initialize Ethernet	N/A
28	FTP INIT ERR	FTP initialization error	Initialize FTP	Error to Initialize FTP	
31	CTL CARD ID ERR	Card ID error	System setting	Mismatch between system setting and card ID	Slot setting
32	OVEN1 CARD ID ERR	Oven card 1 ID error	System setting	Mismatch in isothermal and programmed temperature settings, and explosionproof requirements	N/A
33	OVEN2 CARD ID ERR	Oven card 2 ID error			
34	OVEN3 CARD ID ERR	Oven card 3 ID error			
35	TMP CARD1 ID ERR	Temp. card 1 ID error	System setting	Mismatch in card marks and explosionproof types	N/A
36	TMP CARD2 ID ERR	Temp. card 2 ID error			
37	TMP CARD3 ID ERR	Temp. card 3 ID error			
38	DET CARD1 ID ERR	Detector card 1 ID error	System setting	Mismatch in card types	Detector setting
39	DET CARD2 ID ERR	Detector card 2 ID error			
40	DET CARD3 ID ERR	Detector card 3 ID error			
52	DET1-1 FPGA ERR	Detector card 1-1 FPGA error	Write software in FPGA	Error to write software in FPGA	N/A
53	DET1-2 FPGA ERR	Detector card 1-2 FPGA error			
54	DET2-1 FPGA ERR	Detector card 2-1 FPGA error			
55	DET2-2 FPGA ERR	Detector card 2-2 FPGA error			
56	DET3-1 FPGA ERR	Detector card 3-1 FPGA error			
57	DET3-2 FPGA ERR	Detector card 3-2 FPGA error			

No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
61	AI A/D ERR	AI card A/D calibration error	Calibrate 16-bit AD of temperature controller signal and AI signal upon power-on	Error to calibrate 16-bit AD of temperature controller signal and AI signal upon power-on	N/A
62	TMP CARD1 A/D ERR	Temp. ctrl card 1 A/D cal. error			
63	TMP CARD2 A/D ERR	Temp. ctrl card 2 A/D cal. error			
64	TMP CARD3 A/D ERR	Temp. ctrl card 3 A/D cal. error			
65	OVEN1 TMP A/D ERR	Oven 1 temp. A/D cal. error			
66	OVEN2 TMP A/D ERR	Oven 2 temp. A/D cal. error			
67	OVEN3 TMP A/D ERR	Oven 3 temp. A/D cal. error			
71	OVEN1 COM ERR	Oven 1 communication error	Communication with OVEN 1	Communication between OVEN and CPU is disconnected for a set period of time	N/A
72	OVEN2 COM ERR	Oven 2 communication error	Communication with OVEN 2		
73	OVEN3 COM ERR	Oven 3 communication error	Communication with OVEN 3		
74	TMP1 CTL ERR	Temp. sensor 1 temp. cntrl error	Exceeds the deviation limit setting for Oven 1 temperature setting value and measurement value.	Deviation exceeds the value set	Deviation temperature setting screen
75	TMP2 CTL ERR	Temp. sensor 2 temp. cntrl error	Exceeds the deviation limit setting for Oven 2 temperature setting value and measurement value.		
76	TMP3 CTL ERR	Temp. sensor 3 temp. cntrl error	Exceeds the deviation limit setting for Oven 3 temperature setting value and measurement value.		
77	TMP1 AD ERR	Temp. sensor 1 standard AD error	Standard ZERO/ MIDDLE/SPAN values exceed the range	Each value exceeds x	N/A
78	TMP2 AD ERR	Temp. sensor 2 standard AD error			
79	TMP3 AD ERR	Temp. sensor 3 standard AD error			
81	TMP1 OVER LIMIT	Temp. sensor 1 over limit	Temperature sensor value	Upper limit: User-set value Lower limit: –20°C	N/A
82	TMP2 OVER LIMIT	Temp. sensor 2 over limit			
83	TMP3 OVER LIMIT	Temp. sensor 3 over limit			
84	TMP1 HIGH	Overtemp protection zone1			N/A
85	TMP2 HIGH	Overtemp protection zone2			
86	TMP3 HIGH	Overtemp protection zone3			
87	TMP1 SENSOR BURN OUT	Temp. sensor 1 failure	Temperature sensor value	Temperature exceeds the upper limit of 350°C	N/A
88	TMP2 SENSOR BURN OUT	Temp. sensor 2 failure			
89	TMP3 SENSOR BURN OUT	Temp. sensor 3 failure			

7

No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
90	TMP1 SENS C S/C	Temp. sensor 1 short circuit	Temperature sensor value	Temperature falls below the lower limit of –20°C	N/A
91	TMP2 SENS C S/C	Temp. sensor 2 short circuit			
92	TMP3 SENS C S/C	Temp. sensor 3 short circuit			
93	TMP1 SENS P S/C	Overtemp protect zone 1 short circuit			N/A
94	TMP2 SENS P S/C	Overtemp protect zone 2 short circuit			
95	TMP3 SENS P S/C	Overtemp protect zone 3 short circuit			
111	ELEC PRESS DOWN	Low electronic purge pressure			N/A
112	OVEN1 PRESS DOWN	Low oven 1 pressure			N/A
113	OVEN2 PRESS DOWN	Low oven 2 pressure			
114	OVEN3 PRESS DOWN	Low oven 3 pressure			
115	PURGING1	Oven 1 purging			N/A
116	PURGING2	Oven 2 purging			
117	PURGING3	Oven 3 purging			
121	DET1-1 A/D ERR	Detector 1-1 A/D cal. error	Detector card value	Exceed internal upper and lower limit values	N/A
122	DET1-2 A/D ERR	Detector 1-2 A/D cal. error			
123	DET2-1 A/D ERR	Detector 2-1 A/D cal. error			
124	DET2-2 A/D ERR	Detector 2-2 A/D cal. error			
125	DET3-1 A/D ERR	Detector 3-1 A/D cal. error			
126	DET3-2 A/D ERR	Detector 3-2 A/D cal. error			
127	DET1-1 FLAME OUT	Detector 1-1 A/D flame out	FID & FPD flame detector level	Flame detectors for FID & FPD drop below detection level	Detector signal setting screen
128	DET1-2 FLAME OUT	Detector 1-2 A/D flame out			
129	DET2-1 FLAME OUT	Detector 2-1 A/D flame out			
130	DET2-2 FLAME OUT	Detector 2-2 A/D flame out			
131	DET3-1 FLAME OUT	Detector 3-1 A/D flame out			
132	DET3-2 FLAME OUT	Detector 3-2 A/D flame out			
133	DET1-1 CURRENT ERR	Det 1-1 current out-of-range	TCD current value	TCD current value exceeds 350 mA for H2-He mix, and 150 mA for others. Current applied to the detector drops below 60 mA during Run mode.	N/A
134	DET1-2 CURRENT ERR	Det 1-2 current out-of-range			
135	DET2-1 CURRENT ERR	Det 2-1 current out-of-range			
136	DET2-2 CURRENT ERR	Det 2-2 current out-of-range			
137	DET3-1 CURRENT ERR	Det 3-1 current out-of-range			
138	DET3-2 CURRENT ERR	Det 3-2 current out-of-range			
141	EPC1 COM ERR	EPC 1 communication error	EPC communication	EPC communication fails 5 consecutive times	N/A
142	EPC2 COM ERR	EPC 2 communication error			
143	EPC3 COM ERR	EPC 3 communication error			

No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
151	CAR1-1 PRESS LOW	Carrier gas 1-1 pressure low			N/A
152	CAR1-2 PRESS LOW	Carrier gas 1-2 pressure low			
153	CAR2-1 PRESS LOW	Carrier gas 2-1 pressure low			
154	CAR2-2 PRESS LOW	Carrier gas 2-2 pressure low			
155	CAR3-1 PRESS LOW	Carrier gas 3-1 pressure low			
156	CAR3-2 PRESS LOW	Carrier gas 3-2 pressure low			
157	CAR1-1 PRES CTL ERR	Carrier gas 1-1 control error	Pressure value	Pressure is either above 500 kPa or under 0 kPa	N/A
158	CAR1-2 PRES CTL ERR	Carrier gas 1-2 control error			
159	CAR2-1 PRES CTL ERR	Carrier gas 2-1 control error			
160	CAR2-2 PRES CTL ERR	Carrier gas 2-2 control error			
161	CAR3-1 PRES CTL ERR	Carrier gas 3-1 control error			
162	CAR3-2 PRES CTL ERR	Carrier gas 3-2 control error			
163	UTL1-1 PRES CTL ERR	Utility gas 1-1 control error			
164	UTL1-2 PRES CTL ERR	Utility gas 1-2 control error			
165	UTL1-3 PRES CTL ERR	Utility gas 1-3 control error			
166	UTL1-4 PRES CTL ERR	Utility gas 1-4 control error			
167	UTL2-1 PRES CTL ERR	Utility gas 2-1 control error			
168	UTL2-2 PRES CTL ERR	Utility gas 2-2 control error			
169	UTL2-3 PRES CTL ERR	Utility gas 2-3 control error			
170	UTL2-4 PRES CTL ERR	Utility gas 2-4 control error			
171	UTL3-1 PRES CTL ERR	Utility gas 3-1 control error			
172	UTL3-2 PRES CTL ERR	Utility gas 3-2 control error			
173	UTL3-3 PRES CTL ERR	Utility gas 3-3 control error			
174	UTL3-4 PRES CTL ERR	Utility gas 3-4 control error			

Level 2

DI Alarm

No.	MESSAGE	Alarm Contents	Threshold Item	Setting Value
201	DI#1 ALARM	DI#1 Alarm		
202	DI#2 ALARM	DI#2 Alarm		
203	DI#3 ALARM	DI#3 Alarm		
204	DI#4 ALARM	DI#4 Alarm		
205	DI#5 ALARM	DI#5 Alarm		
206	DI#6 ALARM	DI#6 Alarm		
207	DI#7 ALARM	DI#7 Alarm		
208	DI#8 ALARM	DI#8 Alarm		
209	DI#9 ALARM	DI#9 Alarm		
210	DI#10 ALARM	DI#10 Alarm		
211	DI#11 ALARM	DI#11 Alarm		
212	DI#12 ALARM	DI#12 Alarm		
213	DI#13 ALARM	DI#13 Alarm		
214	DI#14 ALARM	DI#14 Alarm		
215	DI#15 ALARM	DI#15 Alarm		
216	DI#16 ALARM	DI#16 Alarm		
217	DI#17 ALARM	DI#17 Alarm		
218	DI#18 ALARM	DI#18 Alarm		
219	DI#19 ALARM	DI#19 Alarm		
220	DI#20 ALARM	DI#20 Alarm		
221	DI#21 ALARM	DI#21 Alarm		
222	DI#22 ALARM	DI#22 Alarm		
223	DI#23 ALARM	DI#23 Alarm		
224	DI#24 ALARM	DI#24 Alarm		
225	DI#25 ALARM	DI#25 Alarm		
226	DI#26 ALARM	DI#26 Alarm		
227	DI#27 ALARM	DI#27 Alarm		
228	DI#28 ALARM	DI#28 Alarm		
229	DI#29 ALARM	DI#29 Alarm		
230	DI#30 ALARM	DI#30 Alarm		
231	DI#31 ALARM	DI#31 Alarm		
232	DI#32 ALARM	DI#32 Alarm		

Fixed Alarm

No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
251	OVERRIDE	Override			N/A
252	DUAL ETHER ERR	Wrong def. of dual Ethernet	IP address	Invalid IP address setting	Ethernet setting screen
253	FILE_READ_ERR	File reading error	File	Error to read	N/A
254	FILE_WRITE_ERR	File writing error	File	Error to write	N/A
261	HMI SYS ERR	HMI system error	DO contact for HMI Fail		N/A
262	HMI COMM ERR	HMI communication error	DO contact for HMI communication error		N/A
271	OVEN1 COOL ERR	Oven 1 cooling error	Temperature control for programmed temperature oven	Temperature control does not start when analysis starts.	N/A
272	OVEN2 COOL ERR	Oven 2 cooling error			
273	OVEN3 COOL ERR	Oven 3 cooling error			
281	C-OVER	Calibration error	Calibration range	Exceeds the set value.	Peak setting screen
282	C-REPT	Calibration repeatability failure	Repeatable calibration range	Exceeds the set value.	Peak setting screen
283	C-COEF	Failure of calibration coefficient	Invalid calibration coefficient	Exceeds the set value.	Peak setting screen
291	CONC OUT	Concentration abnormal	Concentration	Exceeds the set value.	Alarm setting screen
292	RT OUT	Retention time abnormal	Retention time	Exceeds the set value.	Alarm setting screen
293	DEV OUT	Variation coefficient abnormal	Variation coefficient	Exceeds the set value.	Alarm setting screen
294	TAIL OUT	Tailing coefficient abnormal	Tailing coefficient	Exceeds the set value.	Alarm setting screen

■ Level 3

● DI Alarm

No.	MESSAGE	Alarm Contents	Threshold Item	Setting Value
401	DI#1 ALARM	DI#1 Alarm		
402	DI#2 ALARM	DI#2 Alarm		
403	DI#3 ALARM	DI#3 Alarm		
404	DI#4 ALARM	DI#4 Alarm		
405	DI#5 ALARM	DI#5 Alarm		
406	DI#6 ALARM	DI#6 Alarm		
407	DI#7 ALARM	DI#7 Alarm		
408	DI#8 ALARM	DI#8 Alarm		
409	DI#9 ALARM	DI#9 Alarm		
410	DI#10 ALARM	DI#10 Alarm		
411	DI#11 ALARM	DI#11 Alarm		
412	DI#12 ALARM	DI#12 Alarm		
413	DI#13 ALARM	DI#13 Alarm		
414	DI#14 ALARM	DI#14 Alarm		
415	DI#15 ALARM	DI#15 Alarm		
416	DI#16 ALARM	DI#16 Alarm		
417	DI#17 ALARM	DI#17 Alarm		
418	DI#18 ALARM	DI#18 Alarm		
419	DI#19 ALARM	DI#19 Alarm		
420	DI#20 ALARM	DI#20 Alarm		
421	DI#21 ALARM	DI#21 Alarm		
422	DI#22 ALARM	DI#22 Alarm		
423	DI#23 ALARM	DI#23 Alarm		
424	DI#24 ALARM	DI#24 Alarm		
425	DI#25 ALARM	DI#25 Alarm		
426	DI#26 ALARM	DI#26 Alarm		
427	DI#27 ALARM	DI#27 Alarm		
428	DI#28 ALARM	DI#28 Alarm		
429	DI#29 ALARM	DI#29 Alarm		
430	DI#30 ALARM	DI#30 Alarm		
431	DI#31 ALARM	DI#31 Alarm		
432	DI#32 ALARM	DI#32 Alarm		

7

Fixed Alarm

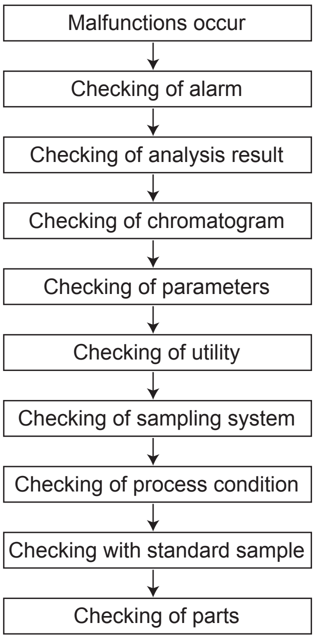
No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
450	EXCP ERR	Exception error			N/A
451	POWER ON	Power on	Power supply	Power supply turned on	N/A
452	PARA MISMATCH	Parameter mismatch	Setting parameter	Mismatch of setting parameters	Respective parameters
453	TIME SET ERR	Time setting failed.	Set time	Error to set time	
454	MODE CHANGE ERR	Operation mode change failed	Operation mode	Error to change operation mode	Respective parameters
455	CHANGE STATE ERR	Measurement state change failed	Measurement state	Error to change measurement state	Respective parameters
456	WDOG TIMER ERR	Watchdog timer error			N/A
461	C-OVER	Calibration error	Calibration range	Exceeds the set value.	Peak setting screen (common)
462	C-REPT	Cal repeatability failure	Repeatable calibration range	Exceeds the set value.	Peak setting screen (common)
463	C-COEF	Failure of cal coefficient	Invalid calibration coefficient	Exceeds the set value.	Peak setting screen (common)
471	CONC OUT	Concentration abnormal	Concentration	Exceeds the set value.	Alarm setting screen
472	RT OUT	Retention time abnormal	Retention time	Exceeds the set value.	Alarm setting screen
473	DEV OUT	Variation coefficient abnormal	Variation coefficient	Exceeds the set value.	Alarm setting screen
474	TAIL OUT	Tailing coefficient abnormal	Tailing coefficient	Exceeds the set value.	Alarm setting screen
481	DETECT NO PEAK	No peak detected	Gate Process Detection Slope	Depends on shape of peak	Peak setting screen (separate)
482	REF PEAK ERR	Wrong reference peak	Peak setting	Stream numbers of reference peak numbers are 1 to 31 and peak numbers are other than 1 to 999.	Peak setting
483	CALC PEAK ERR	Peak calculation error			N/A
484	TRACK PEAK ERR	Peak tracking is not possible			N/A
485	PEAK RECALC ERR	Peak re-integration is failure.			N/A
491	DET SIG OUT	Detector signal out of range	AD conversion value of detector	In the range of 0x800000 - 0x800003 or 0x7ffffc - 0x7fffff	N/A
493	COR ERR	Total compensation error	Peak setting	Peak being executed or peak being processed does not exist.	Peak setting
497	BL CHRMT ERR	Baseline chromatogram error			N/A
498	CHRMT SAVE ERR	Saving chromatogram file failure	SD card	Error to write SD	N/A
521	OVEN1 POWER ON	OVEN1 power on	Power supply	Power supply turned on	N/A
522	OVEN2 POWER ON	OVEN2 power on			
523	OVEN3 POWER ON	OVEN3 power on			
551	PRG SEND ERR	Program send error	File transfer	Error to transfer file	N/A
552	COMMON INFO ERR	Common information error	File transfer	Error to transfer file	N/A
553	CARD START ERR	Card start error	System setting	Mismatch between slot setting and card ID.	Slot setting screen
554	CARD COM ERR	Card communication error			N/A

No.	MESSAGE	Alarm Contents	Threshold Item	Threshold	Threshold Setting
556	COM SYS MSG	System error message			N/A
557	SCRIPT SEND ERR	Script send error	File transfer	Error to transfer file	N/A
558	SCRIPT EXE ERR	Script execution error	File transfer	Error to transfer file	N/A
559	SCRIPT DEL ERR	Script delete error	File transfer	Error to transfer file	N/A
560	RESET MSG	Reset message	Power supply	Power supply turned on	N/A
561	SCRIPT TIMEOUT ERR	Script execution time-out error	Script execution time	Script execution is not completed within 3 seconds	Script File
562	MODBUS CLIENT ERR	MODBUS CLIENT overlap error	IP address, equipment ID	ID address or equipment ID is overwrapped.	IP address, equipment ID

7.2 Common Procedure of Troubleshooting

7

Common procedure of troubleshooting os shown as followings.



F0301.ai

Figure 7.1 Common Procedure of Troubleshooting

7.2.1 Malfunctioning Component Concentration Value

Troubleshooting diagram for malfunctioning component concentration value is shown as followings.

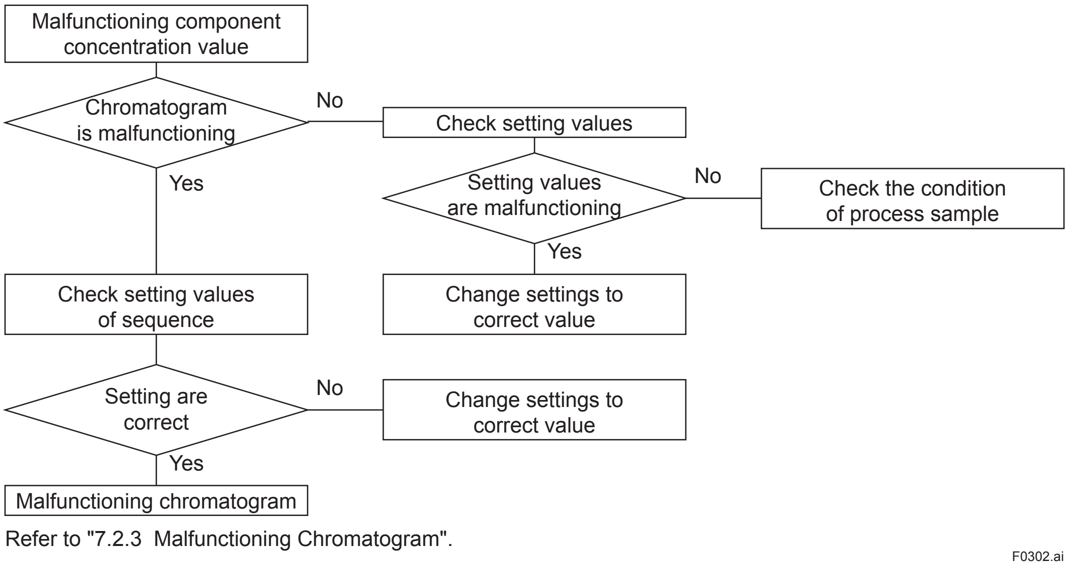


Figure 7.2 Troubleshooting Diagram for Malfunctioning Component Concentration Value

7.2.2 Malfunctioning Retention Time

Troubleshooting diagram for malfunctioning retention time is shown as followings.

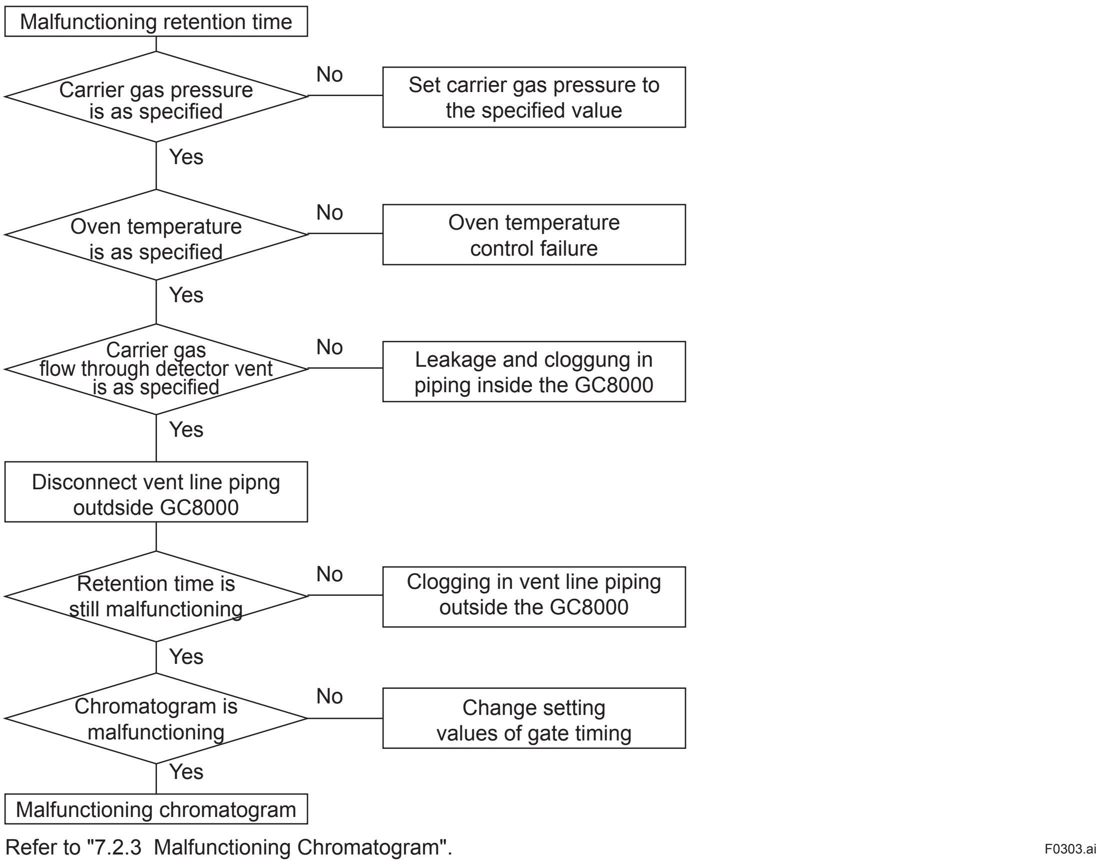


Figure 7.3 Troubleshooting Diagram for Malfunctioning Retention Time

7.2.3 Malfunctioning Chromatogram

It is available to use three types of detector such as TCD, FID and FPD. Troubleshooting diagram for malfunctioning chromatogram is different according to the shown as followings.

(1) TCD

Troubleshooting diagram for malfunctioning chromatogram is shown as followings.

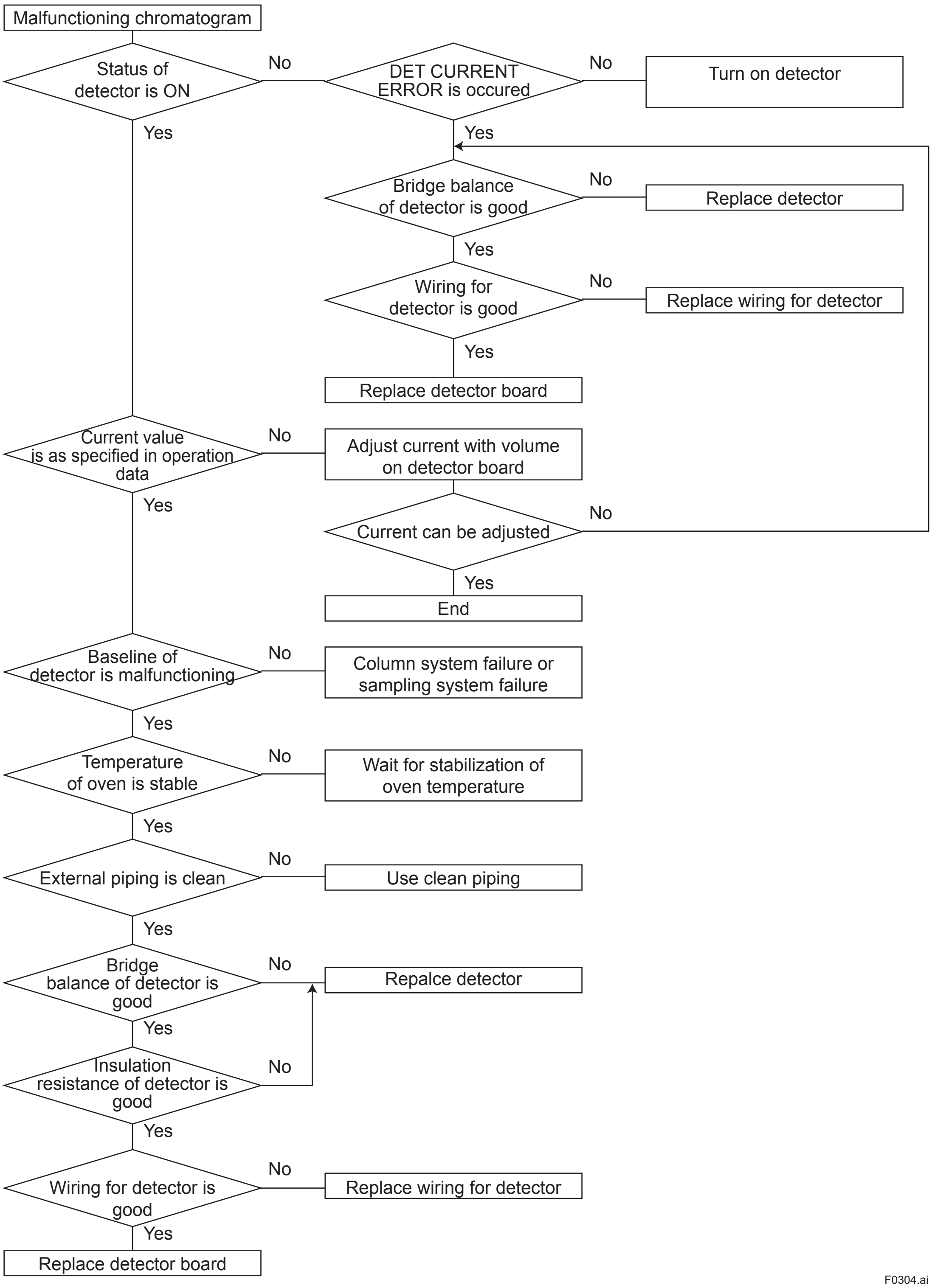


Figure 7.4 Troubleshooting Diagram for Malfunctioning Chromatogram (TCD)

(2) FID

Troubleshooting diagram for malfunctioning chromatogram is shown as followings.

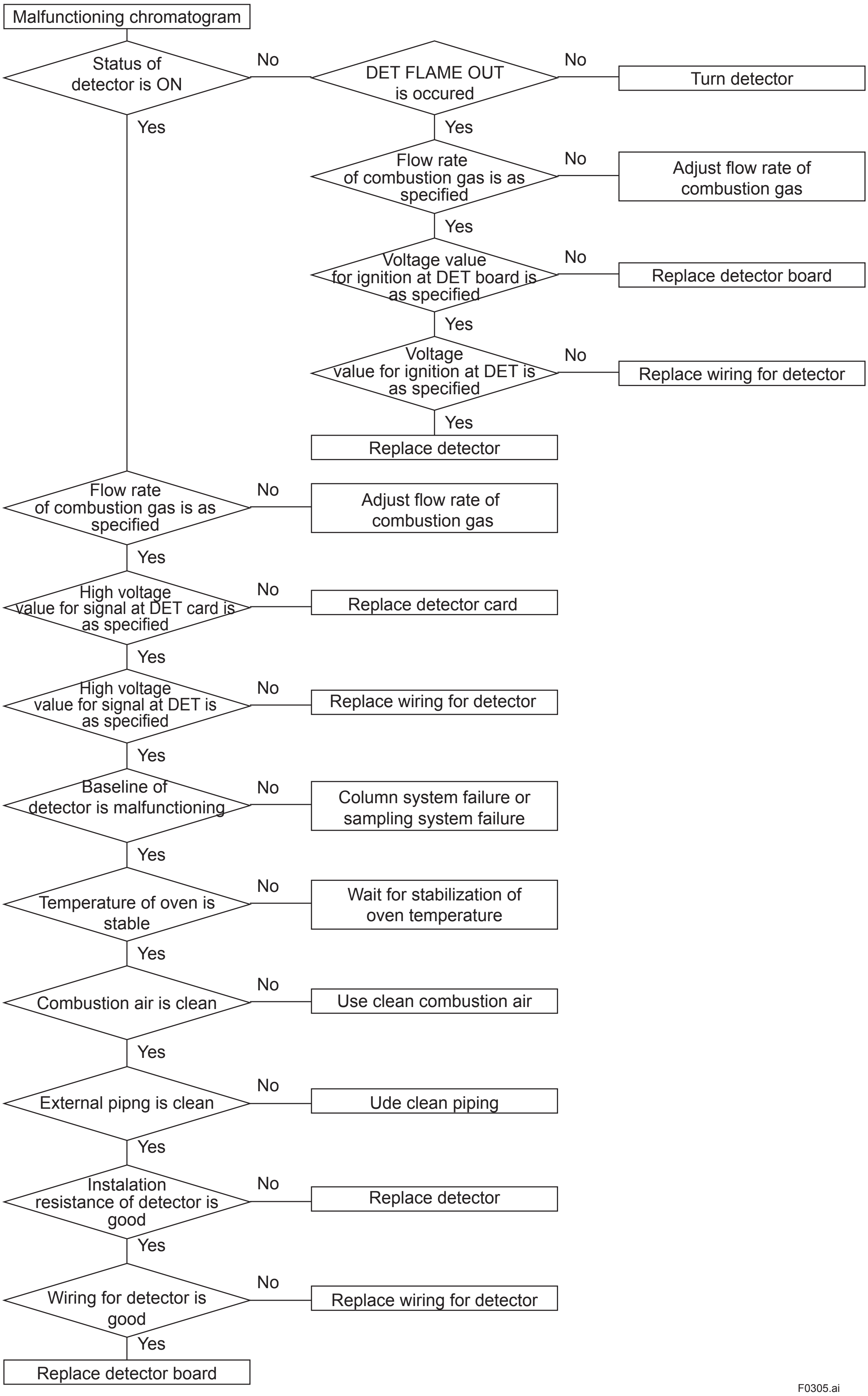


Figure 7.5 Troubleshooting Diagram for Malfunctioning Chromatogram (FID)

(3) FPD

Troubleshooting diagram for malfunctioning chromatogram is shown as followings.

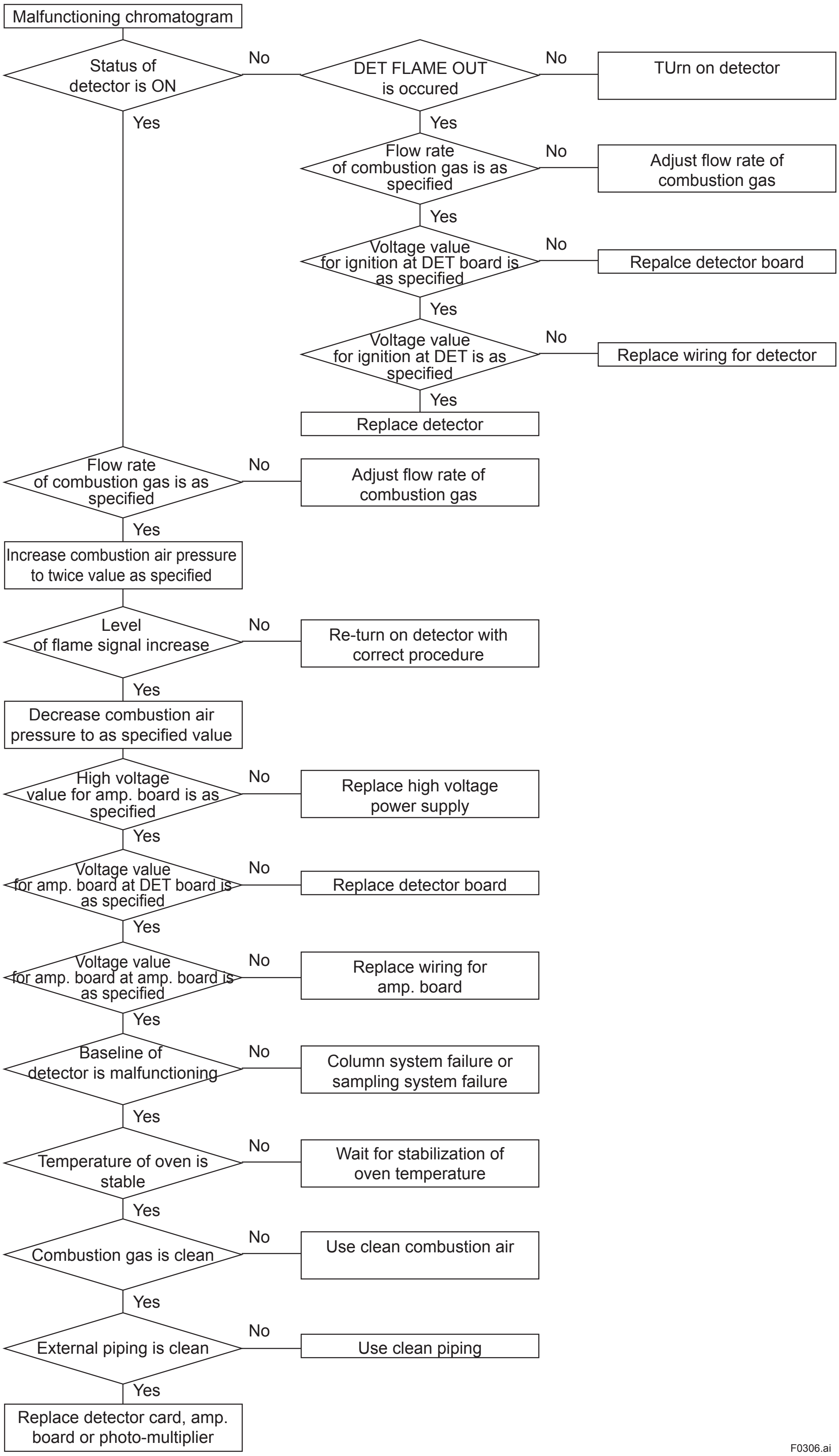


Figure 7.6 Troubleshooting Diagram for Malfunctioning Chromatogram (FPD)

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7.2.4 Column system failure

Contact YOKOGAWA for column system failure.

Appendix A Principle of Gas Chromatograph

A gas chromatograph is an analyzer which first sends a fixed volume of the sampled multicomponent gas mixture to a column, separates it in the column, then measures the concentrations of the components with a detector. The process gas chromatograph analyzes intermittently, allowing periodic analysis by a specified method, thus automatic sampling is possible.

This chapter explains the measurement principle of the GC8000 Process Gas Chromatograph.

■ Sampling Mechanism

The process gas chromatograph consists of a sampling mechanism, a column and a detector.

Sampling is carried out by switching a sampling valve. When separating components or detecting concentrations, the sampling valve is set to allow the gas (liquid) to be measured to flow through the sample column. When sampling, the sampling valve leads the gas (liquid) to be measured to a column on a carrier gas. (See Figure1)

There are two important points regarding sampling: a regular volume is sampled since repeated sampling is required; and samples are taken quickly and securely. The volume is fixed by measuring a specific gas (liquid) of controlled temperature and pressure using a sample measurement tube. Samples are taken quickly and securely by ensuring that the gas to be measured always flows without interrupt.

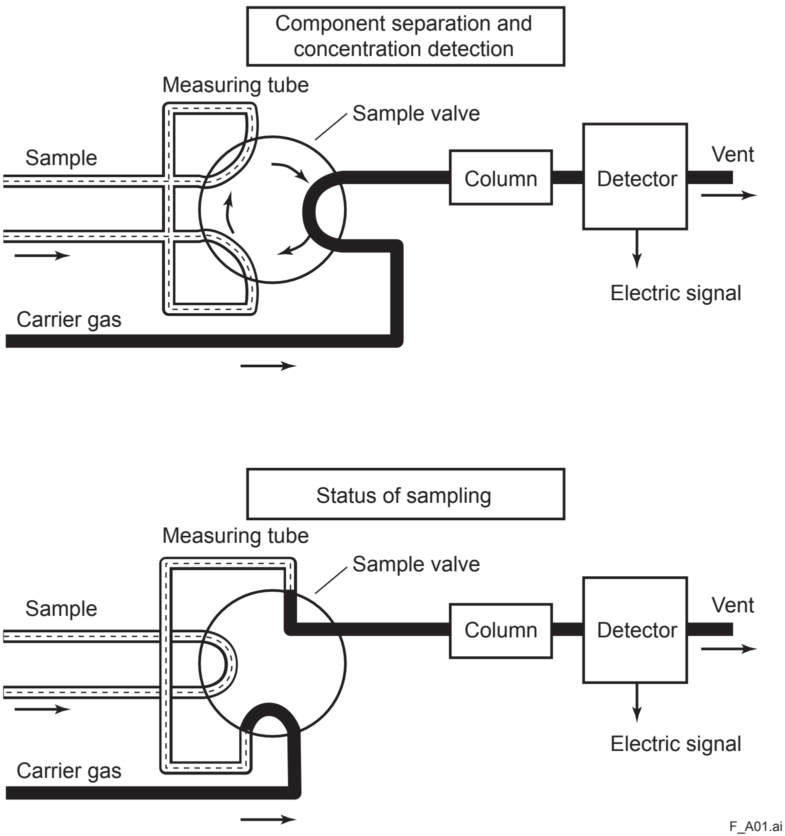


Figure 1 Basic Configuration of Gas Chromatograph

■ Component Separation Using Column

Four types of column are available for the GC8000 Process Gas Chromatograph: a packed column, micro packed column, mega-bore column and capillary column.

Packed columns consist of a stainless steel pipe with a diameter of 2 mm filled with a bulking agent called a stationary phase. Micro packed columns consist of a stainless steel pipe with a diameter of 1 mm. Bulking agents are porous polymer, alumina, or diatomite carrier impregnated with a liquid phase.

Capillary columns use a hollow pipe with a diameter of 0.1 to 1 mm. Those with a diameter of 0.45 mm or larger are called mega-bore columns. As the stationary phase, the inner face coated with liquid phase, micro-particle of porous polymer or alumina supported, or diatomite carrier impregnated with a liquid phase is used.

The components in the multi-component gas mixture sample with carrier gas, which is called the mobile phase, move through the column, repeatedly dissolving into and eluting from the stationary phase at a certain cyclic rate conforming to a fixed partition coefficient* that is unique to each component.

* Partition coefficient: The concentration ratio of the components, calculated by dividing the component concentration which is in equilibrium in the stationary phase by the concentration which is in equilibrium in the mobile phase.

Figure 2 shows a diagram of how the multi-component gas mixture is led to a column and separated into its discrete components over time.

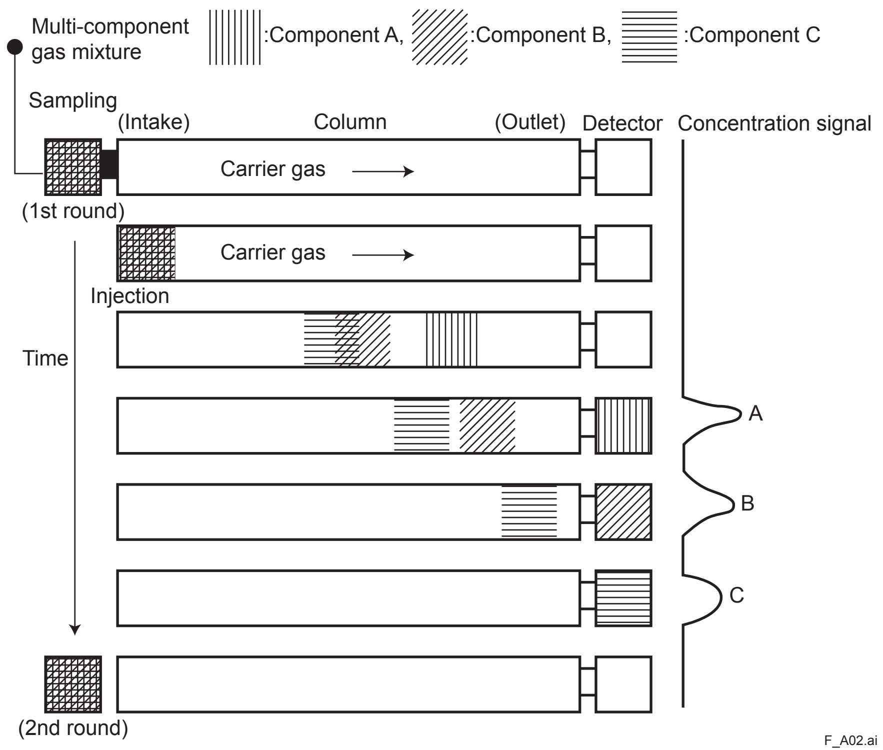


Figure 2 Separating Components Using a Column

■ Detector

The components separated in the column are led to the detector where the concentration of each component is measured.

The GC8000 Process Gas Chromatographs can be fitted with thermal conductivity detectors (TCD), flame ionization detectors (FID) or flame photometric detectors (FPD). The thermal conductivity detector can measure almost all non-corrosive components but sensitivity is relatively low. On the other hand, the hydrogen flame ionization detector can measure hydrocarbon and the flame photometric detector can measure sulfur compounds, respectively with high sensitivity.

Thermal Conductivity Detector (TCD)

The TCD utilizes the difference in the thermal conductivity between the measured gas and the carrier gas and detects the unbalanced voltage produced in a bridge circuit as a measure of concentration.

Figure 3 shows the fundamental principle of the TCD. As shown, there are two streams, each having two filaments. One stream passes the carrier gas only and the other, connected to the column outlet, allows the measured gas to pass during analysis. The filaments in the two streams form a bridge circuit such that the filament in one stream is adjacent to the filament in the other stream. The unbalanced voltage in the bridge is proportional to the concentration of the measured gas (liquid) component.

The TCD is frequently used to measure the component concentration of the measured gas (liquid).

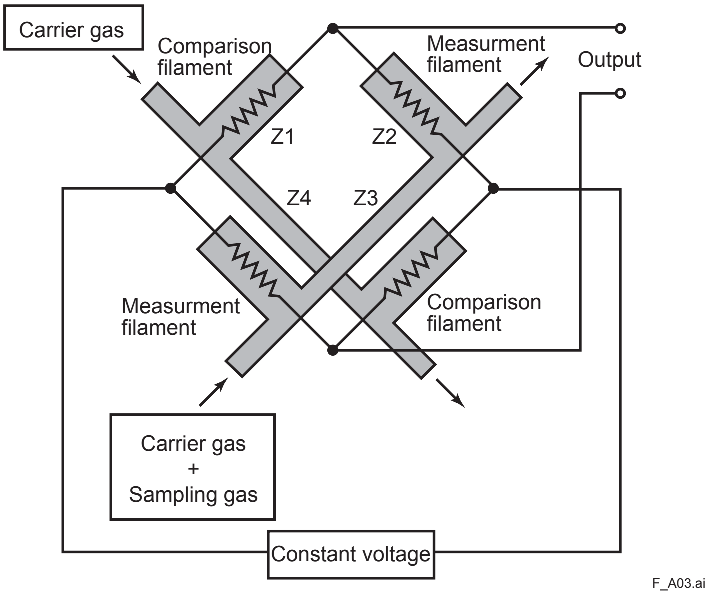


Figure 3 Fundamental Principle of Thermal Conductivity Detector

FID

The FID utilizes the phenomenon that carbon molecules in the measured component (hydrocarbon) are ionized in a hot hydrogen flame. That is, it detects the ionization current which flows between electrodes to which a high voltage is applied. The ionization current is almost proportional to the carbon number.

The FID is used to measure the component concentration of gases containing low concentrations of hydrocarbons.

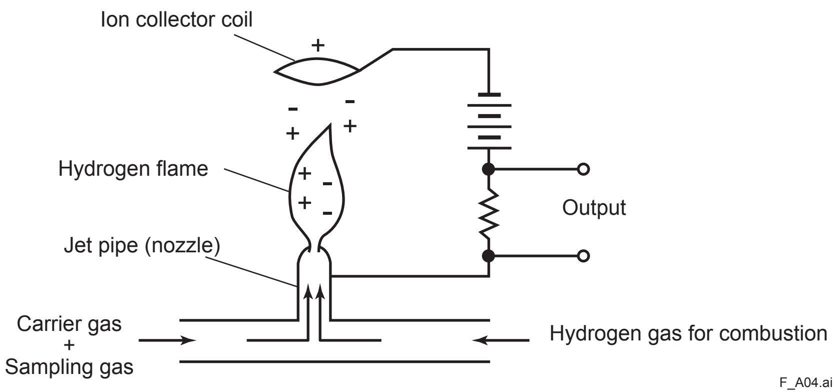


Figure 4 Fundamental Principle of Flame Ionization Detector

FPD

Figure 5 shows the structure of the FPD. As the measured gas containing a sulfur component is led into the excess hydrogen flame, the component containing the sulfur atoms is excited. The FPD detects the luminous intensity of the light emitted when this excited component returns to its base state using a multiplier phototube and converts it to a voltage.

This voltage represents the concentration of the sulfur component in the measured gas.

The FPD can measure the sulfur component with a high sensitivity of 0.2 ppm.

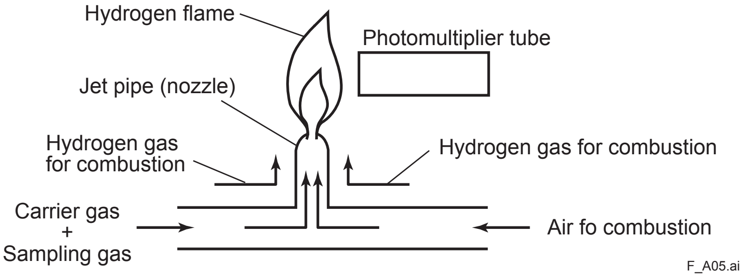


Figure 5   Basic Configuration of Flame Photometric Detector

Appendix B Terminology

■ Operation Terminology

Term	Description	Icon/abbr.
Status	Status can be changed for each GCM. This operation can be made by operators with use level C or higher. The change is possible only in the Stop mode.	
Process	Normal measurement, calibration and validation	
Manual	Manual operation	
Measurement Status of Process	It can be changed for each GCM. This operation can be made by operators with user level B or higher.	
Stream Sequence	Continuously measures streams in order specified in Stream Sequence	
Stream Specification	Repeats the measurement of the specified stream for the preset number of times (0: continuous, 1-999)	
Calibration/ Validation	Performs calibration or validation of the specified number	
Operation Mode and Command	Operation mode can be changed for each GCM or for all GCMs at the same time.	
Run	Mode in which measurement is running. Starts the measurement in the Process mode. This operation can be made by operators with user level B or higher. Starts to display chromatograms in the Manual mode. (It does not detect peaks, calculate concentration, or save chromatograms.)	
Pause	Mode in which measurement pauses. Operates until the pause time specified in the GCM method in the Process mode. This operation can be made by operators with user level B or higher.	
Stop	Mode in which measurement stops. Operates in the Process mode for the main cycle specified in the GCM method. This operation can be made by operators with user level B or higher. Stops the Run mode immediately in the Manual status.	
Command Cancellation	Cancels the operation mode command that is in the operation queue in the Process mode. This operation can be made by operators with user level B or higher.	
Forced Stop	Stops the current operation mode forcibly in the Process mode. This operation can be made by operators with user level C+ or higher.	
GCM	Using multiple ovens and detectors, and simultaneously operating multiple methods, the GC8000 can measure each component under optimum conditions. This reduces the analysis time and achieves a flexible configuration that meets customers' needs. A GCM is one virtual GC. When multiple GCMs are set, the GC8000 works as much as multiple actual GCs. Up to two GCMs can be set in an isothermal oven. Up to two for one isothermal oven Up to four for two isothermal ovens Up to six for three isothermal ovens The following settings are carried out for each GCM: atmospheric-pressure balancing valve number, stream valve number, stream identification output, distillation point, and peak common settings. The operations of stream valves are set in the GCM method settings.	

Term	Description	Icon/abbr.
SYS	SYS is the minimum analysis unit. Multiple SYSs can be set in each GCM. SYSs in the same GCM are synchronized for analysis, while those in different GCMs are not synchronized. Up to two SYSs can be set in an isothermal oven. Up to two for one isothermal oven Up to four for two isothermal ovens Up to six for three isothermal ovens Valves (Valve, RV, or LSV), detectors, and EPCs are set for each SYS. Their respective operations are set in the SYS method. Although atmospheric-pressure balancing valves (AtmV) belong to GCM, their operations are also set in the SYS method. The operations of timing signals are set by using DO in this method as well. (SYS analysis cycle) = (GCM analysis cycle) / n (n: 1-8)	
GCM Method	Any of methods No. 1 to No. 6 can be set for each GCM. In the Manual status or Process–Stop status, the method number will be blank.	
Main Cycle	Time from start (0 second) to stop of analysis	
Warming Up Time	Time for displacement in sample streams	
Stream Valve ON/OFF Time	ON/OFF time of sample stream valves	
Pause Time	Time for measurement pause	
SYS Method		
Analysis Cycle	Time from start (0 second) to stop of analysis	
Peak Detection Stop Time	Time to forcibly stop peak detection of chromatogram	
Tracking Specification		
Automatic Renewal of Tracking Factors		
Valve ON/OFF Time		Valve
Atmospheric-Pressure Balancing Valve ON/OFF Time		AtmV
DO Operation Setting	The operation setting of timing signals by using DO	
Programmed Temperature Setting		
EPC Program Setting		
Purging	Displacement of the gas in the pressurized enclosures with a protection gas (instrumentation air)	
Custom Software Capability	With the programming in YM-BASIC (Yokogawa's original programming language based on BASIC), calculation formulas for analysis results and various measurement statuses such as stream switching can be changed. This function also allows special calculations using the data of analog inputs from other analyzers and/or contact inputs.	
Gate Tracking Function	The automatic peak tracking function of GC1000 Mark II was improved. The setting of tracking (correction) conditions of the gate time setting to detect peaks has become flexible, from simultaneously setting all GCs to setting each SYS or each detector. This enables precise measurement even in multicomponent analysis such as PIONA.	

Instrument Terminology

Term	Description	Notes
ASET	Analyzing server engineering terminal software PC software which operates and displays analyzers	
ASGW	Analyzer server gateway software Exchanges data with the upper system by using the STARDOM FCJ.	
ASIU	Analyzer server interface unit software Serves as an interface with the network for analog output signals of field devices except for process gas chromatographs or input/output of contact signals.	
DCS	Distributed control system The upper system of analyzers	
EPC	Electronic pressure control	
EtherLCD	A function which consolidates the settings for display of I/O and Ethernet connection status of analyzers under connection; operation of I/O, user program, and detectors; and parameters of hardware configuration, analysis method, and I/O, which are mainly used for maintenance among the general settings from the GC-HMI. This is equivalent to the functions of EtherLCD (display and operation), which is the human-machine interface of the GC1000 Mark II, excluding operation and display of analysis data. User-level settings for EtherLCD are independent of other screens of the GC-HMI (analyzer overview, etc.), and so they must be set separately.	
FID	Flame ionization detector	
FPD	Flame photometric detector	
GC-HMI	GC human-machine interface Displays the status of the GC8000 analyzer, operates it, changes its settings, and displays analysis data. 12.1-inch color LCD touch panel on the GC8000	
GCSMP		
LSV	Liquid sample valve	
MC	Methane converter (methanizer)	
PCAS	PC analyzer server software PC software which manages the network and automatically saves data	
RV	Rotary valve	
TCD	Thermal conductivity detector	
Temperature Protection Circuit	A circuit for turning off the heater to prevent overheating	
Column Switching Valve	A valve for switching columns It uses RV.	
Carrier Gas	Gas for carrying sample gas of the measurement target from the sample valve to columns and detectors. H_2, He, Ar, and N_2 are used as the carrier gas.	
Sample Valve	A valve for taking in sample gas. It uses RV (for gas/liquid) or LSV (for liquid).	
Illuminance	The intensity of incident light on a plane surface, based on human perception of brightness Illuminance of 1 lux is a flux of light of 1 lumen (lm) on a plane surface of 1 m^2. Unit: lx	
Hydrogen Limiting Unit	Consists of an air operation valve and a flow controller. It limits the flow of hydrogen (300 ml/min for each oven) or shuts it off. To meet explosion-proof requirements, a regulator must be installed and provide hydrogen at 500 kPa to the GC8000.	
Splitter	A flow splitter	

App.B

Term	Description	Notes
Atmospheric-Pressure Balancing Valve	A balancing valve for sampling gases This valve can be used for sampling gas. As the flow rate changes, the compression rate of sample gas changes, resulting in changes in the sampling volume. This valve is used to prevent such changes. Specifically, install this valve before the sample valve measurement tube and turn it on to stop the flow of sample gas and then turn on the sample valve. When the pressure in the sample valve measurement tube reaches equilibrium with atmospheric pressure at the outlet, turn on the sample valve and start sampling. These procedures are carried out by setting each valve in the Method setting.	
Protection Device	A device for detecting a pressure drop in the control unit to turn off the power supply The device is installed in a pressure-proof enclosure, and is denoted differently in respective explosion-proof standards. FM, CSA: Protection system (Explosionproof enclosure) ATEX, IECEx: Safety device (Flameproof enclosure) TIIS: Protection device (Flameproof enclosure)	
Pressurized Enclosure	An enclosure whose internal pressure is kept high with protection gas The electronic section of the control unit and the electronic section of oven units 1-3 (including EPC enclosure) connect with one another to form a single pressurized enclosure. A large isothermal oven, isothermal oven, and programmed temperature oven in each oven unit are independent pressurized enclosures.	
Back-flush Valve	A switching valve for back flushing It uses RV.	
Non Explosion-proof	General purpose	
Fore-flush Valve	A switching valve for fore flushing It uses RV.	
Flame Arrester	A device for protecting against “flame runaway” It is an explosion-proof device.	
Protection Gas	Air, Nitrogen, Carbon dioxide	
Vortex Tube	A cooler which uses compressed air	
Manifold Regulator		
Mesh Arrestor	Detects FID and FPD.	
Utility Gas	This term generally means all gases used in the device such as protection gas, carrier gas, H_2 for FID and FPD combustion. In the GC8000, it means the following gases except for protection gas and carrier gas: H_2 (for combustion) Air (for combustion) Make-up gas (H_2, He, Ar, N_2)	
Stream Valve	A valve which switches the streams through which samples of measurement targets are flowing.	
Restrictor	A needle-valve type variable resistor It controls the flow rate of carrier gas or utility gas.	

■ Analysis Terminology

Term	Description	Notes
σ (sigma)	This term means standard deviation, and indicates how far individual data are from the mean. 1 σ: 68% of data are within the mean ±1 σ 2 σ: 95% of data are within the mean ±2 σ The GC8000 generally ensures that repeatability is ±1% or ±2% of full scale (2 σ).	

Appendix C Standard Specifications

1. General specifications

Measurable object:
Gas or volatile liquid (400°C or lower boiling point)

Analysis method:
Gas chromatography

Detector: TCD (thermal conductivity detector)
high-sensitivity TCD
FID (flame ionization detector)
FID with methanizer
FPD (flame photometric detector) (only for large isothermal oven)

Number of detectors:
- Type 1: Maximum of 2
  Selectable from TCD: 2, FID: 2, FID with methanizer: 1, FPD: 1
- Type 2: Maximum of 4
  Selectable from TCD: 4, FID: 4, FID with methanizer: 2, FPD: 1
- Type 3: Maximum of 6
  Selectable from TCD: 6, FID: 6, FID with methanizer: 3

Measurable range:
Depends on analysis conditions
- TCD: 1 ppm to 100%
- FID: 1 ppm to 100%
- FID with methanizer:1 ppm to 0.1%
- FPD: 1 ppm to 0.1%

Number of components to be measured:
Maximum of 999 (total number of components in all streams including calibration standard sample streams)

Number of streams to be measured:
Maximum of 31 (including calibration standard sample streams)

Air output for automatic stream switching:
Automatic stream valves can be directly operated for up to eight streams;
Code switching circuits are necessary for nine or more streams.

Note: Applicable only to 1GCM

Contact output for automatic stream switching:
Maximum of 20 points

Analysis period:
Maximum of 21600.0 seconds (six hours)

Quantifying method:
Absolute calibration, sensitivity-corrected absolute calibration, and corrected area normalization

Utility gas supply method:
EPC (electronic pressure controller) or mechanical pressure regulator
Maximum of 18 streams (up to 6 for an isothermal oven)

Number of valves:
- Type 1: Up to 8
  Selectable from 7 Rotary Valves (RV), 1 Liquid-sample Valve (LSV), and 2 Atmospheric Balance Valves (ATM-V)
  Number of RV and LSV is 7 or less
- Type2: Up to 15
  Selectable from 12 RV, 2 LSV, 4 ATM-V
  Number of RV and LSV is 12 or less
- Type3: Up to 21
  Selectable from 15 RV, 3 LSV, 6 ATM-V
  Number of RV and LSV is 15 or less

Note: RVs are not available as Liquid-sample Valve, for ATEX applications.

Material of sample-contact parts:
- RV: 316SS, Hastelloy-C, Rulon, PTFE (Teflon, Bearee)
- LSV: 316SS, Hastelloy-C, Rulon, Glass, PTFE (Teflon, Bearee), Fluororubber (Viton), perfloroelastomer (Kalrez)

Sampling connection:
6 mm or 1/4″ tube (including calibration standard sample streams)
Maximum of 6 streams (up to 2 for each isothermal oven)

Note: Only one Liquid-sample Valve can be mounted in each isothermal oven.

Repeatability: Depends on analysis conditions
- Gas sample:±1% of full scale for measuring ranges (2σ)
- Liquid sample: ±2% of full scale for measuring ranges (2σ)

Ambient condition during operation:
Depends on analysis conditions
–10 to 50°C, 95%RH or less (no condensation)

Ambient condition during storage:
–40 to 85°C, no condensation

Installation location:
Maximum altitude of 2000 m
Avoid exposure to wind, rain, sunlight

Type of protection:
Pressurized enclosure and flameproof enclosure

Certification standard (organization):
FM, ATEX (DEKRA), TIIS

FM: Type X Purging and Explosionproof for Class I, Division 1,Groups B, C and D. T1 to T4 (Described as FM-X hereafter)
Type X and Y Purging for Class I, Division 1, Groups B, C and D. T1 to T4 (Described as FM-Y hereafter)

App.C

ATEX: II2G Ex d px IIB+H_2 T4...T1 Gb (Approval pending)
TIIS: Ex pd IIB+H_2 T1 to T4
EMC standard: EN61326-1 Class A (Emission)
EN61326-1, EN61326-2-3 (Immunity)
Note: ATEX only
Safety standard:
CE Marking: EN61010-1
FM: FM3810 (IEC61010-1)
CSA: CSA61010-1
Protection degree of enclosure:
NEMA3R, Equivalent to IP54 (dust and water resistant structure)
Display: LCD (or without display) and LED (POWER/ALARM/RUN)
Operating display unit: Touch panel (or without operating display unit)
Coating: Polyurethane baked finish
Main body: Silver gray (Munsell 3.2PB 7.4/1.2 or its equivalent)
Gauge: Mint green (Munsell 5.6BG 3.3/2.9 or its equivalent)
Weight:

	Wall-mounting version	Self-standing version
Type 1	approx. 100 kg	approx. 140 kg
Type 2	approx. 155 kg	approx. 190 kg
Type 3	approx. 200 kg	approx. 220 kg

Other functions:
• A real-time clock with back-up batteries is mounted in the control unit (except for the TIIS specification).
• Data storage
The GC8000 can save 1 week of chromatogram data, any chromatogram data (up to 20 per GCM) 30 days of analysis results, and 100 calibration factors. The number of saved data depends on analysis conditions. Saved data can be read and displayed on both the HMI and the PC.
• The GC8000 has a function for limiting the supply of hydrogen when the FID/FPD flame is extinguished.

2. Element Specifications

2.1 Isothermal Oven

Volume:
Large isothermal oven: Approximately 45 L
Standard isothermal oven: Approximately 31 L
Oven temperature range:
55 to 225°C (Temperature can be set in one-degree step.)
Temperature stability: ±0.03°C
Temperature control accuracy: ±0.03°C
Temperature control: PID
Temperature sensor: Pt100 Ω RTD
Other functions: Over-heating prevention function

2.2 Liquid-sample Valve with Vaporizer

Sample pressure: 0 to 3 MPa
Sample temperature: 150°C or lower
Sample volume: 0.25, 0.5, 1, 2, and 3 μL
Vaporizing section:
LSV temperature range:
Oven temperature +5 to 250°C
Temperature stability: ±1°C
Temperature control accuracy: ±1°C
Temperature control:PID
Temperature sensor: Pt100 Ω RTD
Other functions:
Over-heating prevention function

3. Utility

3.1 Power

Power supply: 100/110/115/120/200/220/230/240 V AC ±10%, 50/60 Hz ±5%
Note: Type 3 requires 200 V or more.
Protection devices, such as a breaker, are required to avoid overcurrent.
Wiring method:
FM: Conduit wiring (3/4NPT(F))
ATEX: Cable packing (G3/4(F), 3/4NPT(F), M25x1.5(F))
TIIS: Cable packing (G3/4(F), 3/4NPT(F))
Note: Cable packing for TIIS is provided by Yokogawa.
Other conduit wiring or cable packing should be prepared by the user.
Wiring connection:
FM-X, ATEX, TIIS:
Explosion proof enclosure
FM-Y: Control unit
Power consumption:
Type 1: 1.2 to 1.6 kVA
Type 2: 2.0 to 2.5 kVA
Type 3: 3.0 to 3.7 kVA

3.2 Utility gas

Note: It may vary depending on application.

3.2.1 Instrument air

Pressure: 350 to 900 kPa
Flowrate:
Type 1: 100 to 140 L/min
Type1 with FPD: 130 to 200 L/min
Type 2: 150 to 210 L/min
Type2 with FPD: 180 to 270 L/min
Type 3: 200 to 280 L/min
Dew point: –20°C or lower (condensation of compressed air must be avoided at the ambient temperature.)
Oil: 5 ppm or less
Temperature: –10 to 50°C
Connection: Rc1/4 or 1/4NPT (F)

3.2.2 Carrier gas, combustion gas for FID/FPD, make-up gas for FID/FPD

Types: H_2, N_2, He, or Ar
Purity:
Measuring range from 0 to 50 ppm or more:
99.99% minimum (water: 10 ppm or less, organic components: 5 ppm or less)

Measuring range from 0 to less than 50 ppm:
99.999% minimum (water: 5 ppm or less, organic components: 0.1 ppm or less)

Pressure:
H_2: 500 kPa (72.5 psi) (supplied with extra-regulator for explosion-proof certification)
Other than H_2: 400 to 700 kPa

Consumption:
60 to 300 mL/min per isothermal oven

Connection: 6 mm or 1/4″ tube

3.2.3 Combustion air for FID/FPD:

Purity:
Measuring range from 0 to 50 ppm or more:
water: 10 ppm or less,
organic components: 5 ppm or less
Measuring range from 0 to less than 50 ppm:
water: 5 ppm or less,
organic components: 0.1 ppm or less

Pressure: 400 to 700 kPa

Consumption:
Approximately 300 mL/min per detector

Connection: 6 mm or 1/4″ tube

4. Input and Output Specifications

Wiring method:
FM: Conduit wiring (3/4NPT(F))
ATEX: Cable packing (G3/4(F), 3/4NPT(F), M25x1.5(F))
TIIS: Cable packing (G3/4(F), 3/4NPT(F)), Sealing fitting (only for Ethernet cable)

Note: Cable packing for TIIS is provided by Yokogawa. Other conduit wiring or cable packing should be prepared by the user.

Wiring connection:
FM-X, ATEX, TIIS:
Contact outputs for System Alarm 1,
Annunciator: Explosion proof enclosure
Other I/Os: Control unit
FM-Y:
All I/Os: Control unit

4.1 Communication

4.1.1 Connection to Analyzer network

Included as standard.
Communication standard: Ethernet
Connection type: IEEE802.3U
100Base-TX (RJ-45 shielded twisted pair cable) or 100Base-FX (SC fiber-optics cable)
Channel: 1 or 2
Protocol: TCP/IP, FTP
Data to be transmitted:
Analysis results, calibration factors, alarms, status, and chromatogram
Data to be received:
Operation requests (stream sequence setting, stream setting, run, stop, pause, and range change)
Device to be connected:
PCAS, ASET, ASGW, GC8000 (LCD), and OPC through FCN/FCJ

Note: SHDSL interface (K9802PB) is provided as an option (1 channel only).

External I/O Cutoff Output:
Number of outputs: 2
Function: Monitoring the purge air pressure in the electronics section, applying power (24 V DC) to the signal interrupter when the state is normal.

Signal interrupter (Rack-mounted type: K9806AA, Desktop type:K9806AB):
FM-X, ATEX, TIIS:
Additionally required (only with twisted pair cables). Signal is interrupted by power supply OFF signals from the external I/O cutoff output.
FM-Y: Not required

Note: For installation in a hazadous area, signal interrupter must be stored in a flame-proof enclosure.

4.1.2 Connection to DCS

Both Ethernet and Serial communication are available.

(1) Ethernet communication

The same port as analyzer network is used.
Refer to 4.1.1 Connection to Analyzer network.
Communication standard: Ethernet
Protocol: Modbus/TCP
Communication speed: 100Mbps
Number of DCS connections: Maximum of 4

(2) Serial communication (Option)

Channnel: 1 or 2
Communication standard: RS-422
Transmission: Full duplex (4-wire system)
Protocol: Modbus, Y-Protocol (GC1000/GC8, GC6 and BTU for Japan)

Note: Concurrent usage of Y-Protocol is not available.

Start-stop (asynchronous) communication:
Start bit 1, Data bits 7 (ASCII)/Data bits 8 (RTU), Parity bit 1, Stop bit 1
Parity check: Odd/even/none
Communication speed:
1200/2400/4800/9600/19200/38400 bps
Transmission mode:
ASCII or RTU

Note: Only the ASCII format is used in the Y-Protocol.

Communication control:
None/handshake
Data to be transmitted:
Analysis results, calibration factors, and alarms
Data to be received:
Operation requests (stream sequence setting, stream setting, run, stop, pause, and range change)

App.C

External I/O Cutoff Output:
Number of outputs: 1 or 2
Function: Monitoring the purge air pressure in the electronics section, applying power (24 V DC) to the communication converter/the signal interrupter when the state is normal.
Signal interrupter (Rack-mounted type: K9806AE):
FM-X, ATEX, TIIS:
Additionally required.
RS-422 is outputed signal is interrupted by power supply OFF signals from the external I/O cutoff output.
FM-Y: Not required
Note: For installation in a hazadous area, signal interrupter must be stored in a flame-proof enclosure.
Communication converter (Rack-mounted type: K9806AS, Desktop type: K9806AT):
RS-422/232C communication converter with signal interrupter function.
Signal is interrupted by power supply OFF signals from the external I/O cutoff output.
Note: Two units are required for 2 channel communication.
Note: For installation in a hazadous area, communication converter must be stored in a flame-proof enclosure.

4.1.3 Connection to GCCU MarkII (GC Computing Unit)

Both Ethernet and Serial communication are available.
Note: Applicable only to 1GCM
Note: Analog hold output in the analog output function cannot coexist with the GCCU communication.

(1) Ethernet communication

The same port as analyzer network is used. Refer to 4.1.1 Connection to Analyzer network.
Communication standard: Ethernet
Protocol: Modbus over TCP
Communication speed: 100Mbps
Note: SHDSL interface (K9802PB) is provided as an option (1 channel only).

(2) Serial communication (Option)

Channel: 1
Communication standard:
RS-422
Transmission: Full duplex (4-wire system)
Protocol: Modbus
Start-stop (asynchronous) communication:
Start bit 1, Data bits 7, Parity bit 1, Stop bit 1
Parity check: Even
Communication speed: 9600 bps
Data format: ASCII
Communication control: None
Terminal: Terminal connection (Phoenix terminal)

External I/O Cutoff Output:
Number of outputs: 1
Function: Monitoring the purge air pressure in the electronics section, applying power (24 V DC) to the communication converter when the state is normal.
Communication converter (Rack-mounted type: K9806AS, Desktop type: K9806AT):
RS-422/232C communication converter with signal interrupter function.
Signal is interrupted by power supply OFF signals from the external I/O cutoff output.
Note: For installation in a hazadous area, communication converter must be stored in a flame-proof enclosure.

4.2 Input/Output

System alarm 1 and Annunciator are provided as standard contact outputs. Other Input/Output can be added depending on specifications.
Note: Up to 5 optional cards are selectable.
Note: The maximum number of the contact inputs is 32 and outputs is 20, with any combination of contact input cards, contact output cards, and contact I/O cards.

4.2.1 Contact Output for System Alarm 1

Number of contact outputs: 1
Function: Starting operation when System alarm 1 occurs.
Contact specification:
Relay contact output, c-contact (NC/NO/COM)
Contact rating: 30 V DC, 100 mA
Contact operation: Open/Close

Contact	System alarm	
	Between NC and COM terminals	Between NO and COM terminals
On operation	Open	Close
Off operation	Close	Open
Power supply: OFF	Open	Close

4.2.2 Contact Output for Annunciator

Number of contact outputs: 1
Function: Outputting the state of the purge air pressure in the isothermal oven and the electronics section (State 1 or State 2)
State 1: Outputting the states of override mode ON, power supply of the analyzer OFF, purging, or insufficient pressure
State 2: Outputting the state after the purge
Contact specification:
Relay contact output, c-contact (NC/NO/COM)
Contact rating: 30 V DC, 100 mA

Contact operation: Open/Close

Contact	Annunciator Output	
	Between NC and COM terminals	Between NO and COM terminals
State 1	Open	Close
State 2	Close	Open
Power supply: OFF	Open	Close

4.2.3 Analog Output (Option, Up to 4 cards)

Number of outputs:
8 per card, maximum of 32
Signal type: 4 to 20 mA DC
Isolation: Channel isolation, system isolation (selectable)
Load: 300 Ω or less
Output Types:
Analysis results (analog hold output)/ Chromatogram output
The maximum number of outputs is 32 analog hold outputs, and 8 chromatogram outputs even in multi-analog output card.

Note: The analog hold output cannot coexist with GCCU communication (but the chromatogram output can coexist with GCCU communication).

Output range: Any setting is possible within the measuring range. Auto gain can be set for chromatogram output.

4.2.4 Analog Input (Option, Up to 4 cards)

Number of inputs: 4 per card, maximum of 16
Signal types: 1 to 5 V DC, 4 to 20 mA DC
Isolation: Channel isolation
Accuracy: ±0.5% of full scale (–10 to 50°C)
Input types: Analysis results (e.g. other analyzers), temperature (e.g. ambient temperature), pressure, etc.
Function: The following values can be output by Modbus protocol in the DCS communication after computing input values.
Average value:
The one-second average of analog values measured at every 200 msec and filtered by a predetermined constant
Current value:
The value at the time set in a cycle time
External I/O Cutoff Output:
Number of outputs: 1
Function: Monitoring the purge air pressure in the electronics section, applying power (24 V DC) to the signal interrupter when the state is normal.
Signal interrupter (Rack-mounted type: K9806AE):
FM-X, ATEX, TIIS:
Additionally required. Signal is interrupted by power supply OFF signals from the external I/O cutoff output.
FM-Y: Not required

Note: For installation in a hazadous area, signal interrupter must be stored in a flame-proof enclosure.
The same number unit of the signal interrupter as input card is required.

4.2.5 Contact Output (Option, Up to 4 cards)

Number of contacts: 5 per card, maximum of 20
Function: The following settings are possible at each contact point.
Stream sequence:
Outputs when the specified stream sequence is operated.
Stream: Outputs when the specified stream is operated.
Operation mode:
Outputs when the specified operation mode is operated.
Alarm:
System alarm:
Outputs when the system alarm occurs.
Composition Alarm:
Outputs when the concentration alarm or the retention time alarm occurs.
Timing: Outputs at the time to be set.
Calibration/Validation:
Outputs when the specified calibration or validation is operated.
Stream valve selection:
Output for the external sampling equipment, up to 31.
Stream identifying:
Output for the analog hold output, up to 5 points per 1 GCM (5 bits, up to 31 streams)
Contact specifications:
SSR or Relay contact output, c-contact (NO, NC, COM)
Contact rating:
SSR contact output:
100 to 240 V AC, max. 2 A (Load),
Relay contact output:
24 V AC, max. 2A (Load)
Contact operation: ON/OFF operation
Contact state: Selectable from Open or Close on operation (Open when power supply is turned off.)
External I/O Cutoff Output:
Number of outputs: 1
Function: Monitoring the purge air pressure in the electronics section, applying power (24 V DC) to the signal interrupter when the state is normal.
Signal interrupter (Rack-mounted type, AC: K9806AN, DC:K9806AJ):
FM-X, ATEX, TIIS:
Additionally required. Signal is interrupted by power supply OFF signals from the external I/O cutoff output.

App.C

FM-Y: Not required

Note: For installation in a hazadous area, signal interrupter must be stored in a flame-proof enclosure.
The same number unit of the signal interrupter as contact output card is required.

4.2.6 Contact Input (Option, Up to 4 cards)

Number of contacts: 8 per card, maximum of 32

Function: The following settings are possible at each contact point.

Alarm: Occurrence of external contact alarm (level 2 or 3)

Stream sequence: Performing the specified stream sequence

Stream (continuous): Measuring the specified stream continuously

Stream (once): Measuring the specified stream one time

Calibration/Validation: Calibrating or validating the specified stream

Operation mode: Changing the operation mode (run, pause, stop)

Range change:
Changing the stream and peak ranges

Contact specifications: Zero voltage contact input

Contact rating: 5 V DC, 20 mA or more

Input signal:

Open signal: Input load 100 kΩ or more

Close signal: Input load 200 Ω or less

Operation on input: NC or NO (selectable)

4.2.7 Contact Input/Output (Option, Up to 4 cards)

Number of contacts:
3 for input and 3 for output per card, maximum of 12 for input and output each

Function, Contact specification, Contact rating, Operation specification:

Contact output:
The same functions as in “4.2.5 Contact Output”

Contact input: The same functions as in “4.2.6 Contact Input”

External I/O Cutoff Output:

Number of outputs: 1

Function: Monitoring the purge air pressure in the electronics section, applying power (24 V DC) to the signal interrupter when the state is normal.

Signal interrupter (Rack-mounted type, AC: K9806AN, DC:K9806AJ):

FM-X, ATEX, TIIS:
Additionally required. Signal is interrupted by power supply OFF signals from the external I/O cutoff output (contact output only).

FM-Y: Not required

Note: For installation in a hazadous area, signal interrupter must be stored in a flame-proof enclosure.
The same number unit of the signal interrupter as contact output card is required.

4.3 Air output

Atmospheric balance valve:

Number of points:
Maximum of 6 (1 for a GCM, up to 2 for an isothermal oven)

Pressure: 350 kPa

Connection: 6 mm or 1/4″ tube, the pressure control section of the oven unit

Stream switching valve:

Up to eight automatic valve streams:

Number of points: Maximum of 8 points

Pressure: 350 kPa

Output method: 1 to 1 output

Nine or more automatic valve streams (Note: Applicable only to 1GCM):

Number of points: 4 points (4 bits, 1 to 15 streams) or 5 points (5 bits, 16 to 31 streams)

Pressure: 350 kPa

Output method: Binary code output

Connection:
6 mm or 1/4″ tube, the pressure control section of the oven unit

4.4 User Programming (Option, Up to 1 unit)

The following functions can be set:

- Calculation of analysis results
- Changing operation mode
- ON/OFF operation of DO
- Reading states of DI, AI

5. Communication converter/Signal interrupter

Weight: Approximately 500g

Installation location: Non hazardous area (For installation in a hazardous area, it must be stored in a flame-proof enclosure.)

Ambient condition during operation:
-10 to 50°C, 95 % RH or less (no condensation)

Ambient condition during storage:
-40 to 85°C, no condensation

Safety standard: CE Compliance

5.1 Communication converter

- **RS-422/RS-232C converter:**

(Rack-mounted type: K9806AS, Desktop type: K9806AT)

Number of port: 1

Communication speed: maximum of 38400bps

Power supply: 24 V DC (Supplied from External I/O Cutoff Output of Serial communication card in GC8000)

Earth: Functional earth

Other function: Signal interrupter function

- **Ethernet/SHDSL converter: K9802PB**

Number of port: 1

Communication speed: maximum of 5696kbps

Power supply: 100 to 240 V AC, 50/60Hz, 10W or less

Earth: Protective earth

5.2 Signal interrupter

- **For Ethernet twisted pair cables: (Rack-mounted type: K9806AA, Desktop type: K9806AB)**

Number of port: 2
Communication speed: maximum of 100Mbps
Power supply: 24 V DC (Supplied from External I/O Cutoff Output of CPU board in GC8000)
Earth: Functional earth

- **For RS-422 output: K9806AE**

Number of port: 2
Communication speed: maximum of 38400bps
Power supply: 24 V DC (Supplied from External I/O Cutoff Output of Serial communication card in GC8000)
Earth: Functional earth

- **For analog input: K9806AE**

Number of input: 4
Input current: 4 to 20 mA DC
Input voltage: 1 to 5 V DC
Power supply: 24 V DC (Supplied from External I/O Cutoff Output of Analog input card in GC8000)
Earth: Functional earth

- **For contact output (AC): K9806AN**

Number of output: 5
Rated input: 240 V AC, 2A DC
Power supply: 24 V DC (Supplied from External I/O Cutoff Output of Contact output card in GC8000)
Earth: Protective earth

- **For contact output (DC): K9806AJ**

Number of output: 5
Rated input: 30 V DC, 2A DC
Power supply: 24 V DC (Supplied from External I/O Cutoff Output of Contact output card in GC8000)
Earth: Functional earth

Appendix D Action of External Input and Output Signals

■ Analog output

There are two types of analog output. The maximum number of outputs depends on the type of outputs.

Analog hold output	Output of analysis results Up to 32 outputs (8 per card) The output range can be arbitrarily set within the measurement range. Note: cannot coexist with GCCU-Mk2 (serial) communication.
Chromatogram output	Output of chromatograms Up to 6 outputs (6 per card) The same detector number can be assigned to multiple AOs. The auto gain and auto zero can be set for each detector. Note: can coexist with GCCU-Mk2 (serial) communication.

(1)Analog Hold Output

This is a function to output analysis results as AO.

The AO range can be arbitrarily set within the measurement range in the individual peak setting by using partial settings.

Some partial settings of the measurement range and AO values are shown in Table 1.

Table 1

Individual peak setting		AO range				Concentration (ppm)	AO value	
Stream - peak	Measurement range (ppm)	Partial setting	Concentration (ppm)	Current (mA)	Voltage (V)		Current (mA)	Voltage (V)
#1-#1	1000	1.000	1000.000	20	5	800.000	16.8	4.2
		0.000	0.000	4	1			
#2-#1	1000	0.800	600.000	20	5	800.000	14.7	3.7
		0.500	900.000	4	1			

* Voltage of 1 to 5 V is converted from electric current of 4 to 20 mA using a 250-ohm shunt resistor.

In setting the analog hold output, the number of output analysis values and output actions are different when an actual stream is set and when "99" is set for the output stream number. Actions of contact output are different whether a contact output is used or not as a stream identification signal.

Analog hold output	When an actual stream number is set for the output stream number, up to 2 analysis values (different streams) are output.	Without a stream identification signal
		With a stream identification signal
	When "99" is set for the output stream number, an analysis value is output for every stream that belongs to the GCM.	With a stream identification signal (No other option)

A stream identification signal is a binary-coded stream number which is encoded by turning on and off multiple contact outputs. To use the stream identification signal as a stream identification flag, which informs upper systems of the update of AO, as many DOs as the streams are required to be initially prepared.

For calibration (or validation) streams, the stream identification signal output is initially set to "Exist" or "None." It is set to "Exist" at shipment unless otherwise specified.

- Output exists for calibration (or validation)
- No output for calibration (or validation):

Holds the stream identification signal of the latest measured stream other than calibration or validation.

Actions of analog output and contact output are described in (2) through (4) below. For actions of contact output other than stream identification signals, see the Contact Output.

(2)When Actual Stream is Set for Output Stream Number (without Stream Identification Signal)

Select Normal output for the AO chromatogram on the AO setting screen to open the analog hold output (analysis result output) setting screen (Figure 1). Specify the GCM number, output stream number, peak number, and the upper and lower limits of the partial range for the peak of which analysis results are to be output.

When an actual stream number is set for the output stream number, up to 2 analysis values of different streams are output.

Set the stream identification signal output to “None” for each GCM (Figure 2).

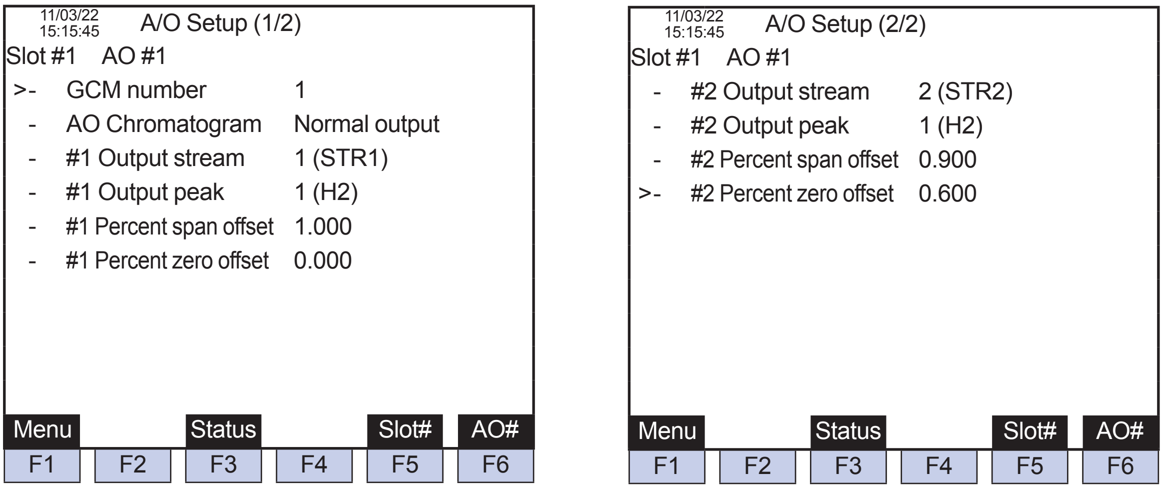


Figure 1 Analog Hold Output: Analysis Result of Actual Streams (AO Setting Screen on GC-HMI EtherLCD)

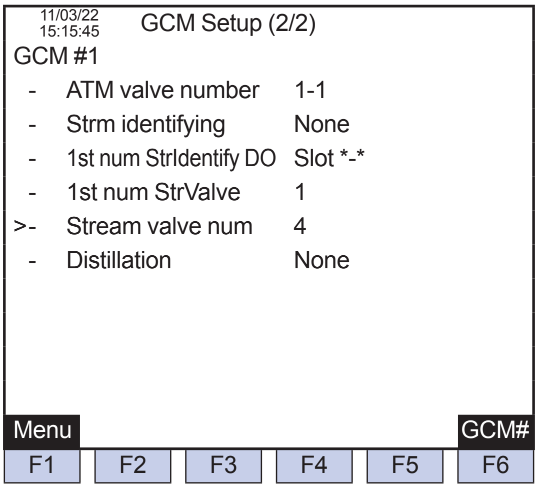


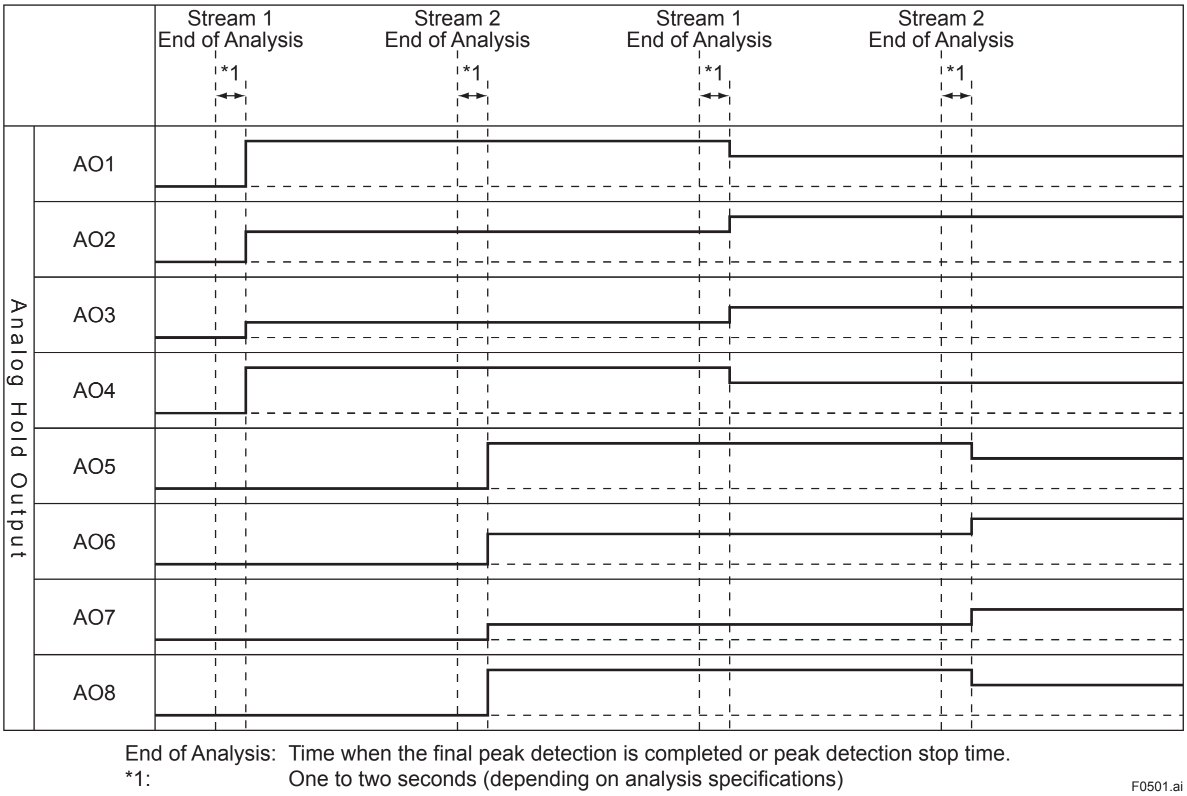
Figure 2 Stream Identification Signal Output: None (GCM Setting Screen on GC-HMI EtherLCD)

Table 2 shows an example of analog output settings.

Figure 3 illustrates respective actions.

Table 2 Example of Analog Output Settings

	Output stream #1	Output peak #1	Output stream #2	Output peak #2
AO1	1	1	None	None
AO2	1	2	None	None
AO3	1	3	None	None
AO4	1	4	None	None
AO5	2	1	None	None
AO6	2	2	None	None
AO7	2	3	None	None
AO8	2	4	None	None



End of Analysis: End of peak detection time in SYS method
*1: One to two seconds (depending on analysis specifications)

Figure 3 Example of Actions of Analog Output

App.D

(3)When Actual Stream is Set for Output Stream Number (with Stream Identification Signal)

Select Normal output for the AO chromatogram on the AO setting screen to open the analog hold output (analysis result output) setting screen (Figure 1). Specify the GCM number, output stream number, peak number, and the upper and lower limits of the partial range for the peak of which analysis results are to be output.

Table 3 and Figure 4 show the settings for one GCM with six streams where a stream identification signal is used.

Table 4 and Figure 5 show the settings for two GCMs with three streams each where a stream identification signal is used.

Table 3 Example of Stream Identification Signal Settings for One GCM with Six Streams

			GCM1					
			Stream 1	**Stream 2**	**Stream 3**	**Stream 4**	**Stream 5**	**Stream 6**
			STR1	**STR2**	**VAL1**	**VAL2**	**CAL1**	**CAL2**
			Measurement	**Measurement**	**Validation**	**Validation**	**Calibration**	**Calibration**
GCM1	SLOT4	DO1	Stream identification flag	Stream identification flag	Stream identification flag	Stream identification flag	Stream identification flag	Stream identification flag
		DO2	1	0	1	0	1	0
		DO3	0	1	1	0	0	1
		DO4	0	0	0	1	1	1
Stream valve number			1	2	3	4	3	4

* Select Up to 7 streams and Starting DO number for stream identification: 4-1 for GCM1. Use one DO card (5 ch).
* The starting stream valve number and number of stream valves of GCM1 are “1” and “6,” respectively.
* The above settings are for the case where output exists for calibration (or validation) streams.
In the case where output dose not exists for calibration (or validation), the stream identification signal of the latest measured stream other than calibration or validation streams is held.

11/03/22
15:15:45 GCM Setup (2/2)
GCM #1
- ATM valve number 1-1
- Strm identifying Up to 7 streams
>- 1st num StrIdentify DO Slot 4-1
- 1st num StrValve 1
- Stream valve num 6
- Distillation None

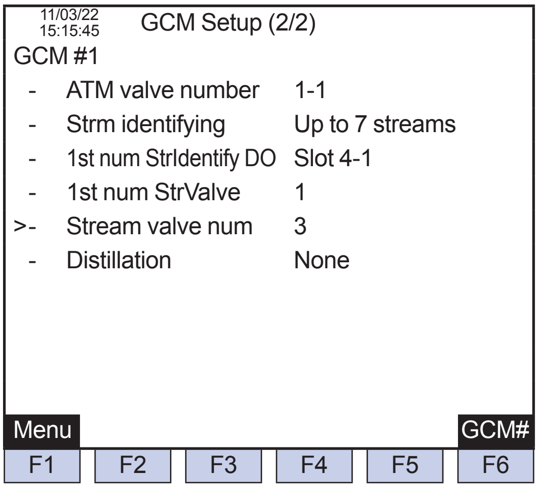
Menu GCM#
F1 F2 F3 F4 F5 F6

Figure 4 Stream Identification Signal Output: Exist (GCM Setting Screen on GC-HMI EtherLCD)

Table 4 Example of Stream Identification Signal Settings for Two GCMs with Three Streams Each

			GCM1			GCM2		
			Stream 1	**Stream 2**	**Stream 3**	**Stream 4**	**Stream 5**	**Stream 6**
			STR1	**VAL1**	**CAL1**	**STR2**	**VAL2**	**CAL2**
			Measurement	**Validation**	**Calibration**	**Measurement**	**Validation**	**Calibration**
GCM1	SLOT4	DO1	Stream identification flag	Stream identification flag	Stream identification flag			
		DO2	1	0	1			
		DO3	0	1	1			
		DO4	0	0	0			
GCM2	SLOT5	DO1				Stream identification flag	Stream identification flag	Stream identification flag
		DO2				0	1	0
		DO3				0	0	1
		DO4				1	1	1
Stream valve number			1	2	2	4	5	5

* Select Up to 7 streams and Starting DO number for stream identification: 4-1 for GCM1. Use one DO card (5 ch).
* Select Up to 7 streams and Starting DO number for stream identification: 5-1 for GCM2. Use one DO card (5 ch).
* The starting stream valve number and number of stream valves of GCM1 are “1” and “3,” respectively.
* The starting stream valve number and number of stream valves of GCM2 are “4” and “3,” respectively.
* The above settings are for the case where output exists for calibration (or validation).
In the case where output does not exist for calibration (or validation), the stream identification signal of the most recently measured stream other than calibration or validation is held.



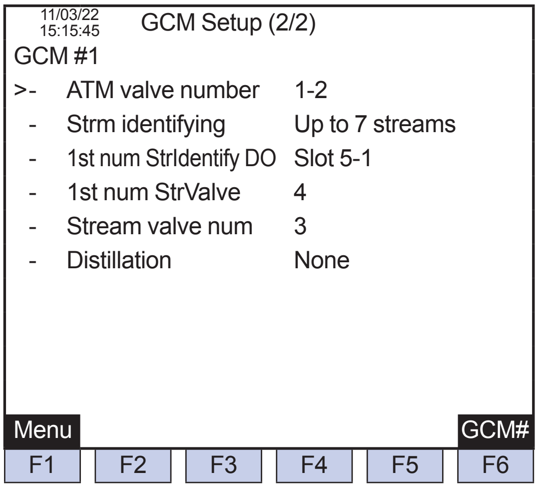
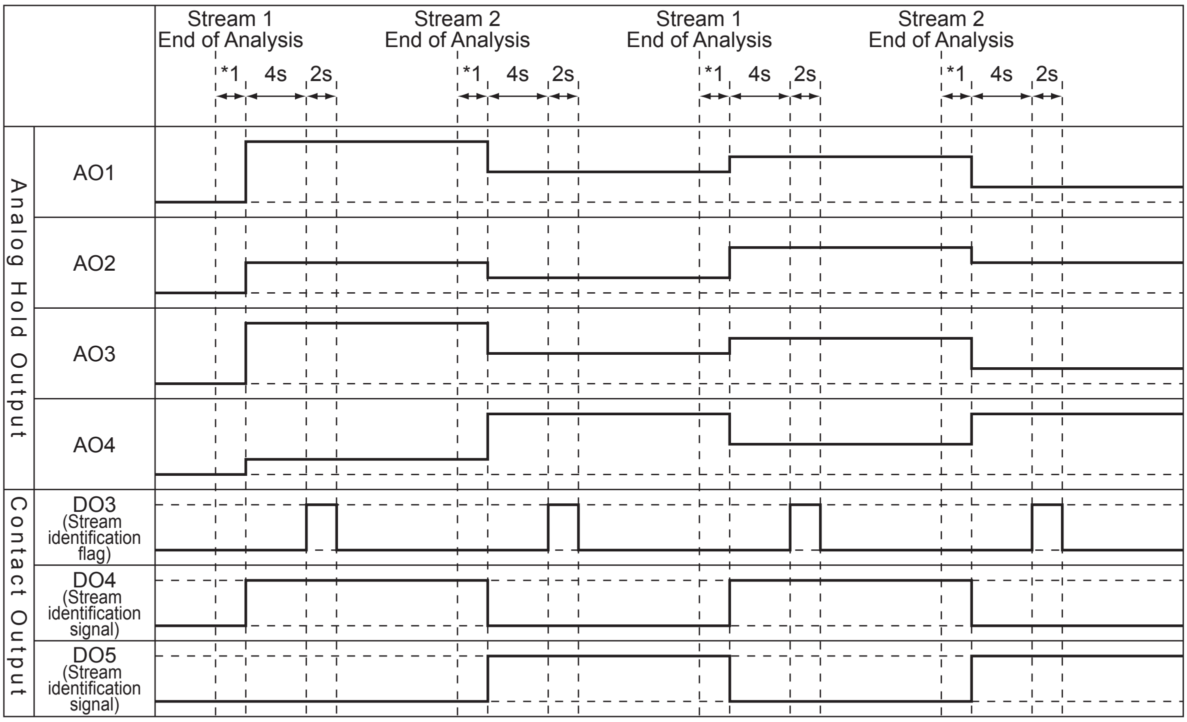


Figure 5 Stream Identification Signal Output: Exist (GCM Setting Screen on GC-HMI EtherLCD)

Table 5 shows an example of analog output settings.
Figure 6 illustrates respective actions.

Table 5 Example of Analog Output Settings

	Output stream #1	Output peak #1	Output stream #2	Output peak #2
AO1	1	1	2	1
AO2	1	2	2	2
AO3	1	3	2	3
AO4	1	4	2	4



End of Analysis: Time when the final peak detection is completed or peak detection stop time.
*1: One to two seconds (depending on analysis specifications)

F0502.ai

End of Analysis: End of peak detection time in SYS method
*1: One to two seconds (depending on analysis specifications)

Figure 6 Example of Actions of Analog Output

(4)When “99” is Set for Output Stream Number (with Stream Identification Signal)

Select Normal output for the AO chromatogram on the AO setting screen to open the analog hold output (analysis result output) setting screen (Figure 5.37).

To output an analysis value for all the streams that belong to the GCM, specify the GCM number and set the output stream number to “99.” Next, specify the peak number as well as the upper and lower limits of the partial range. The #2 output peak setting is invalid.

When “99” is specified for the stream number, be sure to use contact output as a stream identification signal.

For an example of settings in the case where a stream identification signal is used, see 6.1.3.

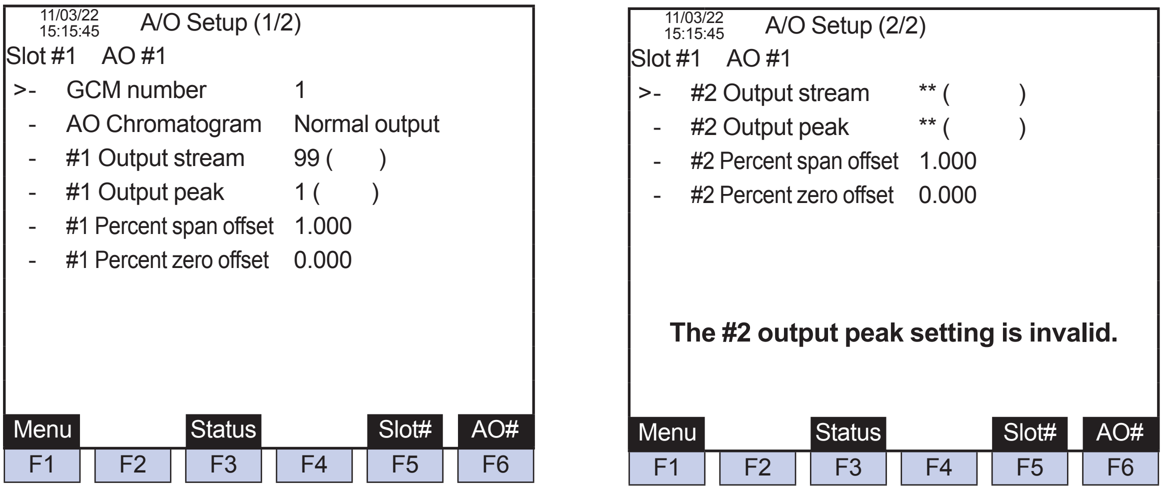


Figure 7 Analog Hold Output: Analysis Result of All the Streams that Belong to the GCM (AO Setting Screen on GC-HMI EtherLCD)

Table 6 and 7 show an example of analog output settings.

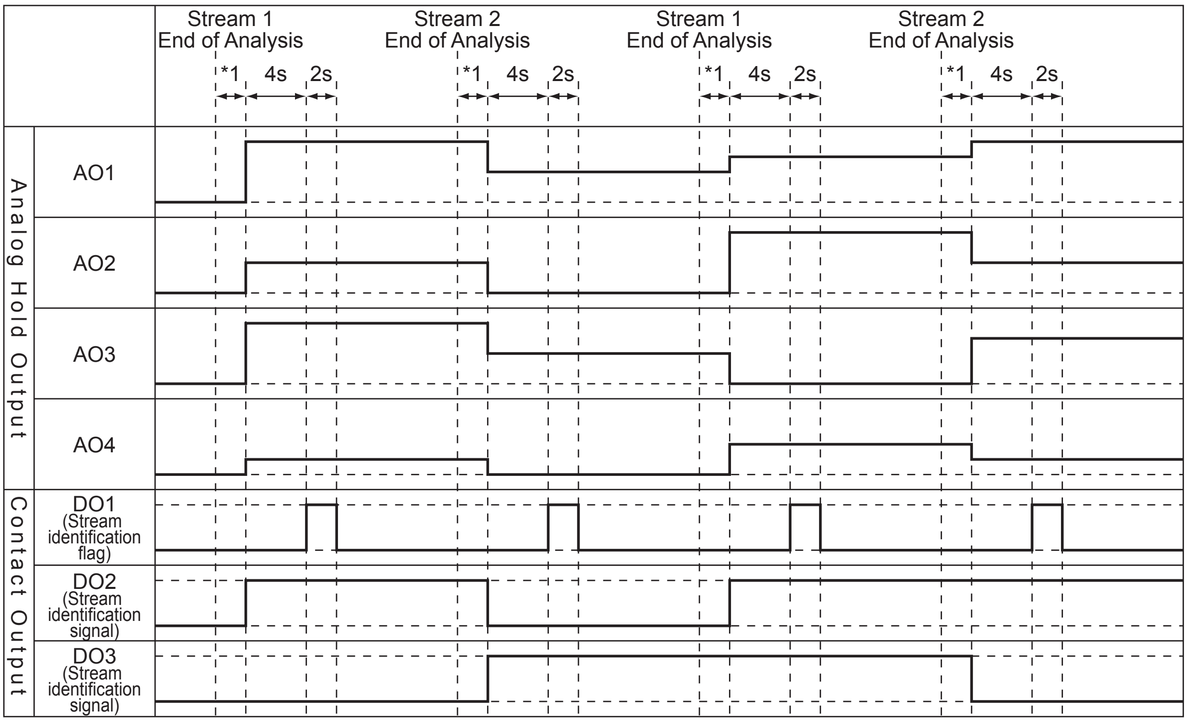
Figure 8 illustrates respective actions.

Table 6 Conditions of Peaks for Streams

	Stream 1	Stream 2	Stream 3
Peak 1	Exist	Exist	Exist
Peak 2	Exist	None	Exist
Peak 3	Exist	Exist	None
Peak 4	Exist	None	Exist

Table 7 Example of Analog Output Settings

	Output stream #1	Output peak #1	Output stream #2	Output peak #2
AO1	99	1	None	None
AO2	99	2	None	None
AO3	99	3	None	None
AO4	99	4	None	None



End of Analysis: End of peak detection time in SYS method
*1: One to two seconds (depending on analysis specifications)

Figure 8 Example of Actions of Analog Output

(5)Chromatogram Output

This is a function to output chromatograms as AO.

Up to eight outputs are available. One detector number (DET1-1, 1-2, 2-1, 2-2, 3-1, or 3-2) is set for one AO. The same detector number can be assigned to multiple AOs. The auto gain and auto zero can be set for each detector. Settings are specified the detector signal setting screen and the individual peak setting screen. These settings relate not only to the display of AO chromatograms but also to that of HMI and ASET chromatograms.

● Data Display Cycle

The AO chromatogram data display cycle varies depending on the sample rate specified for the detector signal.

Sample rate (ms)	AO chromatogram data display cycle (ms)
40	80 (A chromatogram data is extracted every 80 ms from the main unit.)
80	80
160	160

* The HMI chromatogram data display cycle is the same as above.

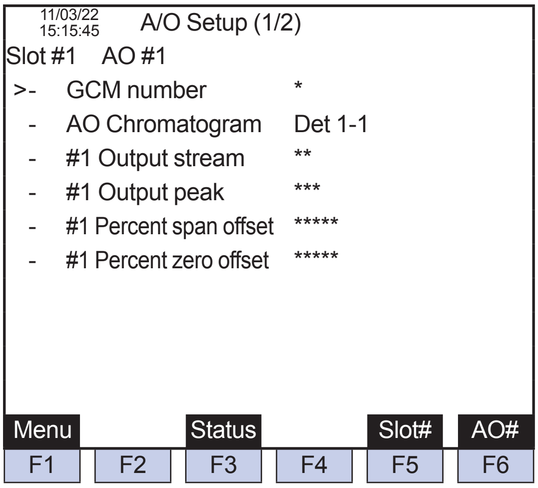
App.D

Response Delay of Signal Height (mV)

The signal height of AO chromatograms is displayed with a response delay of approx. 70 % compared with HMI and ASET chromatograms.

Table 8 Example of Response Delay of Signal Height of AO Chromatograms

Time (s)	ASET chromatogram (mV)	AO chromatogram (mV)
0.08	0.000	
0.16	0.500	(0.00–0.500) × 0.7+0.500 = 0.150
0.24	0.500	(0.500–0.500) × 0.7+0.500 = 0.500
0.32	1.000	(0.500–1.000) × 0.7+1.000 = 0.650
0.40	50.000	(1.000–50.000) × 0.7+50.000 = 15.700
0.48	100.000	(50.000–100.000) × 0.7+100.000 = 65.000
0.56	100.000	(100.000–100.000) × 0.7+100.000 = 100.000



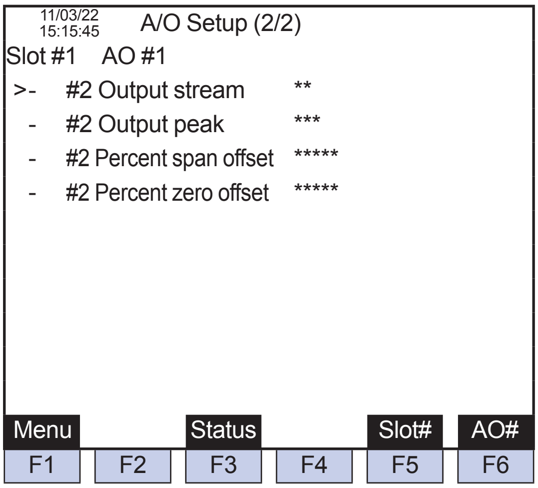


Figure 9   Chromatogram Output (AO Setting Screen on GC-HMI EtherLCD,)

Auto Gain

This is a function to change (enlarge or reduce) the display width of chromatogram signals according to gain values.

The display width is calculated as follows.

Type of chromatogram	Display width of chromatogram signals
HMI and ASET	1000.000 mV/2^[Gain]
AO	16 mA/2^[Gain] 4 V/2^[Gain] when a 250-ohm shunt resistor is used

Example: Gain: 5

Display width of HMI and ASET chromatograms:
1000.000 mV / 2^5 = 31.250 mV

Display width of AO chromatograms: 16 mA / 2^5 = 0.5 mA
4 V / 2^5 = 0.125 V (Shunt resistance: 250 ohm)

There are three types of auto gain function as listed below. The calculation method of the display width and the relevant types of chromatogram differ among them.

Type	Display width of chromatogram signals	Relevant chromatogram type
None	The display width is fixed at 1000.000 mV.	—
Individual gain	The display width is determined for each peak using the auto gain value specified for each individual peak.	AO chromatogram HMI chromatogram ASET chromatogram
Overall gain	The display width is determined at once for all detectors using the overall gain value specified in the detector signal setting.	AO chromatogram HMI chromatogram

Auto Zero

This is a function to change the zero point of chromatogram signals according to the auto zero value.

Type	Display width of chromatogram signals	Relevant chromatogram type
Automatic acquisition	The signal level automatically acquired at the auto zero time (s) specified in the detector signal setting is regarded as the zero value.	AO chromatogram HMI chromatogram
Auto zero value	The auto zero value specified for each individual peak in the detector signal setting is used.	AO chromatogram HMI chromatogram
Invalid	The zero value is fixed at 0.000 mV.	—

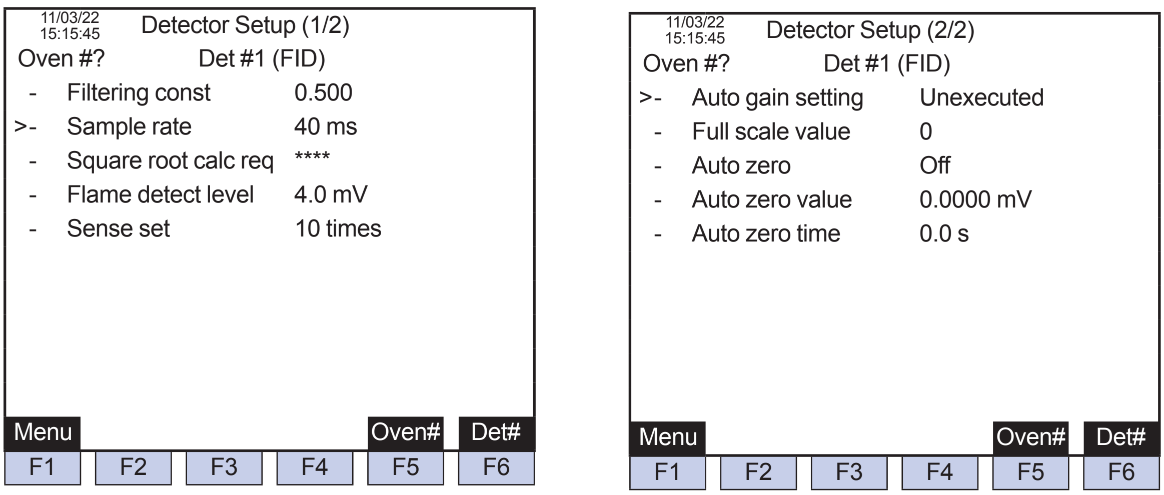


Figure 10 Auto Gain and Auto Zero Settings (Detector Signal Setting Screen on GC-HMI EtherLCD)

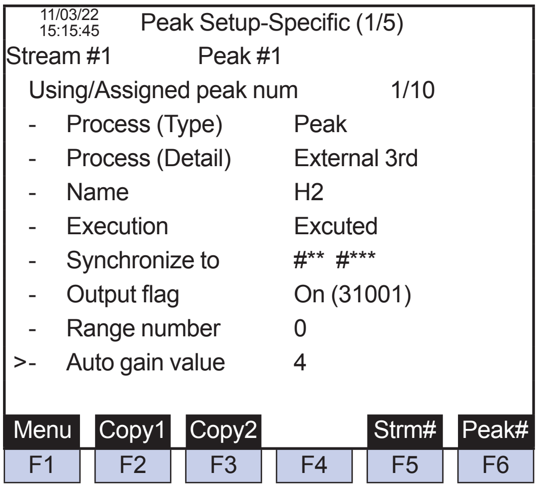


Figure 11 Auto Gain Value (Individual Peak Setting Screen on GC-HMI EtherLCD)

■ Analog Input

By using optional AI cards (up to four cards, four inputs per card), up to 16 inputs can be output as AO.

AI cards can acquire analog information from field instruments (process pressure gauges and flow meters) and analyzers, which can be calculated with the user program, a new function of the GC8000.

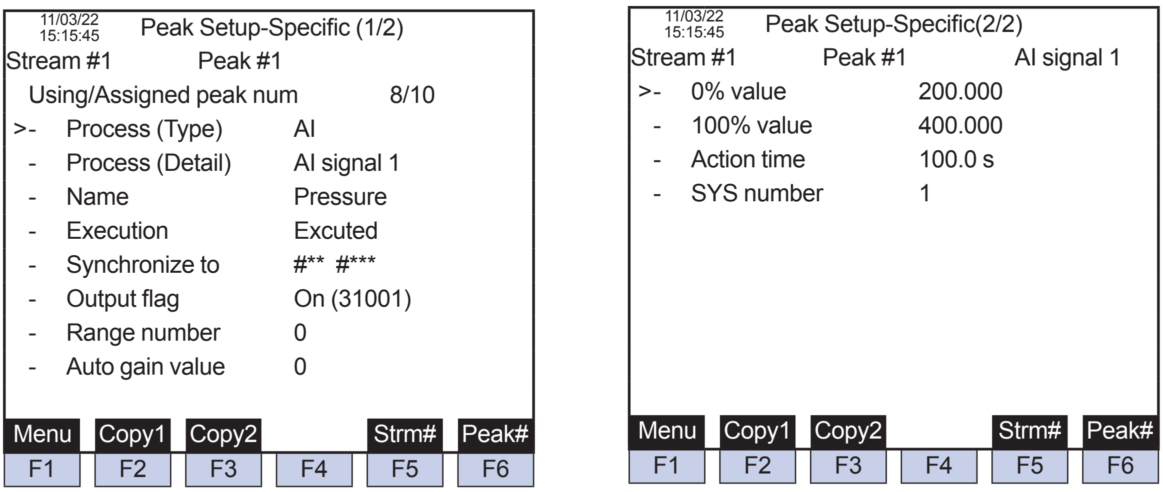


Figure 12 AI Processing (Individual Peak Setting Screen on GC-HMI EtherLCD)

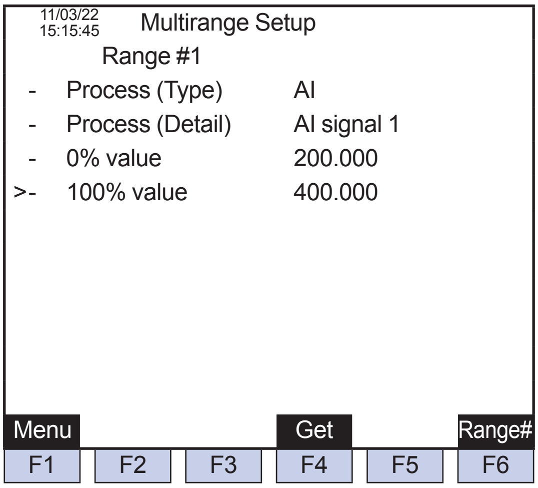


Figure 13 AI Processing (Multi-Range Setting Screen on GC-HMI EtherLCD)

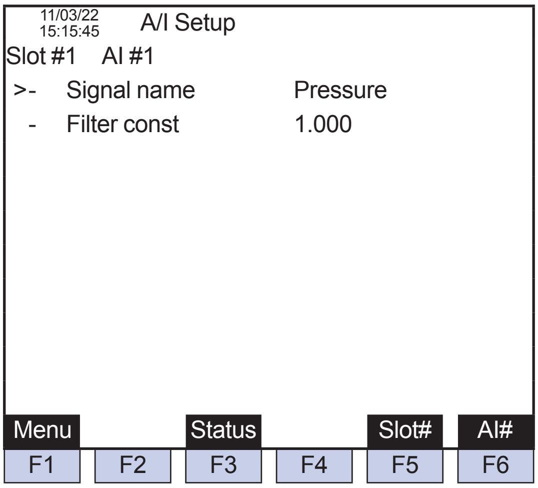


Figure 14 AI Setting Screen on GC-HMI EtherLCD

■ Contact Output

As for contact output, by using optional DO cards (up to four cards, five outputs per card) and by using optional DIO cards (up to four cards, three inputs and outputs per card), up to 20 outputs and up to 12 outputs can be output, respectively.

Specify the settings on the DO setting screen on the GC-HMI EtherLCD, and then verify the operation condition on the DO condition screen on the GC-HMI EtherLCD.

The following seven types can be specified for contact output.

- Stream Sequence
- Stream
- Operation Mode
- Alarm
- Timing
- Calibration/Validation
- Stream Valve Switching

● Stream Sequence

The Stream Sequence function of DO is a function to send out information that a preset stream sequence number is assigned to each GCM. When a stream number specified for a GCM on the DO setting screen is activated, the contact output is turned on regardless of the mode (stop, pause, or run).

Multiple stream sequence numbers can be set for one contact.

Action in the case where the stream sequence number 1 of the GCM number 1 is set for the contact number 1 are described below. For example, this section describes the action where the stream sequence and calibration are set as shown in Table 9 and 10, respectively.

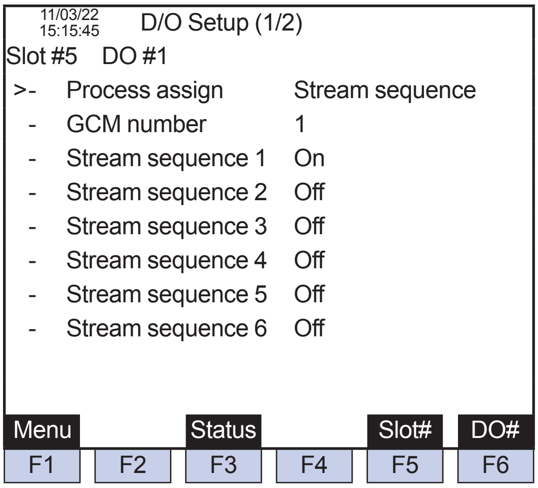
Table 9

	1st stream	**2nd stream**	**3rd stream**
Stream sequence 1	Stream 1	Stream 2	Stream 3
Stream sequence 2	Stream 4	Stream 5	Stream 6

Table 10

	Calibration stream number	**Measurement frequency**	**Automatic calibration**	**Validation stream number after calibration**	**Measurement frequency**	**Validation stream number before calibration**	**Measurement frequency**
Calibration 1	Stream 7	2	Valid	0	0	Stream 8	1

<table>
<tr><td rowspan="4">In the status of stream sequence 1</td><td>Stop to Pause</td><td rowspan="4">Always On for the specified stream sequence regardless of the mode</td></tr>
<tr><td>Stop to Run</td></tr>
<tr><td>Run to Pause</td></tr>
<tr><td>Run to Stop</td></tr>
<tr><td colspan="2">Run mode of stream sequence 1 to Run mode of stream sequence 2</td><td rowspan="3">Turned Off for stream sequences other than the specified stream sequence regardless of the mode</td></tr>
<tr><td colspan="2">Pause mode of stream sequence 1 to Stop mode of stream sequence 2</td></tr>
<tr><td colspan="2">Stop mode of stream sequence 1 to Stop mode of stream sequence 2</td></tr>
<tr><td colspan="2">Run mode of stream sequence 2 to Run mode of stream sequence 1</td><td rowspan="3">Turned On for the specified stream sequence regardless of the mode</td></tr>
<tr><td colspan="2">Pause mode of stream sequence 2 to Stop mode of stream sequence 1</td></tr>
<tr><td colspan="2">Stop mode of stream sequence 2 to Stop mode of stream sequence 1</td></tr>
<tr><td colspan="2">Run mode of stream sequence 1 to Run mode of stream specification 1</td><td rowspan="3">Turned Off for stream sequences other than the specified stream sequence regardless of the mode</td></tr>
<tr><td colspan="2">Pause mode of stream sequence 1 to Stop mode of stream specification 1</td></tr>
<tr><td colspan="2">Stop mode of stream sequence 1 to Stop mode of stream specification 1</td></tr>
<tr><td colspan="2">Run mode of stream sequence 1 to Calibration/ Validation</td><td>Turned Off when analysis starts for the calibration/ validation stream</td></tr>
<tr><td colspan="2">Pause mode of stream sequence 1 to Calibration/ Validation</td><td rowspan="2">Turned Off when the warming up time starts for the calibration/validation stream</td></tr>
<tr><td colspan="2">Stop mode of stream sequence 1 to Calibration/ Validation</td></tr>
</table>



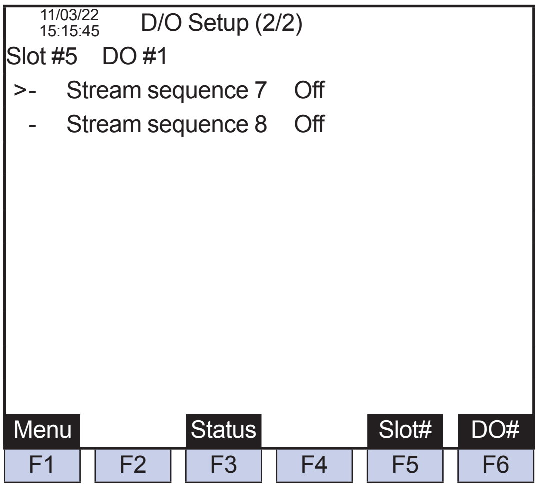


Figure 15 Process Specification: Stream Sequence (DO Setting Screen on GC-HMI EtherLCD)

● Stream

The Stream function of DO is a function to send out information that a specified stream is in the run or pause mode. When a stream set on the DO setting screen is in operation, the contact output is turned On regardless of the measurement status (stream sequence or stream specification).

Actions in the case where the stream number 1 is specified for the contact number 1 are described below. For example, this section describes the actions where the stream sequence and calibration are set as shown in Table 11 and 12, respectively.

In the status of stream sequence 1 or stream specification 1	Stop to Pause	Turned On when the mode changes to the pause mode
	Stop to Run	Turned On when the mode changes to the run mode
	Run to Pause	Kept turned On
	Run to Stop	Turned Off when the mode changes to the stop mode
Run mode of stream sequence 1* to Run mode of stream sequence 2		Turned Off when analysis starts for the stream 2
Pause mode of stream sequence 1* to Stop mode of stream sequence 2		Turned Off when the mode changes to the stop mode of stream 2
Stop mode of stream sequence 1* to Stop mode of stream sequence 2		
Run mode of stream sequence 2 to Run mode of stream sequence 1*		Turned On when analysis starts for the stream 1
Pause mode of stream sequence 2 to Stop mode of stream sequence 1*		Kept turned Off
Stop mode of stream sequence 2 to Stop mode in the status of stream sequence 1*		
Run mode of stream sequence 1 to Run mode of stream specification 1		Kept turned On
Pause mode of stream sequence 1 to Stop mode of stream specification 1		Turned Off when the mode changes to the stop mode of stream 1
Stop mode of stream sequence 1 to Stop mode of stream specification 1		Kept turned Off
Run mode of stream sequence 1* to Calibration/ Validation		Turned Off when analysis starts for the calibration/ validation stream
Pause mode of stream sequence 1* to Calibration/ Validation		Turned Off when analysis starts for the calibration/ validation stream
Stop mode of stream sequence 1* to Calibration/ Validation		Kept turned Off

* Same for the case of stream specification 1

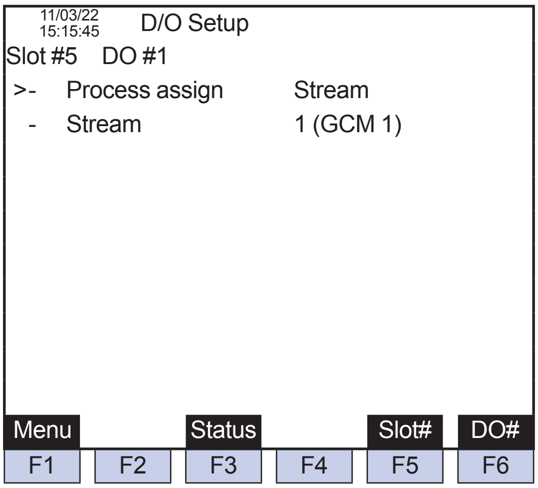


Figure 16 Process Specification: Stream (DO Setting Screen on GC-HMI EtherLCD)

Operation Mode

The Operation Mode function of DO is a function to send out information that the operation mode of each GCM is in the specified mode. The contact output is turned On in the operation mode set on the DO setting screen.

One among the following four types of operation mode is set for each contact point.

- Run
- Run (Warming up time)
- Stop
- Pause

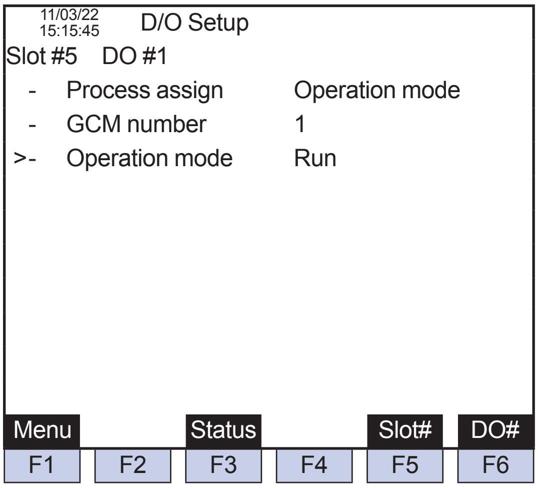


Figure 17 Process Specification: Operation Mode (DO Setting Screen on GC-HMI EtherLCD)

Alarm

The Alarm function of DO is a function to send out information that an alarm, which level is specified for all GCMs or each GCM, is activated. The contact output is turned On when an alarm of the level set on the DO setting screen is generated. The contact output is turned Off when the alarm is cleared.

To set an alarm for all GCMs, specify “0” for the GCM number. To set an alarm for each GCM, specify the relevant GCM number.

One or more of the following three types of alarm level can be set for each contact point.

- Alarm level 1: No. 1 to 200
- Alarm level 2: No. 201 to 400 (including component alarm No. 291 to 294)
- Component alarm No. 291 to 294 (part of Level 2 alarm)

For the details of alarms, see 7.1.

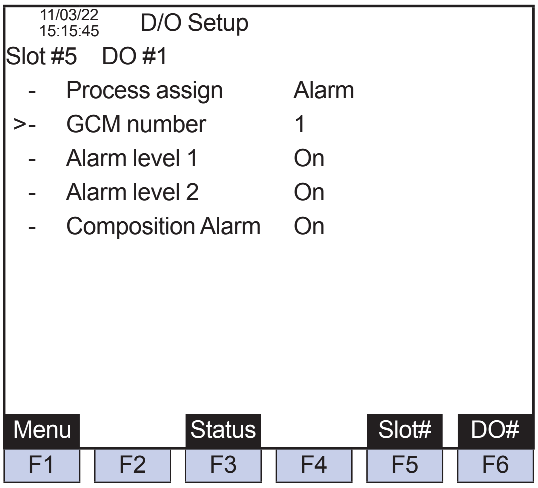


Figure 18 Process Specification: Alarm (DO Setting Screen on GC-HMI EtherLCD)

The Component alarm is a level 2 alarm that can be registered by users.

An alarm is activated when a measurement of the peak specified for all streams or each stream exceeds the upper limit or falls below the lower limit. The alarm keeps going off until the measurement returns within the specified range.

Up to 32 alarms can be set for each GCM.

To cover the peak numbers of all streams, specify “99” for the stream number. To cover the peak numbers of each stream, specify the relevant stream number.

The following four types of measurement (check items) can be set as a trigger of a Component alarm. One check item can be set for each contact.

- Concentration
- Retention time
- Variation coefficient
- Tailing factor

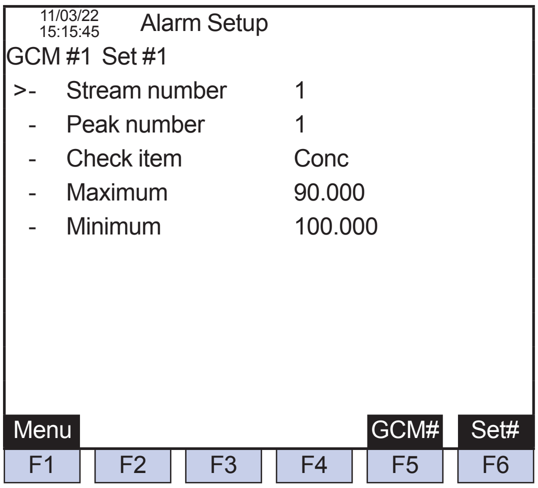


Figure 19 Alarm Setting Screen on GC-HMI EtherLCD

App.D

● Timing

The Timing function of DO is a function to send information about the time of completion of peak detection to the upper systems.

This is used in combination with analog hold output (analysis result output) that uses AO.

The contact output is turned On and Off at the time set for the DO operating time in the SYS method.

● Calibration/Validation

The Calibration/Validation function of DO is a function to send out information that a calibration or validation number set for each GCM is being executed. The contact output is turned On when the measurement status of the GCM set on the DO setting screen is the status of the specified calibration or validation number.

Multiple calibration or validation numbers can be set for one contact.

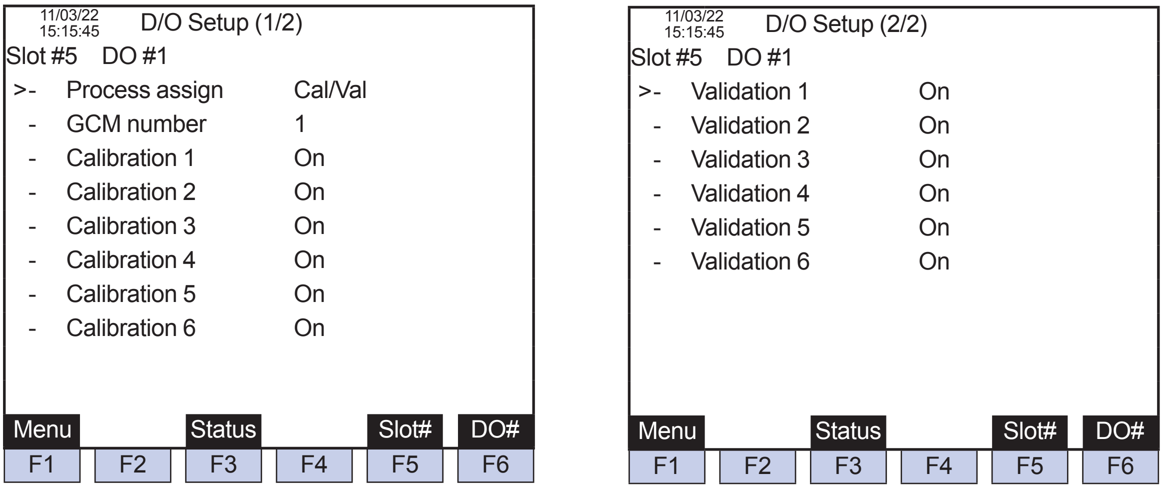


Figure 20 Process Specification: Calibration/Validation (DO Setting Screen on GC-HMI EtherLCD)

● Stream Valve Switching

The Stream Valve Switching function of DO is a function to turn On and Off external stream valves using DO signals.

The contact output is turned On and Off at the time set for the Stream valve ON/OFF time in the GCM method.

To enable the Stream valve switching function of DO, One-to-one output (DO) is required to be selected as the stream valve type in the initial hardware configuration, and as many DOs as streams are required to be initially prepared.

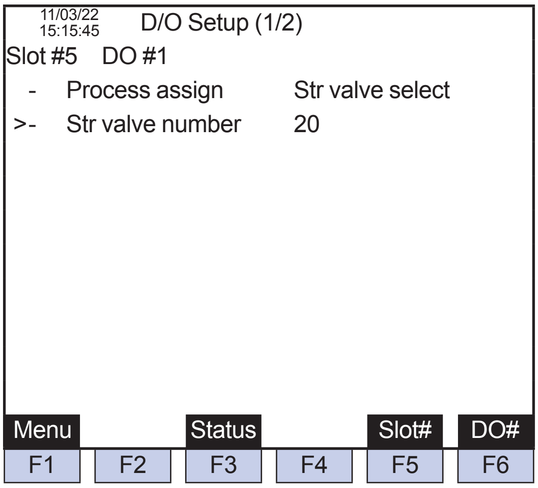


Figure 21 Process Specification: Stream Valve Switching (DO Setting Screen on GC-HMI EtherLCD)

■ Contact Input

As for contact input, by using optional DI cards (up to four cards, eight outputs per card) and by using optional DIO cards (up to four cards, three inputs and outputs per card), up to 32 outputs and up to 12 outputs can be output, respectively.

Depending on the initial hardware settings, the contact input must be set to On While Open or On While Closed. The initial setting is On While Open unless otherwise specified.

Specify the settings on the DI setting screen on the GC-HMI EtherLCD, and then verify the operation condition on the DI condition screen on the GC-HMI EtherLCD.

The following six types can be set for contact input.

- Stream Sequence
- Stream
- Range Switching
- Calibration/Validation
- Operation Mode
- Alarm Process

● Stream Sequence

The Stream Sequence of DI is a function to give a command to change the measurement status to the status of a specified stream sequence number for a specified GCM using contact input as a trigger.

Eight patterns of stream sequence can be used for each GCM.

To give a command to all GCMs, set “0” for the GCM number.

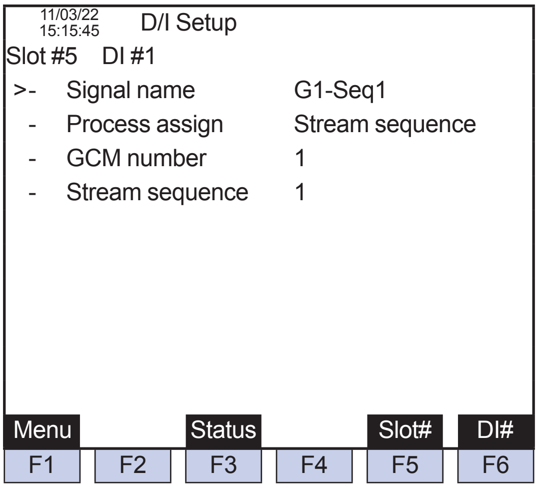


Figure 22 Process Specification: Stream Sequence (DI Setting Screen on GC-HMI EtherLCD)

● Stream

The Stream function of DI is a function to give a command to change the measurement status so that the specified stream is measured a preset number of times using contact input as a trigger. To measure the specified stream continuously, set "0" for the number of times of measurement.

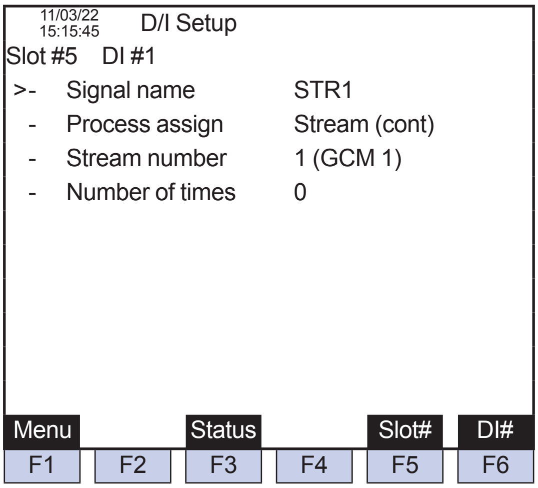


Figure 23 Process Specification: Stream (DI Setting Screen on GC-HMI EtherLCD)

● Range Switching

The Range switching function of DI is a function to give a command to change the range to a specified range for the range-specified peak of the specified stream using contact input as a trigger.

To enable the Range switching function of DI, individual peak setting and multi-range settings are required in advance for the relevant stream and peak.

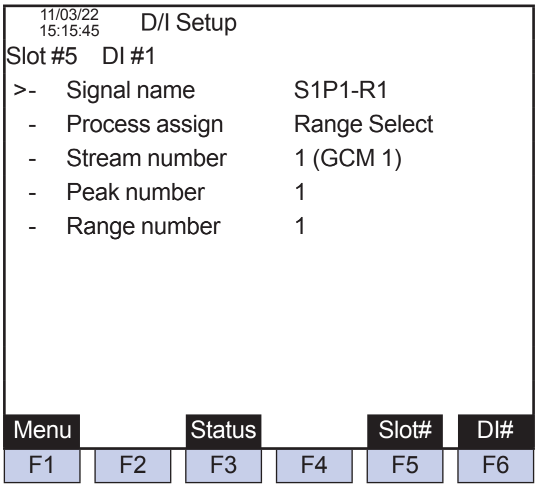


Figure 24 Process Specification: Range Switching (DI Setting Screen on GC-HMI EtherLCD)

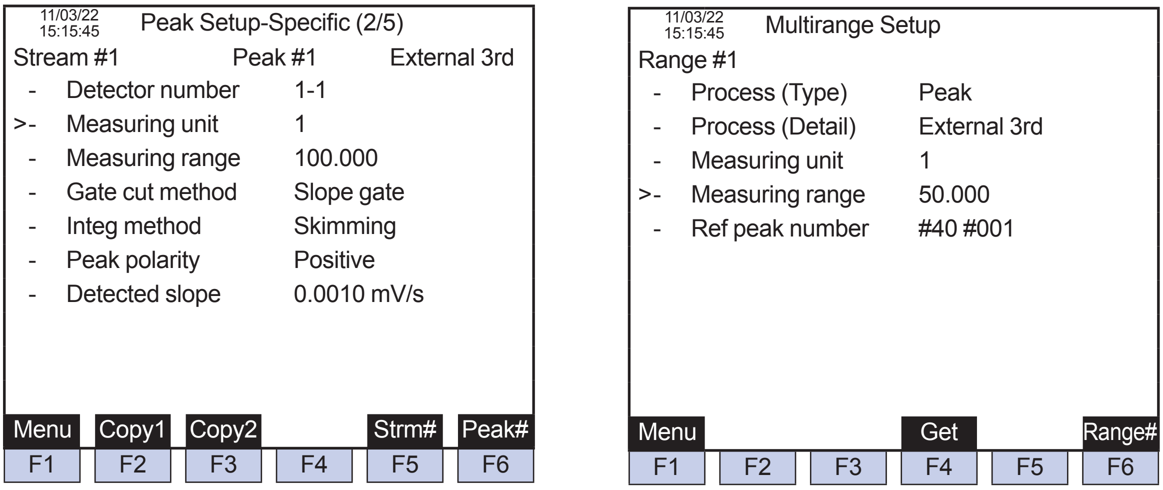


Figure 25 Individual Peak Setting Screen and Multi-Range Setting Screen on GC-HMI EtherLCD

● Calibration/Validation

The Calibration/Validation function of DI is a function to give a command to change the measurement status to the status of a specified calibration or validation number using contact input as a trigger.

Six patterns of calibration setting and validation setting can be used for each GCM.

To give a command to all GCMs, set “0” for the GCM number.

The Calibration/Validation function of DI is available for semiautomatic calibration. To enable the function, the relevant calibration or validation number is required to be specified in advance.

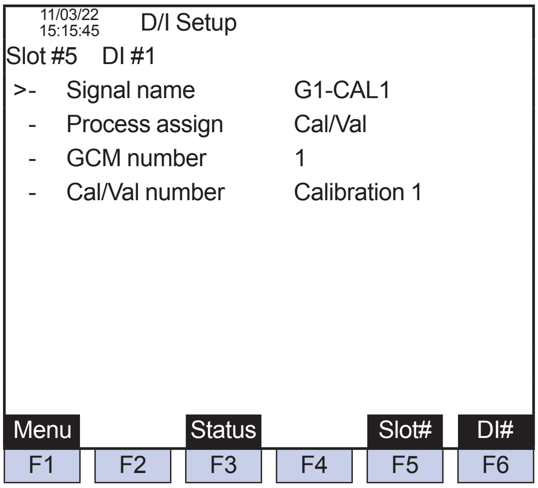


Figure 26 Process Specification: Calibration/Validation (DI Setting Screen on GC-HMI EtherLCD)

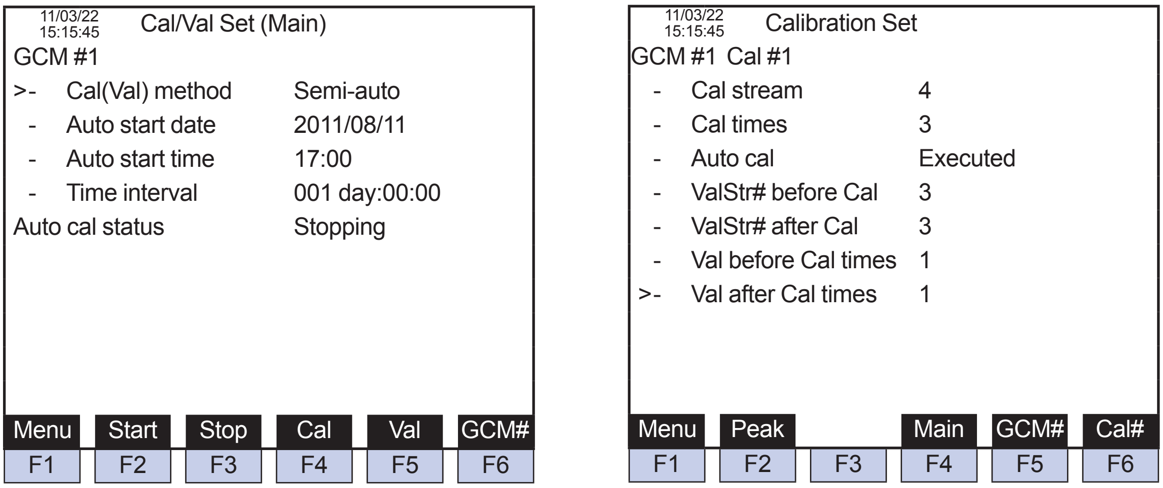


Figure 27 Calibration/Validation Setting Screen and Calibration Screen on GC-HMI EtherLCD.

● Operation Mode

The Operation Mode function of DI is a function to give a command to change the operation mode to a specified operation mode for a specified GCM using contact input as a trigger.

To give a command to all GCMs, set “0” for the GCM number.

One among the following three types of operation mode is set for each contact point.

- Run
- Stop
- Pause

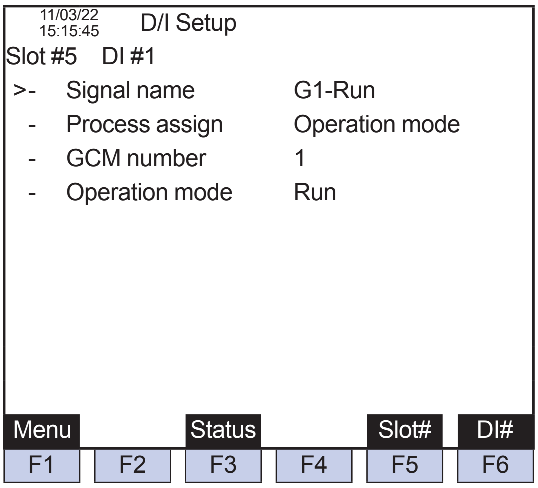


Figure 28 Process Specification: Operation Mode (DI Setting Screen on GC-HMI EtherLCD)

Alarm Process

This is a function to activate a specified alarm using contact input as a trigger.

To set an alarm for all GCMs, specify “0” for the “GCM number.” To set an alarm for each GCM, specify the relevant GCM number.

The alarm level can be set to “2” or “3.” The alarm number is determined as follows depending on the alarm level and the DI contact number.

Alarm level 2: 200 + Contact number (No. 201 to 232)

Alarm level 3: 400 + Contact number (No. 401 to 232)

An alarm message can be defined using up to 22 alphanumeric characters.

For the details of alarms, see Section 7.1 “DI Alarm.”

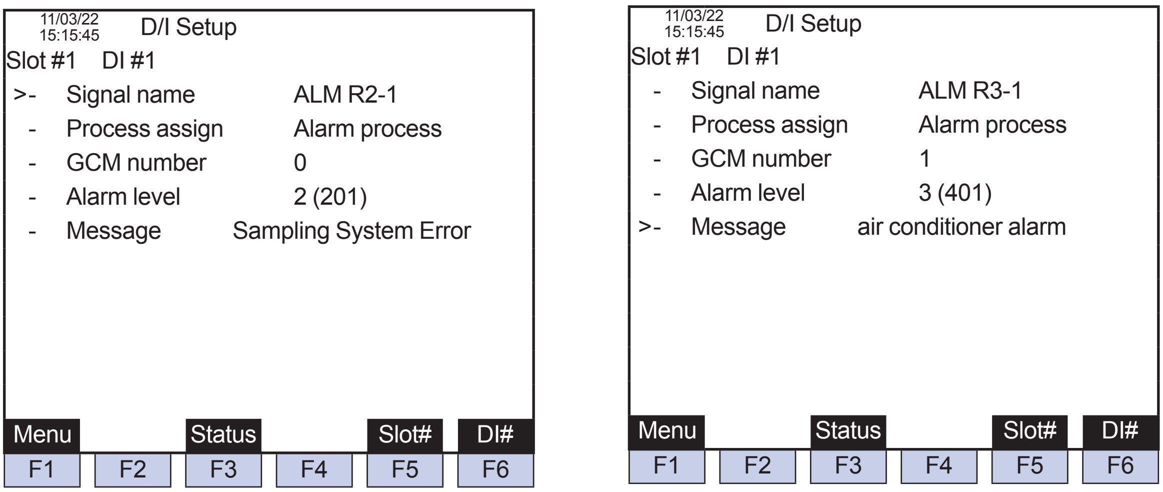
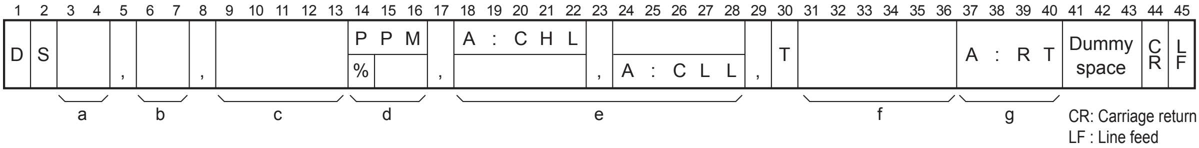


Figure 29 Process Specification: Alarm Setting (DI Setting Screen on GC-HMI EtherLCD)

Communication Input and Output

GC6 Type Output Data Format (fixed to 45 characters)

(1) Analysis value data (component concentration)

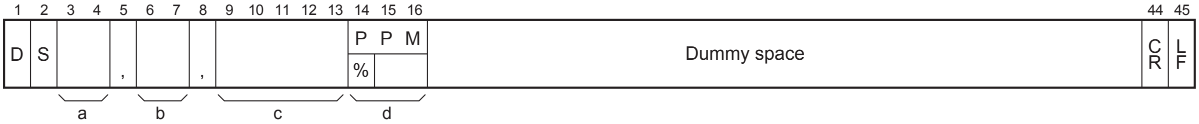


a: Stream number (01 to 24) [Stream number (01 to 31)]
b: Component number (01 to 24) [Peak number (1 to 99)]
c: Component concentration (without zero suppression)
d: Unit
e: Concentration error alarm (Upper limit = A:CHL, Lower limit = A:CLL)
f: Retention time (seconds)
g: Retention time error alarm

Note: The error alarm is output only if an error occurs. (Dummy space if no error occurs.) GC8000/GC1000 data in bracket [ ].

F0504.ai

(2) Analysis value data (component ratio operation, linear polynormial operation)

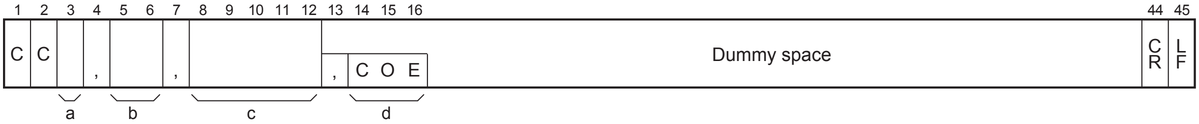


a: Stream number (01 to 24) [Stream number (01 to 31)]
b: Component number (01 to 24) [Peak number (1 to 99)]
c: Computed value (without zero suppression)
d: Unit

Note: GC8000/GC1000 data in bracket [ ].

F0505.ai

(3) Calibration factor



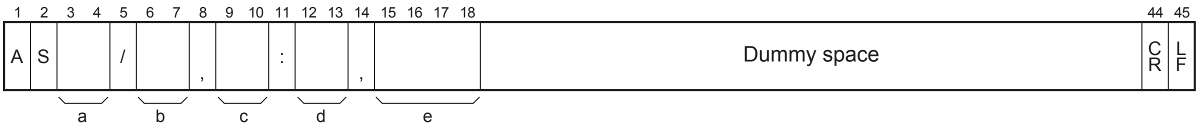
a: Standard sample (STD1=1, STD2=2) [Stream number (1 to 9)]
b: Component number (01 to 24) [Peak number (1 to 99)]
c: Calibration factor (without zero suppression)
d: Calibration factor error (only if an error occurs)

Note: GC8000/GC1000 data in bracket [ ].

F0506.ai

(4) Error alarm

- Memory pattern check error
- Calibration out of range
- Isothermal oven temperature error
- Pressure switch 1 (or 2) OFF
- Communication error
- Calibration repeatability error
- Watchdog timer
- Detector 1 (or 2) calibration error
- Power off
- External contact inputs 1 to 8
- FID1 (or 2) extinguished



a: Month b: Day c: Hour d: Minute e: Error alarm types

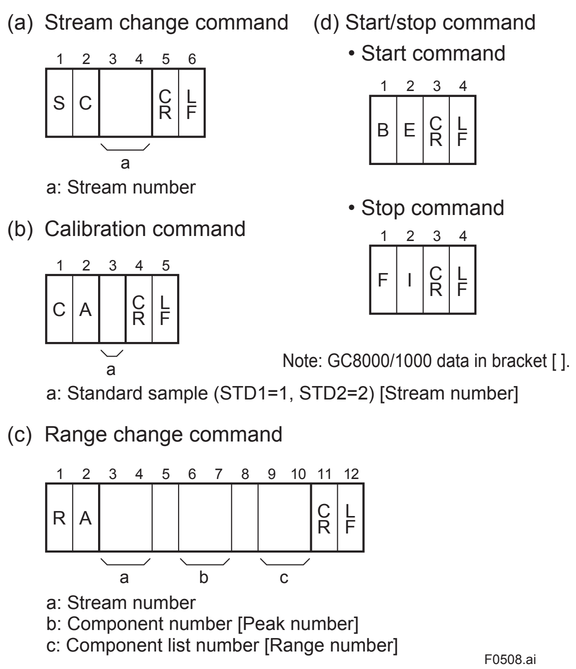
- MEM: Memory pattern check error
- WDT: Watchdog timer
- AD1: Detector 1 calibration error
- AD2: Detector 2 calibration error
- TMPH: Isothermal oven temperature error
- CAR1: Pressure switch 1 OFF
- CAR2: Pressure switch 2 OFF
- EXT1: External contact input 1
- EXT2: External contact input 2
- ⋮
- EXT8: External contact input 8

  8 items in total
- FLM1: FID1 extinguished
- FLM2: FID2 extinguished
- RPT: Calibration repeatability error
- CAL: Calibration out of range
- POF: Power off
- NSD: Communication error (GC8000/GC1000 – GCCU)

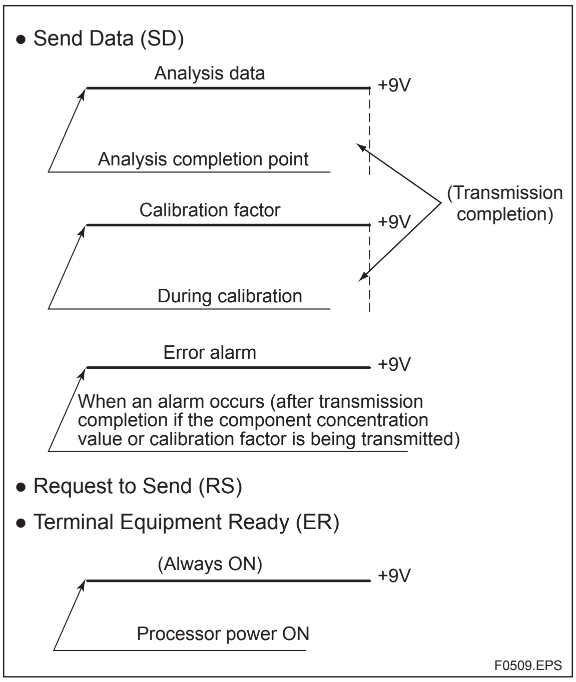
Note: For 3 characters, the 18th character is a dummy space.

F0507.ai

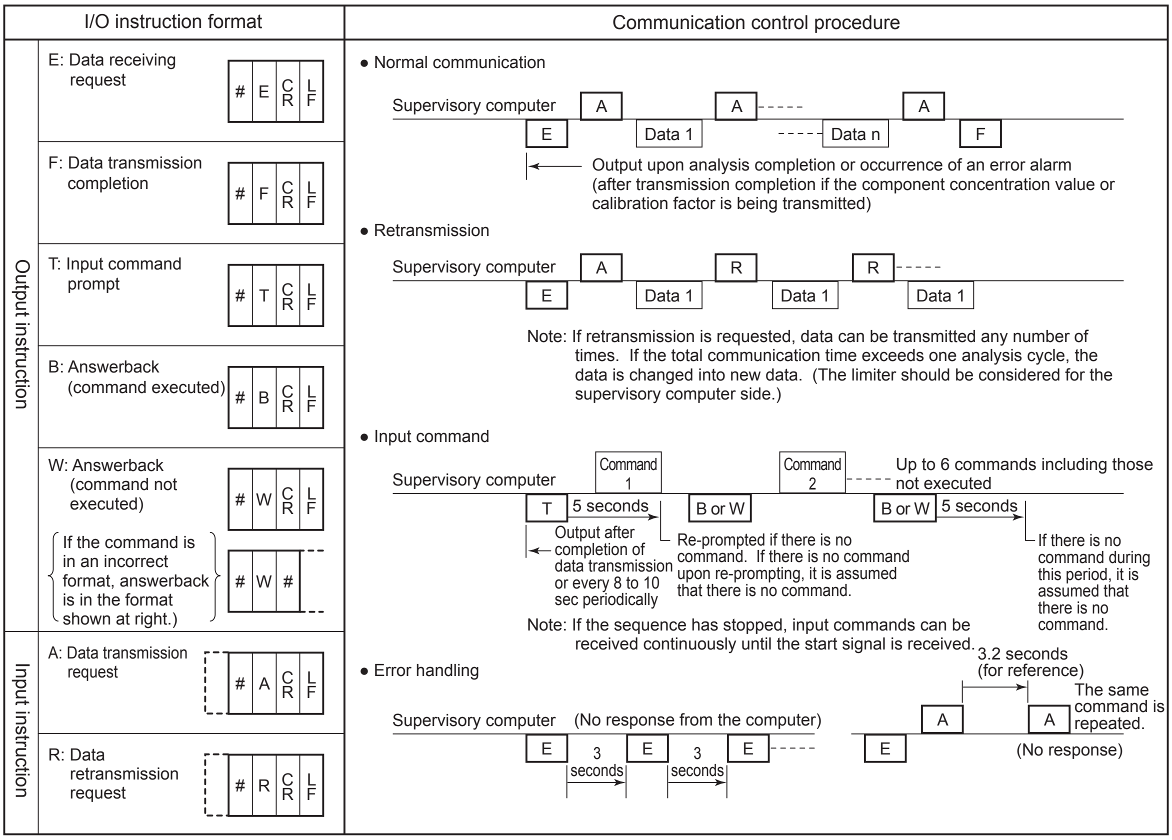
GC6 Type Input Data Format



Output signal transmission timing of non-procedure



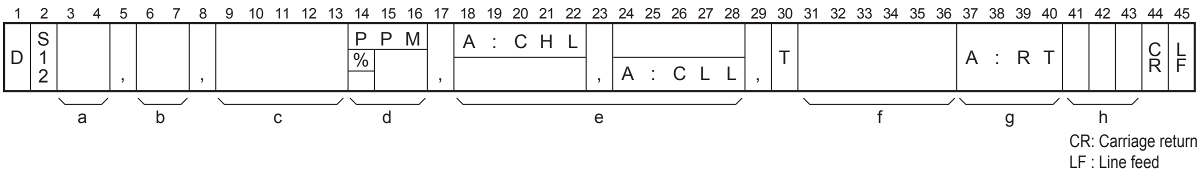
I/O instruction format and communication control procedure for handshake



F0510.EPS

GC8/GC1000 Type Output Data Format (fixed to 45 characters)

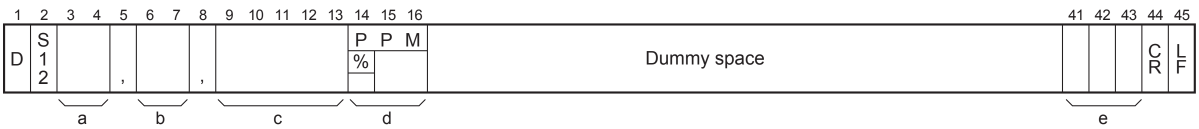
(1) Analysis value data (concentation)



a: Stream number (01 to 31) b: Peak number (1 to 99) when the head is DS c: Component concentration (without zero suppression)
Peak number 0 to 99 (100 to 199) when the head is D1 d: Unit
Peak number 0 to 55 (200 to 255) when the head is D2
e: Concentration error alarm (Upper limit = A:CHL, Lower limit = A:CLL) f: Retention time (seconds) g: Retention time error alarm
h: Analyzer number 1 to 250 (zero suppression provided)
Note: The error alarm is output only if an error occurs. (Dummy space if no error occurs)

F0511.ai

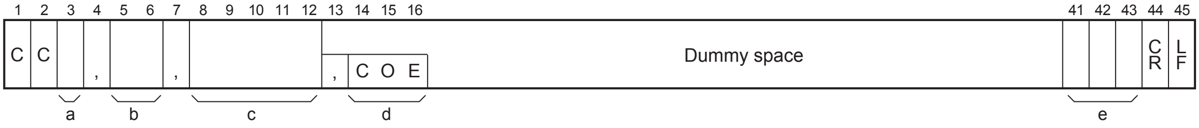
(2) Analysis value data (component ratio operation, linear polynormial operation)



a: Stream number (01 to 31) b: Peak number (1 to 99) when the head is DS c: Computed value (without zero suppression)
Peak number 0 to 99 (100 to 199) when the head is D1 d: Unit
Peak number 0 to 55 (200 to 255) when the head is D2
e: Concentration error alarm (Upper limit = A:CHL, Lower limit = A:CLL)

F0512.ai

(3) Calibration factor

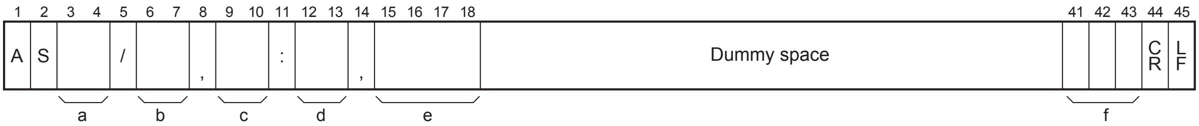


a: Stream number (1 to 9)
b: Peak number (1 to 99)
c: Calibration factor (without zero suppression)
d: Sensitivity error (if an error occurs)
e: Analyzer number 1 to 250 (zero suppression provided)

F0513.ai

(4) Error alarm

- Memory pattern check error
- Calibration out of range
- Isothermal oven temperature error
- Pressure switch 1 (or 2) OFF
- Communication error
- Calibration repeatability error
- Watchdog timer
- Detector 1 (or 2) calibration error
- Power off
- External contact inputs 1 to 8
- FID1 (or 2) extinguished



a: Month b: Day c: Hour d: Minute e: Error alarm types
f: Analyzer No.1 to 250

- MEM: Memory pattern check error
- WDT: Watchdog timer
- AD1: Detector 1 calibration error
- AD2: Detector 2 calibration error
- TMPH: Isothermal oven temperature error
- CAR1: Pressure switch 1 OFF
- CAR2: Pressure switch 2 OFF
- EXT1: External contact input 1
- EXT2: External contact input 2
- ⋮
- EXT8: External contact input 8

(EXT1 to EXT8: 8 items in total)

- FLM1: FID1 extinguished
- FLM2: FID2 extinguished
- RPT: Calibration repeatability error
- CAL: Calibration out of range
- POF: Power off
- NSD: Communication error (GC8000/GC1000 – GCCU)

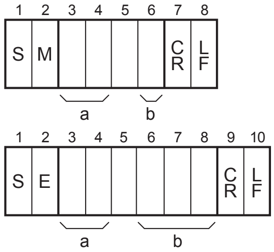
Note: For 3 characters, the 18th character is a dummy space.

F0514.ai

App.D

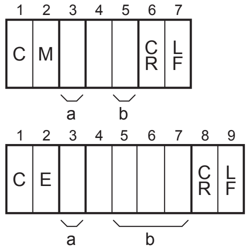
GC8/GC1000 Type Input Data Format

(a) Stream change command



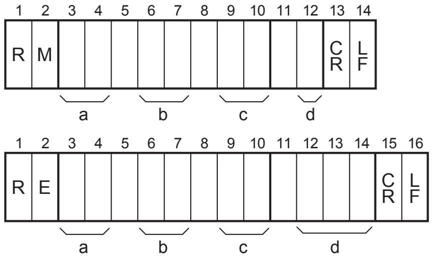
a: Stream number
b: Analyzer number (1 to 6) or (001 to 255)

(b) Calibration command



a: Stream number
b: Analyzer number (1 to 6) or (001 to 255)

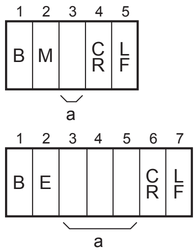
(c) Range change command



a: Stream number
b: Peak number
c: Range number
d: Analyzer number (1 to 6) or (001 to 255)

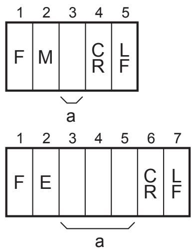
(d) Start/stop command

• Start command



a: Analyzer number
(1 to 6) or (001 to 255)

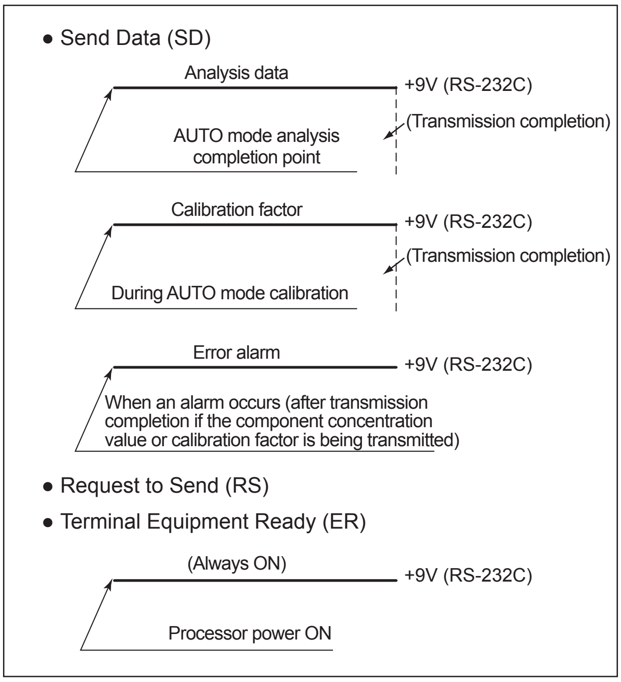
• Stop command



a: Analyzer number
(1 to 6) or (001 to 255)

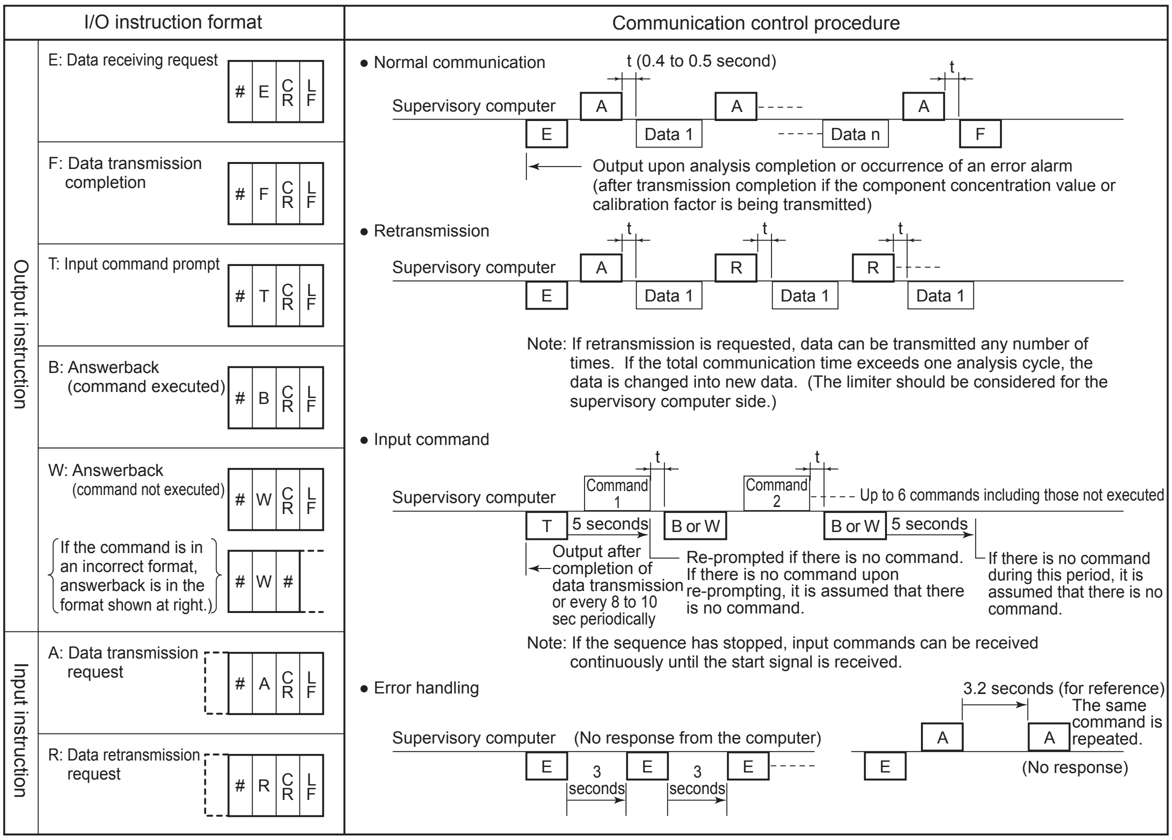
F0515.ai

Output signal transmission timing of non-procedure



F0516.EPS

I/O instruction format and communication control procedure for handshake



F0517.EPS

Note: If #ACRLF or #RCRLF is not received in 20 seconds or more after the data has been sent, the transmission of the analysis data of that cycle will be aborted.

● Modbus Communication Data Specification

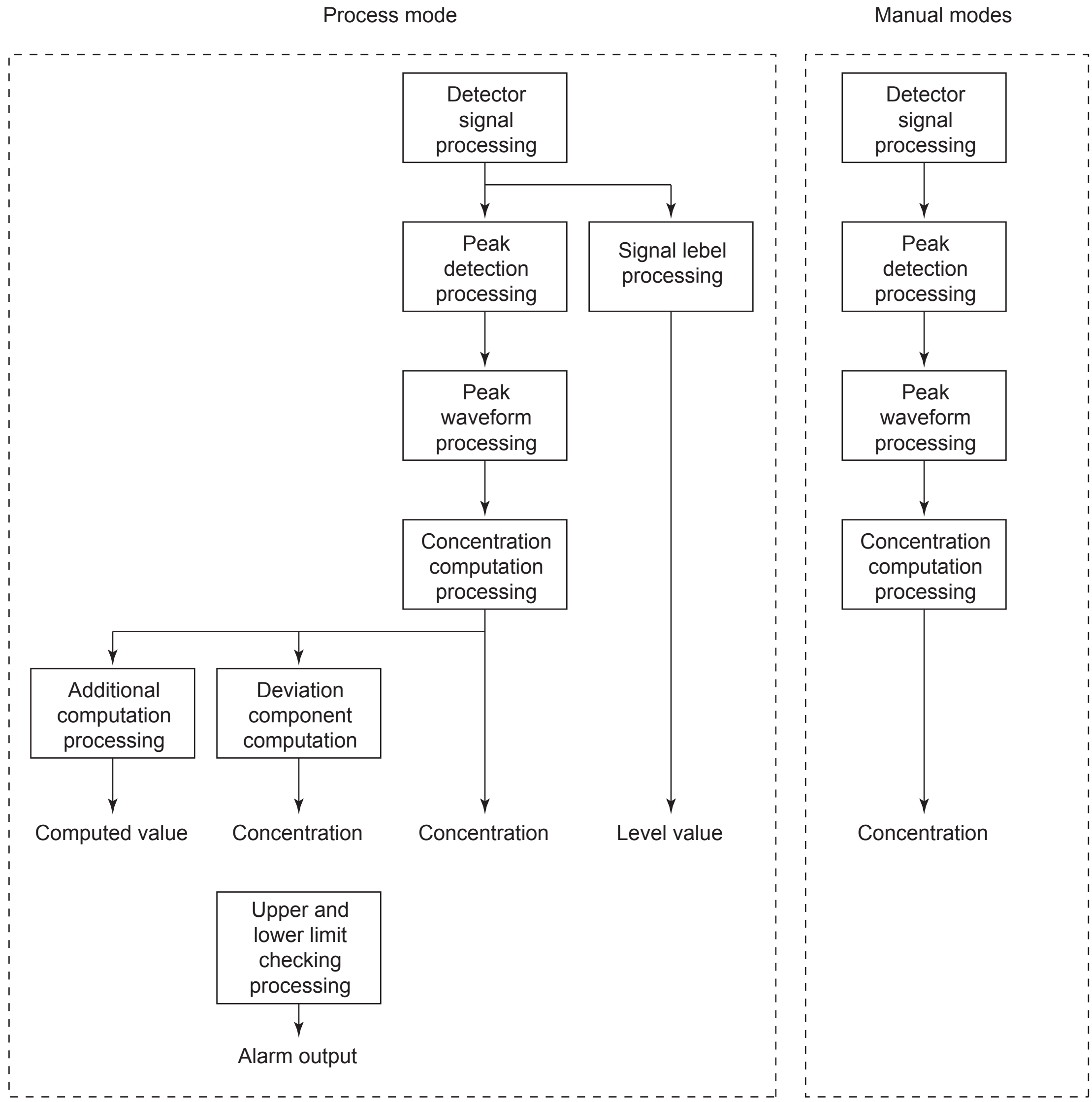
Refer to GS 11B08B02-01E.

Appendix E Computation Scheme

This chapter describes how concentrations and computations are derived based on signals from the detectors so that you can understand the computation functions of the GC8000.

General

The computation function of the GC8000 is composed of the processes shown in the figure below.

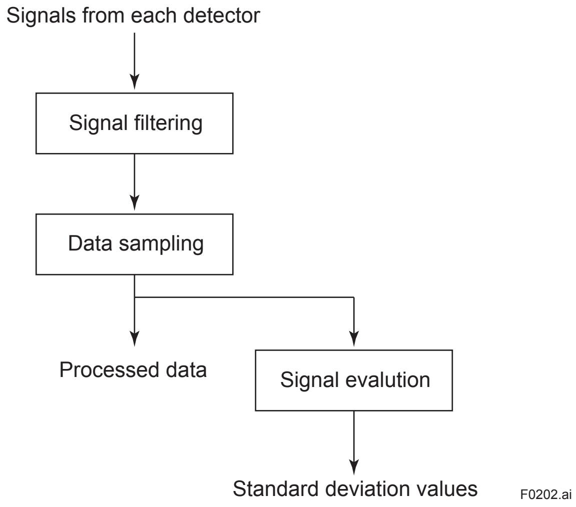


F0201.ai

Detector Signal Processing

Detector signal processing receives signals from each detector, eliminates noise from the signals, and transmits the filtered signals to the following peak detection processing.

The figure below shows the flow of the processing.



(1) Signal Filtering

The filtering step eliminates high-frequency components from the signals transmitted from each detector every 20 ms. The filtering formula is:

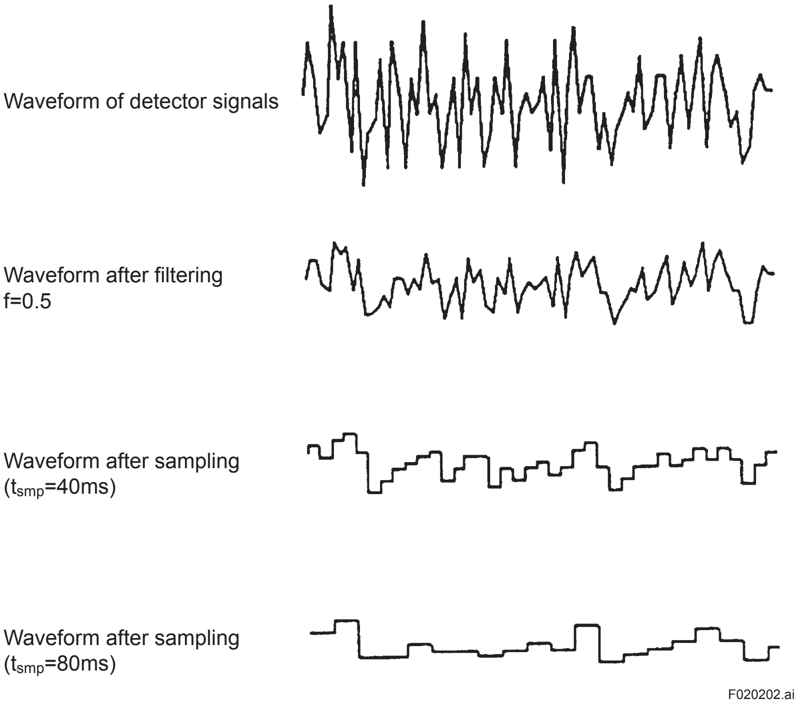
$$y_t = f\,(x_t - y_{t-1}) + y_{t-1}$$

Where:

y_t : filtered data
y_{t-1} : previous data from 20 ms before
f : filtering coefficient (variable between 0.01 and 1.000)
x_t : signal from a detector

(2) Data Sampling

At every time t_{smp}, the data sampling step averages the signals acquired every 20 ms from detectors. Note that t_{smp} is a value calculated from multiplying 20 ms by 2^n (n=0 or a variable integer from 1 to 9; therefore, t_{smp} is a variable between 20 ms and 10.24 s).



(3) Signal Evaluation

The signal evaluation step calculates the standard deviation of sampled 20 signals according to the following formulas:

$$y_{avrg} = \frac{1}{20} \sum_{i=t-19}^{t} y_i$$

$$s_d = \sqrt{\frac{1}{20} \sum_{i=t-19}^{t} (y_i - y_{avrg})^2}$$

Where:

y_i : sampled signals (20 signals)

s_d : standard deviation of the sampled data

App.E

■ Process Mode Processing

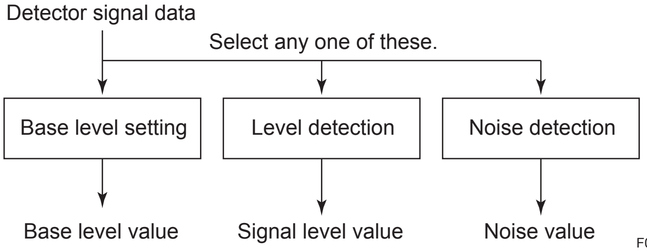
There are four kinds of process mode:

1. Signal level processing
2. Peak processing
3. Deviation component computation processing
4. Additional computation processing

Up to 255 settings can be computed and they are separately divided for each stream.

(1) Signal Level Processing

There are three kinds of processing: base level setting, level detection, and noise detection.



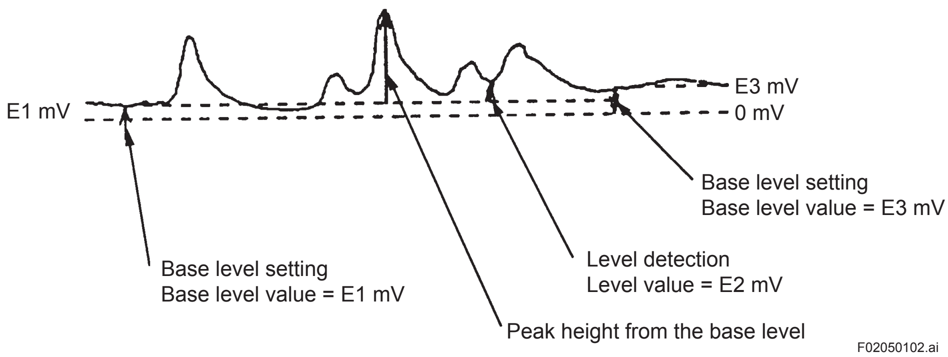
F020501.ai

Base Level Setting

The signal level in the voltage at the specified time in the analysis cycle (operation time) is stored as the base level value.

Level Detection

The difference between the latest base level and the signal level at the specified time in the analysis cycle (operation time) is detected as the signal level.

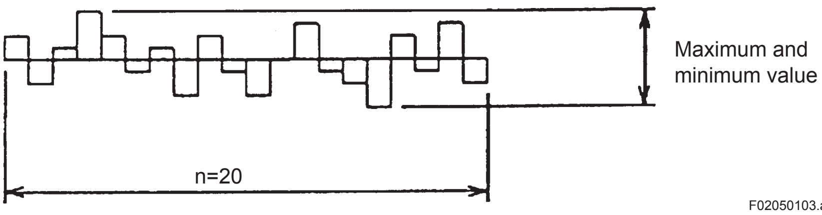


F02050102.ai

Noise Detection

The noise value of the signal at the specified time in the analysis cycle is obtained.

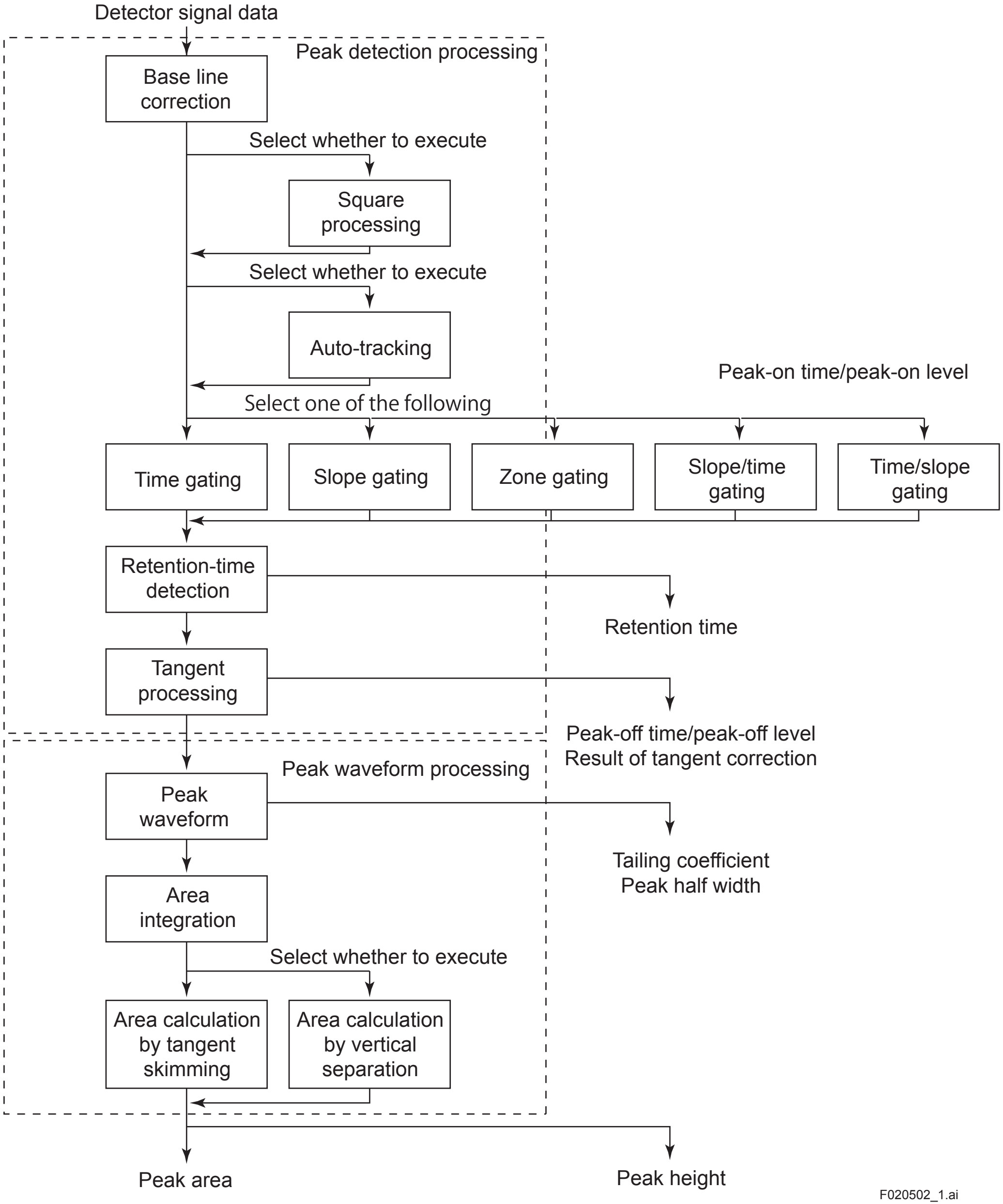
The difference between the maximum and minimum values among 20 data is converted into a value per second as the noise value.



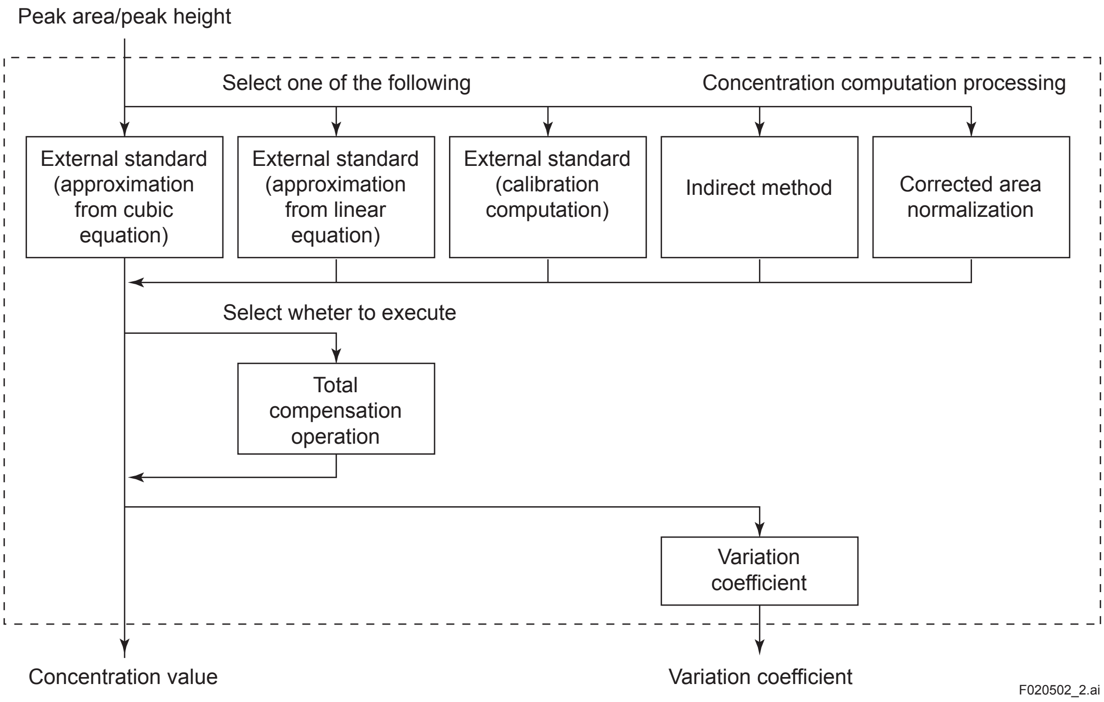
F02050103.ai

(2) Peak Processing

Peaks are detected from the detector signal data, and the concentration is calculated from the area or height of the peak.



F020502_1.ai



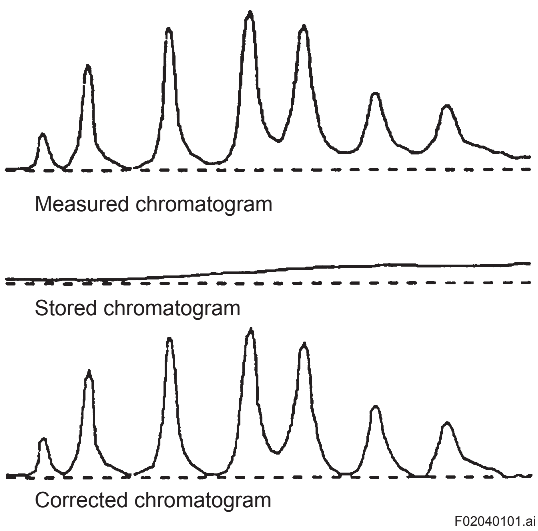
Peak Detection

The details on square processing, retention time detection processing, and tangent processing are the same as in peak processing in Manual mode.

(a) Base Line Correction Processing

Base Line Correction

In base line correction, stored chromatogram data are subtracted from the measured detector signal data, and processing following the peak detection are carried out on the subtracted data. When storage is specified, base line correction is not done.



You can select whether or not correction is carried out for each stream.

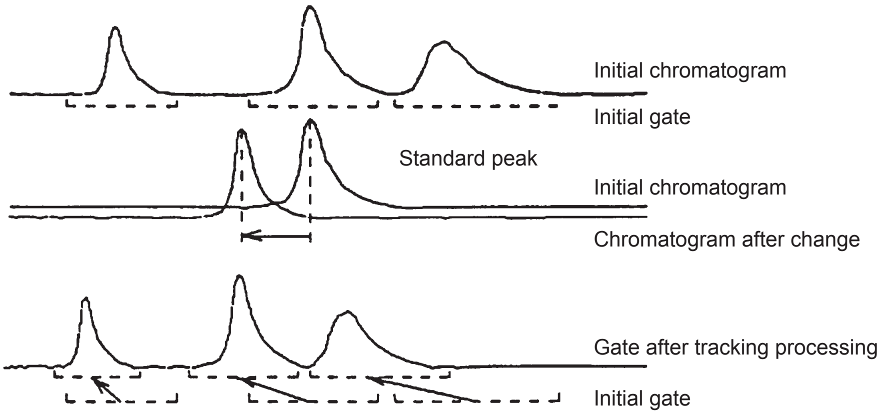
(b) Auto-tracking Peak Processing

As the retention time changes, gates for each peak are displaced. To prevent this displacement, auto-tracking peak processing automatically changes the gate time for each peak according to the change in the retention time.

Actions:

According to the change in the retention time of each peak that is specified as standard, the gate time of the specified peak and processing time of the specified signal level are changed. When only one standard peak is specified, the gate time and processing time are obtained in proportion with the retention time. When two or more standard peaks are specified, the gate time and processing time are obtained for each peak by performing a linear approximation on the first peak and the last peak.

The variation coefficient of the obtained retention time is shared by all peaks.



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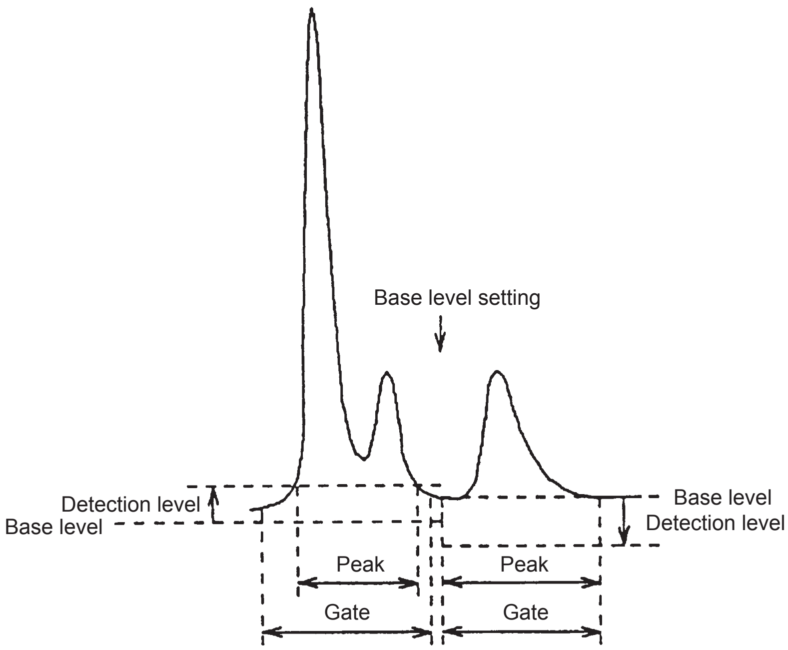
(c) Time Gating

Time gating processing detects peaks within the predefined time interval when the following condition is satisfied:

The detector signal value is higher than the detection level within the range between the specified gate-on time and gate-off time.

The detection level can be set for each peak based on the signal level upon analysis start (or the base level when the base level setting is specified).



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(d) Slope Gating

Slope gating processing detects peaks based on the change in the time of detector signal data. The time when detection is started is predefined as the gate time. When all the following conditions are satisfied, it is assumed that the peak is started (on):

- The analysis elapse time is greater than the gate-on time.
- The previous peak is ended.
- The detector signal exceeds the detection level.
- The gradient of the detector signal (change with time) exceeds the peak-on detection slope value.

When all the following conditions are satisfied, it is assumed that the peak is ended (off):

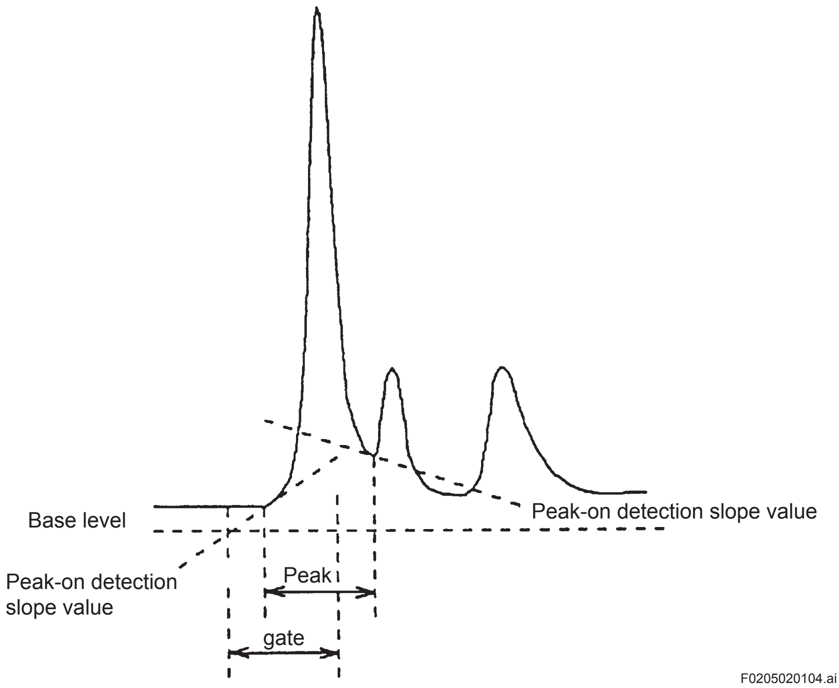
- The analysis elapse time passes the gate-off time.
- The detector signal passes the peak point.
- The detector signal is lower than the detection level.
- The gradient of the detector signal (change with time) is smaller than the peak-off detection slope value.

If the next gate is started before the detector signal passes the peak point, it is also assumed that the peak is ended (off).

The detection level can be set for each peak based on the signal level upon the start of analysis (or the base level when the base level setting is specified).

The peak-on detection slope value is equal to the detection slope value (set for each peak).

The peak-off detection slope value is the detection slope value multiplied by the detection slope on/off ratio (that can be group-set).



(e) Zone Gating

Zone gating method detects peaks under the upper limitation of specified number of peaks in the range (zone) between the gate-on time and the gate-off time.

(i) Peak detection action in zone gating

The peak detection action in the zone gating acquires the number of peaks assigned to the zone using the gate on as a trigger and like the regular slope detection, starts the detection of peak on. As soon as the peak on is detected, the detection of peak off is started. At the point the peak off is detected, the first peak is determined.

The following peak detection is started and then the second and third peaks are determined. This peak detection action is continued until the peaks of assigned number are determined. After the detection of the final peak in the zone has been completed, the peak detection is not performed until the gate-off time.

For instance, assuming the assigned number of peaks is 5 in the zone peak detection starting at peak 3, the peak detection is started from the gate on, and if the detection is performed normally, the data will be stored in the peak buffers of peak 3, 4, 5, 6, and 7 in the order of detection.

(ii) Generation of peak search errors

If the gate is finished after the peak detection has been started but before the peak detection of the assigned number of peaks is not completed, peak search errors with regard to the undetermined peaks will be generated. In the same example as above, assuming that three peaks are detected before the gate off, peak search errors will be generated for peaks 6 and 7, respectively

(iii) Coexistence of zone gating with other peak detection actions

Like the slope gating, time gating and slope-on/time-off method, the zone gating method is performed by setting at the peak unit. Therefore, the zone gating method is considered as one of the regular detection actions, allowing it to coexist with other detection methods in one stream.

(iv) An action when the previous peak is on before the zone gating starts

If the previous peak (in this case, the slope detection peak) has not been finished before the zone gating starts, the previous peak is forced to become off at the time the zone gating turns on. At this time an error message or any other notice indicating the forced termination is not generated.

(v) An action when the current peak is on upon the zone gating is finished

If the currently detected peak is not finished when the zone gating processing is finished, the current peak is forced to become off at the time the zone gating turns off. At this time an error message or any other notice indicating the forced termination is not generated.

(vi) Auto-tracking peak method in the zone gating

In the auto-tracking peak in the zone gating method, specifying the tracking standard is not supported. Therefore, either “Tracking exec” or “No tracking” should be specified for the peak tracking in the zone gating. When “Tracking exec” is specified, the setting of a starting peak in the zone gating becomes effective and the second and the following settings are disregarded.

(vii) Confirmation of minimum detection height/area

In the zone gating method, the settings of minimum detection peak height and area are enabled and for the peaks detected in all zone gating processing, the minimum detection peak height and area are checked uniformly. If there are some peaks not satisfying these conditions, the processing and data storing of those peaks are skipped and the following peak is processed. This means that the peaks not satisfying these conditions are not counted as a zone assigned peak, but discarded.

(viii) Setting of the peak detection conditions

The zone gating method performs slope detections under the same conditions by using the setting of the starting peak number (slope conditions and polarity) in the zone gating with regard to the slope detection conditions of the peak in the zone.

(ix) Handling of chromatograph data errors

If void data are found in the detecting peaks, the zone gating method generates a chromatograph data error, skip processing and data storing of the peaks of concern, and performs the following peak processing. Peaks that have caused a chromatograph error will not be counted as a zone assigned peak, but discarded.

(f) Slope/Time Method

Unlike the usual slope detection method or time gating method, slope/time method performs a peak detection by using the slope detection method for the peak on detection and the time gating method for the peak off.

- **Coexistence of slope/time method with regular peak detection actions**

  Like the slope gating, time gating and zone gating method, the slope/time method is performed by setting at the peak unit. Therefore, the slope/time method is considered as one of the regular detection actions, allowing it to coexist with other detection methods in one stream.

(g) Time/slope Method

Unlike the usual slope detection method or time gating method, time/slope method performs a peak detection by using the time gating method for the peak on detection and the slope detection method for the peak off.

- **Coexistence of time/slope method with regular peak detection actions**

  Like the slope gating, time gating and zone gating method, the time/slope method is performed by setting at the peak unit. Therefore, the time/slope method is considered as one of the regular detection actions, allowing it to coexist with other detection methods in one stream.

Peak Waveform processing

This is the same as in peak waveform processing in Manual mode. (See Section 2.3.2.) However, area calculation by tangent skimming or vertical separation can be specified for each peak.

Concentration Computation Processing

Concentration is computed when level processing for the last peak is completed in each stream.

Corrected area normalization or the standard method (external standard of indirect method) can be group-specified in the stream common list.

(a) External Standard (Approximation by Cubic Equation)

The external standard (approximation by cubic equation) computes concentration from the area value based on the predefined coefficient.

The specified standard peak is used for the coefficient α, S_b, R, K, A and B.

The computation formula is:

$$C = RK(\alpha S_i/S_b)\ (A\ (\alpha S_i/S_b)^2 + B(\alpha S_i/S_b) + 1)$$

Where:

C : concentration
α : calibration factor
S_b : standard area (or height)
S_i : measured area (or height)
R : measurement range
K : coefficient
A : coefficient
B : coefficient

(b) External Standard (Approximation by Linear Equation)

The external standard (approximation by linear equation) calculates a coefficient of the linear equation from the area (or height) of two peaks specified as standard peaks specified as standard peaks and calculates the concentration from the area (or height) measured using the coefficient.

The equations are as follows.

(1) During calibration

During calibration, if the range of the calibration coefficient is zero, calculate the standard area, if specified, calculates the calibration coefficient.

- When the range of the calibration coefficient is zero:
  Standard area = (Integrated area value / The number of integration) * (Measuring range / Standard concentration)
  Calibration coefficient = 1
- When the range of the calibration coefficient is other than zero:
  Calibration coefficient = ((Integrated are value / The number of integration) * (Measuring range / Standard concentration)) / Standard area

(2) During measurement

Calculate the concentration of peak i using standard concentrations and areas (or heights) of reference peaks j and k.

The area of reference peak j, S_j, is calculated as follows.

S_j -= a_j SO_j (CO_j / R_j)

Where:

S_j	: area of reference peak j
a_j	: calibration coefficient
SO_j	: standard area
CO_j	: standard concentration
R_j	: measuring range

The area of reference peak k, S_k, is calculated as follows.

$S_k = a_k SO_k (CO_k / R_k)$

Where:

S_k	: area of reference peak k
a_k	: calibration coefficient
SO_k	: standard area
CO_k	: standard concentration
R_k	: measuring range

Coefficients a and b in the linear equation are calculated as follows.

$$a = \frac{C_j - C_k}{S_j - S_k}$$

$$b = C_j - aS_j$$

The concentration of peak i is calculated as follows.

$$c_i = as_i + b$$

Where:

c_i	: concentration of peak i
s_i	: area (or height) of peak i
a	: slope of the linear equation (coefficient)
b	: intercept of the linear equation (coefficient)
C_j	: concentration of reference peak j
C_k	: concentration of reference peak k

(c) Calibration Computation

The calibration stream, validation stream, and measurement stream are set for each stream. As for the calibration stream, the standard area or calibration coefficient is obtained for each peak.

When the calibration streams continues three times or more the calibration coefficient is obtained using the average of the last three results.

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When the calibration streams continues less than three times, the calibration coefficient is calculated from the results obtained.

If the range of the calibration coefficient is set to zero, the standard area is obtained setting the calibration coefficient to 1.

If the range of the calibration coefficient is set to other than zero, the calibration coefficient should be obtained.

Note that calibration is not performed in the following conditions; they are regarded as an alarm status:

- The calibration coefficient of any one of the peaks in a calibration stream exceeds the standard range (group setting).
- The variation coefficient (see (g)) of any one of the peaks in a calibration stream exceeds the requirement range (group setting).
- The concentration value of any one of the peaks in a calibration stream exceeds the calibration range.

These calibration range are concentration ration to standard concentration.

There are set en bloc from 0 to 1.

The alarm status is removed under the following conditions.

- The results of the re-performed calibration stream does not induce an alarm status.
- The operation mode is changed.

(d) Indirect Method

The indirect method computes the concentration of the measured peak assuming that the ratio of the area (or height) for the concentration of the standard peak to the area (or height) for the concentration is constant.

The computation formula is:

$$c_i = K_i\, \alpha_j\, f_i \frac{s_i}{s_j} \left[A_i \left(a_j f_i \frac{s_i}{s_j} \right)^2 + B_i\, a_j\, f_i \frac{s_i}{s_j} + 1 \right] c_j$$

Where:

c_i : concentration of measured peak i
c_j : measuring range of reference peak j (calibration stream) set in standard peak j (external cublic equation processing)
s_i : area (or height) of measured peak i
s_j : standard area of reference peak j (calibration stream) set in standard peak j (external cublic equation processing)
f_i : sensitivity correction coefficient of measured peak i to standard peak j
K_i : linearizing coefficient of measured peak i
A_i : linearizing coefficient of measured peak i
B_i : linearizing coefficient of measured peak i
α_j : calibration coefficient of standard peak j

(e) Corrected Area Normalization

Corrected area normalization computes the concentration of each peak using area values measured in a stream and taking the total area value as 1. Processing computes the concentration by multiplying the value of each peak by the coefficient (the mole sensitivity correction coefficient or weight sensitivity correction coefficient).

The computation formula is:

$$c_i = \frac{f_i s_i}{\sum_{j=l}^{k} (f_j s_j)}$$

Where:

c_i : concentration of peak i
s_i : area of peak i
f_i : sensitivity correction coefficient of peak i

(f) Total Compensation

Total compensation computes the concentration measured in a stream so that the total value of the measurement components is the total value specified in each stream.

The computation formula is:

$$c_{ni} = c_{total} \frac{c_i}{\sum_{j=l}^{k} c_j}$$

Where:

c_{ni} : result of total compensation for peak i (excluding the concentrations of the “Total compensation disable” peaks)
c_{ni} : concentration of peak i
c_{total} : total of the concentration values

(g) Variation Coefficient Computation

Variation coefficient computation computes the variation coefficient for concentration.

The computation formula is:

$$c_{avrg} = \frac{\sum c_i}{n}$$

$$c_v = \frac{1}{c_{span}} \sqrt{\sum \frac{(c_i - c_{avrg})^2}{n}}$$

Where:

c_i : concentration of peak i
c_{span} : measurement span of peak i
c_v : variation coefficient of concentration for peak i

(3) Deviation Component Computation

Deviation component computation computes the difference between the concentration values measured in a stream and the total concentration specified for each stream.

Deviation coefficient computation can be made for obtained concentration values. See the section on variation coefficient computation in peak processing.

If the result of a computation is negative, the result is counted as 0.

The computation formula is:

$$c_j = c_{total} - \sum_{i=1}^{k} c_i$$

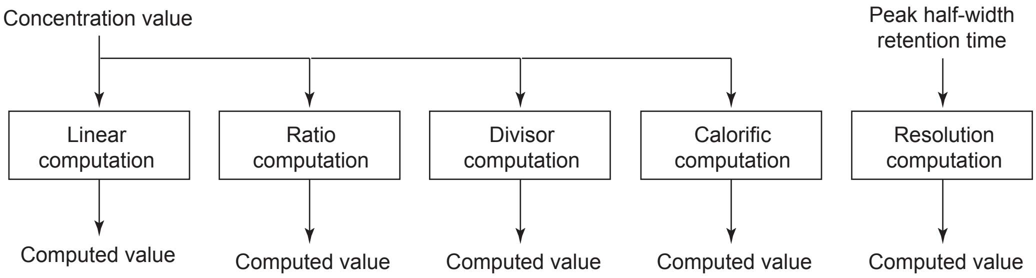
Where:

c_i : concentration of peak i
c_j : concentration of deviation component j
c_{total} : total of the concentration values

(4) Additional Computation Processes

There are linear computation, ratio computation, resolution computation, Divisor computation, and calorific value computation functions.

The computation flow is as shown below.



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Linear Computation

Linear computation multiplies each obtained concentration (including deviation concentration values) by the coefficient and calculates the total of the results.

Linear computation is available for the concentrations of a stream where the computation is predefined.

Since five coefficients can be set for each concentration, five sets of computation formulas can be set for each stream.

The computation formula is:

$$x_j = a_j \sum_{i=1}^{k} a_{ij} c_i + b_j$$

Where:

x_j : result of the linear computation
c_i : concentration of peak i
a_{ij} : coefficient of linear computation j of peak i
a_j : coefficient a of computation j
b_j : coefficient b of computation j

Ratio Computation.

Ratio computation computes the ratio of two obtained concentrations.

Every time the concentration of the numerator X_k is computed, the computation is updated.

The computation formula is:

$$x_j = \frac{x_k}{x_m}$$

Where:

x_j : result of ratio computation
x_k : concentration of peak k
x_m : concentration of peak m

● Resolution Computation

Resolution computation calculates the peak resolution from the retention time and peak half-width of two peaks.

The expression formula is:

$$x_j = \frac{2(t_{r(l)} - t_{r(m)})}{1.699(t_{w(l)} + t_{w(m)})}$$

Where:

x_j : result of resolution computation
$t_{r(l)}$: retention time of peak l
$t_{r(m)}$: retention time of peak m
$t_{w(l)}$: peak half width of peak l
$t_{w(m)}$: peak half width of peak m

● Divisor Computation

When all components, such as a total compensation and area percentage, in the sample are measured and compensated so that the total is compensated to 100 % of measured values (or a specific value), the trend of changes in the absolute volume of the component concentrations. In this case, using this computation the trend of changes in the absolute volume can be monitored.

(a) When the standard method (absolute calibration model method) is specified for computation and the total compensation is enabled.

To perform the Divisor computation, the total compensation should be set to be enabled.

Assuming that the concentrations of each peak by the absolute calibration model are a1, a2, a3, a4, a5, and a6, that "Total compensation disabled" is set for a2 and a3, and that the total compensation values is T, the Divisor value is calculated as follows.

Sum = a1 + a2 + a3 + a4 + a5 + a6

Divisor_Value = (Sum - (a2 + a3)) / (T - (a2 + a3))

If (Sum - (a2 + a3)) or (T - (a2 + a3)) is zero, Divisor_Value should be zero.

(b) When the area percentage method is specified for computation.

In the area percentage method, the Divisor value is output in 0 to 1 as taking the standard total area (set value) as 100 %.

● Function of Calorific Value Calculation

As a standard function the GC8000 is capable of calculating calorific values. This section explains how it calculates the value in accordance with the following standards.

- ISO 6976
- ASTM D3588-81
- ASTM D3588-91
- JIS K2301

(a) ISO 6976

The GC8000 converts each peak result obtained in volume percent into the one in mole fraction, and calculates the real gas calorific value on a molar basis, real gas calorific value on a mass basis, real gas calorific value on a volumetric basis, relative density of the real gas, density of the real gas, compression factor and Wobbe index of the sample gas from the ideal gas calorific value on a molar basis, ideal gas calorific value on a mass basis, ideal gas calorific value on a volumetric basis, molar mass, and summation factor of each peak.

<Formula>

$$Z_{mix} = 1 - (\sum x_i \sqrt{b_i})^2$$

$$Z_i = 1 - (\sqrt{b_i})^2$$

$$x_i = \frac{\frac{x_{Vi}}{Z_i}}{\sum \frac{x_{Vi}}{Z_i}}$$

$$M = \sum x_i M_i$$

$$\bar{H} = \bar{H}^\circ = \sum x_i \bar{H}_i^\circ$$

$$\hat{H} = \hat{H}^\circ = \sum (\frac{x_i M_i}{M}) \hat{H}_i^\circ$$

$$\tilde{H}^\circ = \sum x_i \tilde{H}_i^\circ$$

$$\tilde{H} = \frac{\tilde{H}^\circ}{Z_{mix}}$$

$$d^\circ = \sum x_i \frac{M_i}{M_{air}}$$

$$d = \frac{d^\circ Z_{air}}{Z_{mix}}$$

$$\rho^\circ = \left(\frac{p}{RT}\right) \sum x_i M_i$$

$$\rho = \frac{\rho^\circ}{Z_{mix}}$$

$$W = \frac{\tilde{H}}{\sqrt{d}}$$

Where:

$\bar{H}$: real gas calorific values on a molar basis
$\bar{H}^\circ$: ideal gas calorific values on a molar basis
$\bar{H}_i^\circ$: ideal gas calorific values on a molar basis of component i
$\hat{H}$: real gas calorific values on a mass basis
$\hat{H}^\circ$: ideal gas calorific values on a mass basis
$\hat{H}_i^\circ$: ideal gas calorific values on a mass basis of component i
$\tilde{H}$: real gas calorific values on a volumetric basis
$\tilde{H}^\circ$: ideal gas calorific values on a volumetric basis
$\tilde{H}_i^\circ$: ideal gas calorific values on a volumetric basis of component i
M : molar mass
M_i : molar mass of component i
M_{air} : molar mass of air (28.9626)
$\sqrt{b_i}$: summation factor of component i
Z_{mix} : compression factor
Z_i : compression factor of component i
Z_{air} : compression factor of air (Section 1.5.2, Table 6)
ρ : density of real gas
ρ° : density of ideal gas
x_i : mole fraction of component i
x_{Vi} : colume percent of component i
R : molar gas constant (8.314510J/molK)
p : Pressure (101.325kPa)
T : absolute temperature
W : Wobbe Index

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(b) ASTM D3588-81

The GC8000 converts each peak result obtained in volume percent into the one in mole fraction, and calculates the real gas calorific value, real gas specific gravity, compressibility factor, and Wobbe index of the sample gas from the ideal gas calorific value, ideal gas specific gravity, compressibility factor, and compressibility summation factor of each component.

<Formula>

$$Z = 1 - \left(\sum x_i \sqrt{b_i}\right)^2 + 0.005(2x_H - x_H^2)$$

$$x_i = \frac{\dfrac{x_{Vi}}{z_i}}{\sum \dfrac{x_{Vi}}{z_i}}$$

$$H = \sum x_i H_i$$

$$G = \sum x_i G_i$$

$$H_r = \frac{H}{z}$$

$$G_r = \frac{0.99959G}{z}$$

$$W = \frac{H_r}{\sqrt{G_r}}$$

Where:

- H_r : real gas calorific value (total or net)
- H : ideal gas calorific value (total or net)
- H_i : ideal gas calorific value of component i (total or net)
- G_r : real gas specific gravity
- G : ideal gas specific gravity
- G_i : ideal gas specific gravity of component i
- z : compressibility factor
- z_i : compressibility factor of component i
- $\sqrt{b_i}$: compressibility summation factor of component i
- x_i : mole fraction of component i
- x_H : mole fraction of hydrogen
- x_{Vi} : volume percent of component i
- W : Wobbe Index

(c) ASTM D3588-91

The GC8000 converts each peak result obtained in volume percent into the one in mole fraction, and calculates the real heating value per unit volume, real heating value per unit mass, real relative density, real gas density, compressibility factor and Wobbe index of the sample gas from the ideal heating value per unit volume, ideal relative density, ideal gas density, compressibility factor and summation factor of each peak.

<Formula>

$$Z = 1 - P\left(\sum x_i \sqrt{\beta_{ii}}\right)^2$$

$$x_i = \frac{\dfrac{x_{Vi}}{Z_i}}{\sum \dfrac{x_{Vi}}{Z_i}}$$

$$H_V^{id} = \sum x_i H_{Vi}^{id}$$

$$d^{id} = \sum x_i d_i^{id}$$

$$\rho^{id} = \sum x_i r_{Vi}^{id}$$

$$H_m^{id} = \frac{H_V^{id}}{\rho^{id}}$$

$$H_v \cong \frac{H_V^{id}}{Z}$$

$$d = \frac{d^{id} Z_a}{Z}$$

$$\rho = \frac{\rho^{id}}{Z}$$

$$H_V \cong \frac{H_V}{r} = H_m^{id}$$

$$W = \frac{H_V}{\sqrt{d}}$$

Where:

- H_V : real heating value per unit volume (gross or net)
- H_V^{id} : ideal gross (or net) heating value per unit volume
- H_{Vi}^{id} : ideal gross (or net) heating value per unit volume of component i
- H_m : real heating value per unit mass (gross or net)
- H_m^{id} : ideal gross (or net) heating value per unit mass
- d : real relative density
- d^{id} : ideal relative density
- d_i^{id} : ideal relative density of component i
- ρ : real gas density
- ρ^{id} : ideal gas density
- ρ_i^{id} : ideal gas density of component i
- Z : compressibility factor
- Z_i : compressibility factor of component i
- Z_a : compressibility factor of air (0.9996)
- $\sqrt{\beta_{ii}}$: summation factor of component i
- x_i : mole fraction of component i
- x_{Vi} : volume percent of component i
- P : pressure (14.696psia)
- W : Wobbe Index

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(d) JIS K2301

The GC8000 converts each peak result obtained in volume percent into the one in mole fraction, and calculates the calorific value (gross or net), specific value, compression factor, and Wobbe index of the sample gas from the calorific value (gross or net), specific value, compression factor and summation factor of each peak.

<Formula>

$$Z = 1 - \left(\sum C_{Mi}\sqrt{b_i}\right)^2 + 0.0005(2C_{MH} - C_{MH}^{\ 2})$$

$$C_{Mi} = \frac{\frac{C_{Vi}}{Z_i}}{\sum \frac{C_{Vi}}{Z_i}}$$

$$H_G = \frac{\sum C_{Mi}H_i}{Z}$$

$$S = \frac{\sum C_{Mi}S_i}{Z}$$

$$W = \frac{H}{\sqrt{S}}$$

Where:

- H_G : calorific value (gross or net)
- H_i : ideal calorific value of component i (gross or net)
- S : Specific value of the sample gas
- S_i : ideal specific value of component i
- Z : compression factor of the sample gas
- Z_i : compression factor of component i
- $\sqrt{b_i}$: summation factor of component i
- W : Wobbe Index of the sample gas
- C_{Vi} : volume percent of component i
- C_{Mi} : mole fraction of component i
- C_{MH} : mole fraction of hydrogen

(5) Upper and Lower Limit Checking

Upper and lower limit checking of 32 points can be set as to the following items.

If the conditions of the specified upper and lower limit checking are not satisfied, an alarm is generated.

For signal level processing, the base level value, signal level, and noise value should be checked according to the processing details. In peak processing, the following four upper and lower limits can be checked for each peak:

1. concentration value (including the base level value, signal level value, noise value, and computed value)
2. retention time
3. variation coefficient
4. tailing coefficient

For deviation component computation and additional computation processing, the upper and lower limits of computed values can be checked. Multiple items can be checked for each processing as follows.

Stream number

Processing number

Item (concentration, retention time, etc.)

Upper limit

Lower limit

Alarm level

The alarm status is removed when:

- the value falls within the range between the limits; or,
- the operation mode is changed.

Appendix F GC File Converter (GCFC)

GC File Converter (GCFC) software converts a chromatogram file, which is stored in the PC Analyzer Server (PCAS) and Analyzing Server Engineering Terminal (ASET) (single mode), into a file readable by EZChrom*

* EZChrom is a chromatography data system from Agilent Technologies, which collects, processes, and controls analysis data of chromatographs.

■ Installation of GCFC

This section describes how to install GCFC in a PC.

This description assumes that your PC system is as follows and that you fully understand how to use it.

● System Conditions

Check that the operating system is one of the following:

Microsoft Windows XP Professional SP3 (32-bit, Japanese or English)

Microsoft Windows Server 2008 SP2 (32-bit, Japanese or English)

Microsoft Windows 7 Professional (32-bit, Japanese or English)

Check that the hardware meets the following conditions:

OS	Windows XP	Windows Server 2008	Windows 7
CPU	Pentium II 350 MHz or faster	CPU 2 GHz or faster	CPU 1 GHz or faster
Memory	At least 128 MB	At least 2 GB	At least 1 GB
Hard disk	At least 3 MB of free space (for the program only)		

There must be sufficient space on the hard disk to store data, in addition to the space for the program.

● Installation procedure

Insert the installation CD into the CD-ROM drive.

The installation program starts automatically (or click on GCFC.exe instead).

Then follow the instructions of the wizard.

IMPORTANT

Administrator rights are required for installing and operating GCFC. Operation cannot be ensured for other log-in accounts without administrator rights.

■ Startup

GCFC can be started by clicking Windows' Start button, selecting All Programs, and clicking on GCFC.exe in the GCFC group.

Or, if there is a GCFC shortcut icon on the desktop, you can double-click it instead.

Figure 1 GCFC shortcut icon

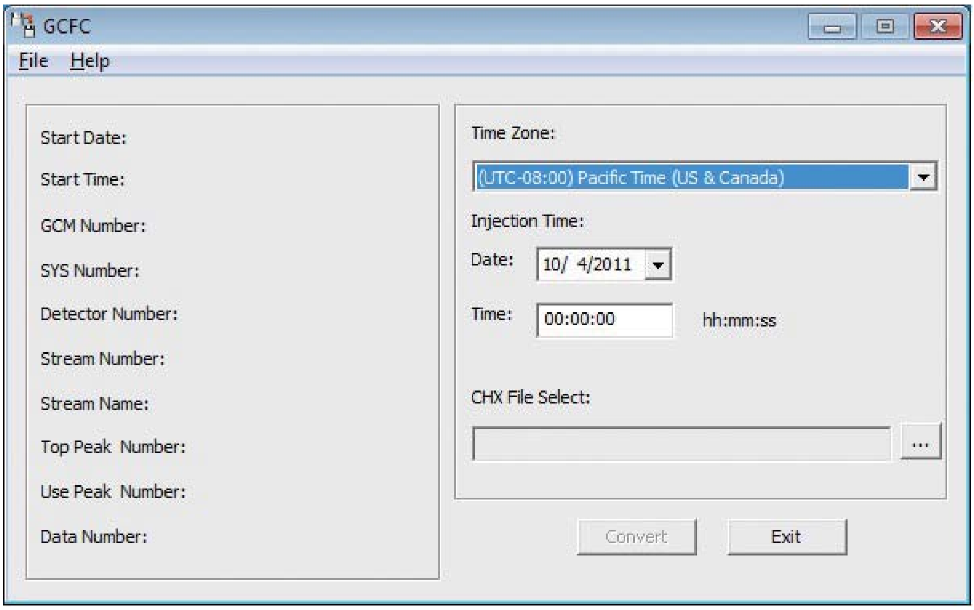

Figure 2   GCFC main window (default)

■ Operation

Click the [button] button, and the File Open window appears for specifying a file to be converted. Select a file and click the Open button.

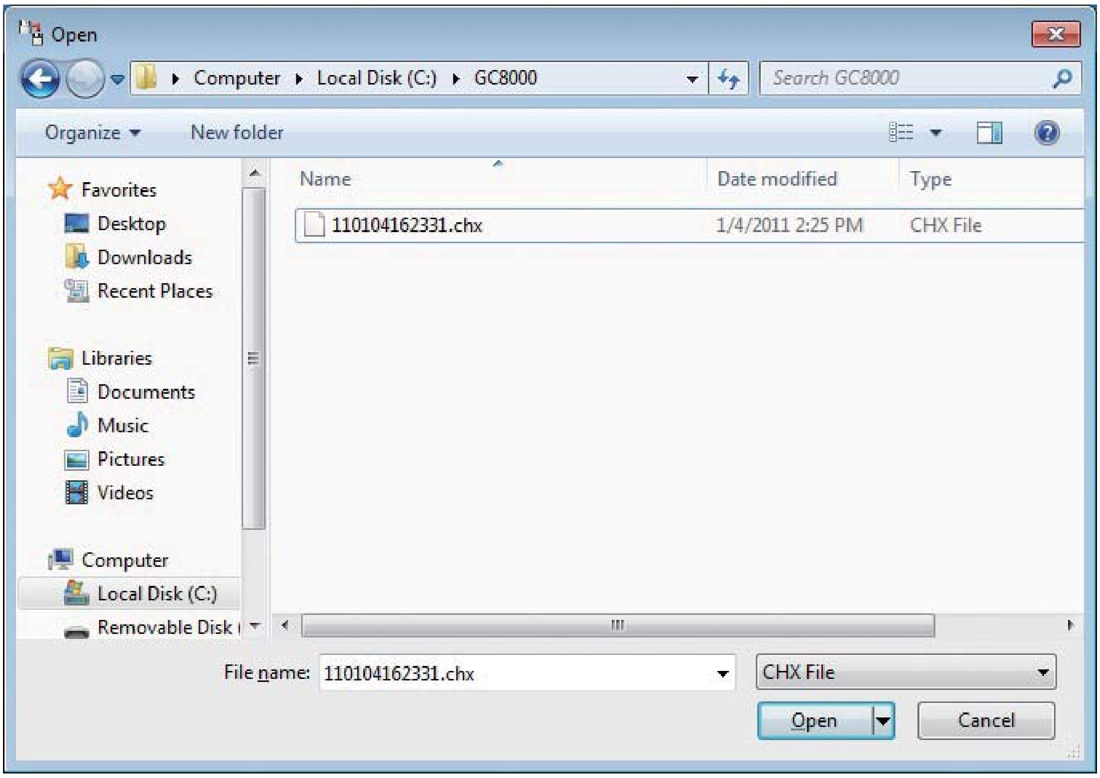

Figure 3   File Open window

Select the chromatogram file of the GC8000 (*.chx).
Information about the file appears.

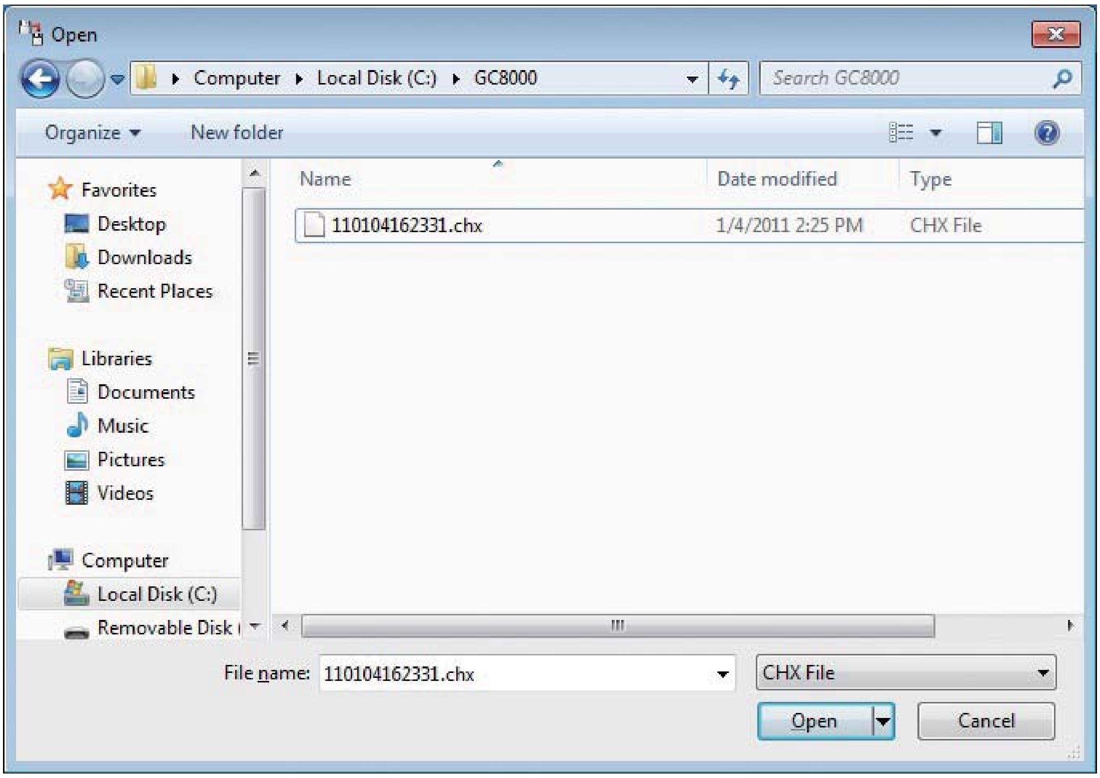

Figure 4　GCFC main window (after selecting a file)

Click the Convert button, and a .cdf file that can be read by EZChrom is created.
A .cdl file is also created, to be used if any error occurs. Delete it if it is not necessary.
The name and location of these two files are the same as those of the .chx file.
(The file extensions are "cdf" and "cdl".)
If files with the same name exist, a Warning dialog box appears.

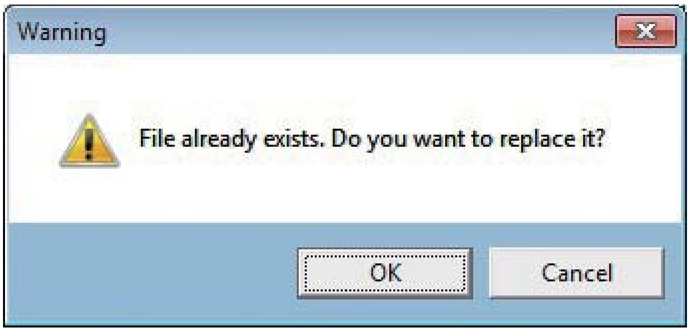

Figure 5　Warning message

■ Exit

Click the Exit button, or click the Close command on the File menu.

Appendix G User Program

1. Basic Syntax Rule

1.1 Texts and Lines

The script program consists of several lines. A line consists of text which starts either a statement or label, and the end of the line (page break).

● Length of one line (maximum number of enterable characters)

A line ends when the maximum number of one-byte characters of 126 or maximum number of enterable characters have been entered, or by hitting the return key.

● Labels

Labels are used in cases such as a program divergence.

Example: GOTO DISP@

…

DISP@DP"A"

Labels are indicated by upper case alphabets or numerals added with @.

Following a label, texts are described at the end of the line or after a one-byte space.

● Description of Texts

Upper case alphabets are used for the characters to describe statements in a text.

In cases where statement, labels, variables and constants are lined together, they must be separated by a one-byte space.

A line cannot contain more than two complex sentences.

Example: [Wrong]

```
IFA = ITHEN
GOTO DISP@
ENDIF
```

[Correct]

```
IF_A = 1_THEN
GOTO_DISP@
ENDIF
```

(The underscore (_) is a one-byte space)

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1.2 Character Set

Usable characters are one-byte alphanumeric characters and special characters.

Kana or Chinese characters cannot be used.

- Alphabets: Upper case - ABCDEFGHIJKLMNOPQRSTUVWXYZ
  Lower case - abcdefghijklmnopqrstuvwxyz
  Lower case can be used for DP statements and comments.
- Numerals: 0123456789
- Special characters: (one-byte space) !"# $%"( )*+,–./:;<=>?@[\]{}−|

1.3 Data Types

Integer, real type (single precision real number type) and double precision real number type can be used.

- Integer Type
  Integers in the range of –32768 to 32767 are taken as values.
  They are shown internally as 2-byte (16-bit).
- Real Type (single precision real number type)
  Real numbers are taken as values. They are shown internally as 4-byte (32-bit).
  Significant figures are roughly 7-figure decimals. Absolute values are in the range of 2.7 × 10 – 20 to 9.2 × l0 – 18.
- Double Precision Real Number Type
  Real numbers are taken as values. They are shown internally as 8-byte (64-bit).
  Significant figures are roughly 16-figure decimals. Absolute values are in the range of 2.7 × 10 – 20 to 9.2 × l0 – 18.

1.4 Constants

● Numeric Constants

The following numeric constants can be used.

(1) Expressed without decimal point or exponential part. Example: 10, –10
(2) Expressed with decimal point but without exponential part. Example: 0.12, –0.145
(3) Expressed with both decimal point and exponential part. Example: 0.35E7, –2.5E–4
(4) Expressed without decimal point but with exponential part. Example: 1E12, –4E–7, 3E+10

Note: Only decimal numbers can be used.
Numeric constants of over 16 digits in length generate a syntax error.

● Character-string constant

Character-string constants can use DP statements.

Usable character-strings are one-byte alphanumeric characters and one-byte special characters.

1.5 Variables

The conditions for GC8000 user script variables are as follows:

(1) Use variables after declaring. Initial value of variable is 0.
(2) Maximum length of variable name is 16 digits.
(3) All variable names must be defined in upper-case characters.
(4) Depending on the variable type, the initial character must always start with “I,” “R” or “D.”
When the variable type is INTEGER, the initial character of the variable name is “I.”
When the variable type is REAL, the initial character of the variable name is “R.”
When the variable type is DOUBLE, the initial character of the variable name is “D.”
(5) There is a limitation on the number of variables that can be used to define one script file. (Differs depending on RAM size being used.)

● Numeric Variable

The type of the numeric variable is specified by the statement type declaration (DEFINT, DEFSNG, DEFDBL). Numeric variables have a maximum of 16 alphanumeric digits that start with an alphabetic character as follows.

DEFINT: I
DEFSNG: R

DEFDBL: D

Up to 1024 numeric variables can be used (including reserved variables).

Array Variables

Array variables are declared in DIM statements. One-dimensional arrays and two-dimensional arrays can be used.

One hundred array variables can be used in one script file.

One-dimensional arrays and two-dimensional arrays have up to 1024 elements each.

Variable names that have been used as simple variables cannot be declared in the DIM statements as array names.

An array name that has been declared cannot also be declared again in the DIM statement.

When an array is declared, all the elements of the array are set to zero.

Arrays are required to be declared in DIM statements (declarations cannot be made implicitly).

One-dimensional array format: Array name (X)
Two-dimensional array format: Array name (X) (Y)
Array definition: DIM Array name (X) AS TYPE
DIM Array name (X) (Y) AS TYPE
X, Y: Array size –1
TYPE: INTEGER, REAL, DOUBLE

Example: One-dimensional array statement: DIM RS (4) AS REAL
Element: RS (O), RS (l), RS (2), RS (3), RS (4)
Two-dimensional array statement: DIM IS (2) (3) AS INTEGER
Element:

IS (0) (0)	IS (0) (1)	IS (0) (2)	IS (0) (3)
IS (1) (0)	IS (1) (1)	IS (1) (2)	IS (1) (3)
IS (2) (0)	IS (2) (1)	IS (2) (2)	IS (2) (3)

Reserved Variables

Reserved variables are variables that are reserved by the system.

User cannot use the variable name in Table 1 as a variable name defined by DEFINT, etc.

Table 1 List of reserved variables

Variable Name	Data Type	Range	Function
DATE	Integer	1 to 31	Saves the date of the current time setting.
HOUR	Integer	0 to 23	Saves the hour of the current time setting.
MIN	Integer	0 to 59	Saves the minute of the current time setting.

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1.6 Operations

Table 2 shows the categories of arithmetic operation, relational operation and logical operation and the precedence order of operations.

Table 2 Precedence Order of Operations

Item	Symbol (Operator)	Precedence Order
Operation in parenthesis	( )	High
Unary operation	+, –, NOT	↓
Exponentiation	^	↓
Multiplication & division	*, /	↓
Addition & subtraction	+, –	↓
Relational operation	=, <, >, >=, <=, <>	↓
Logical operation	AND	↓
Logical operation	OR, EXOR	Low

2. Syntax

The following explains the functions, statements and commands supported by the GC8000 user script.

- Functions perform specific operations for numerical values and other inputs, and return values as results.

  Functions always use the right side of the assignment expressions; entry on the left side is not possible.
- Statements are commonly used commands in normal programs.
- Commands are specific to GC8000 and are used to read data into GC8000 main unit and to change settings.

When actually entering data, comply with the following rules.

1. Uppercase alphabetic characters, parenthesis, and the symbol “@”can be entered directly.
2. Up to 126 characters can be entered in a line.
3. Enter a space for an underscore (_). Do not omit it.
4. In case of functions

   Enter mathematical equations or character string expressions in lowercase alphabetic characters.

   Numeric constants and numeric variables are included in mathematical equations. Only character string constants are included in character string expressions. When entering a character string, type quotation marks (“ ”) before and after the character string. Depending on the function, the range and content that can be described will differ.
5. In case of commands and statements

   Items in Chinese characters and lowercase alphabetic characters are entered in numerical values, numeric variables or character strings.

   When entering a character string, type quotation marks (“ ”) before and after the character string.
6. Items enclosed in square brackets are additional items and can be omitted.

   It is not required to enter square brackets “[” and “]” in the actual entry.

   Example: DATA constant [, constant, ….]
   Constants from the second onwards can be omitted.

2.1 Functions

Constants supported by GC8000 user script are shown in Table 3.

Table 3 List of functions

No.	Function Format
1	ABS
2	DIV
3	EXP
4	LOG
5	MOD
6	SQR

Regarding to function content, see the following.

ABS — Function

Function: Gives absolute value.
Format: ABS (x)
x: Equation
Explanation: Gives absolute value of x.

DIV — Function

Function	Gives division results.
Format	DIV (x, y)
x, y: Equation
Explanation	Gives results by calculating x/y and rounding down decimal points.
If x, y is either numerical value or variable, then it can be an integer, a single precision real number or a double precision real number.

EXP — Function

Function	Gives the value of the exponent function against e (natural number).
Format	EXP (x)
x: Equation
Explanation	Takes the value of the exponent function result of the numerical value shown by the either the numerical value or numeric variable of x.
When the value of x is more than 43.66827237527656, an operation overflow and error will occur (when x is a double precision real number).

LOG — Function

Function	Gives natural logarithm.
Format	LOG (x)
x: Equation (x>0)
Explanation	Gives the numerical value of the natural logarithm (logarithm that takes natural number e as base) shown by either the numerical value or numeric variable of x.
x must be a positive number.

MOD — Function

Function	Gives the remainder from integer division.
Format	MOD (x, y)
x, y: Equation
Explanation	Calculates x/y and gives the remainder.
If x, y are either numerical value or numeric variable, then it can be an integer, a single precision real number or a double precision real number.

SQR — Function

Function	Gives the square root.
Format	SQR (x)
x: Equation (x ≥ 0)
Explanation	Calculates the square root of the numerical value shown by either the numerical value or numeric variable of x.
Value of x must be more than zero.

2.2 Statements

Please note the following points.

- Layer depth of a nest (the general layer depth for IF, FOR and WHILE) can be up to 100 statements.
- Up to 100 GOTO/GOSUB statements can be used in one script file.
- Up to 100 labels can be used in one script file.
- Up to 100 DATA statements can be used in one script file.

Table 4 shows the statements that can be used in the GC8000 user script.

Table 4 List of statements

No.	Statement Format
1	DATA
2	DEFINT/DEFSNG/DEFDBL
3	DIM
4	DP
5	END
6	FOR/NEXT
7	GOSUB/RETURN
8	GOTO
9	IF...THEN/ENDIF, IF...THEN/ELSE/ENDIF, IF..THEN/ELSEIF.....THEN/(ELSE/)ENDIF
10	LET
11	READ
12	REM
13	RESTORE
14	WHILE/END WHILE

See the following for details regarding to statement content.

DATA — Statement

Function — READ statement sets replacement data in each variable.

Format — DATA constant [, constant, …]
Constant: Numeric

Explanation — DATA statement can be placed anywhere in the program or even dispersed.
Space is ignored for numeric variables in the READ statement.
The RESTORE statement enables the DATA statement read by the READ statement to be set by line unit
Up to 1024 constants can be used as a parameter after DATA.

DEFINT/DEFSNG/DEFDBL — Statement

Function — Declares type of variable.

Format — (1) DEFINT variable name [, variable name…]
(2) DEFSNG variable name [, variable name…]
(3) DEFDBL variable name [, variable name…]

Explanation — Declares type of variable. All variables specified with initial characters of variables become the specified type.
DEFINT declares variable as an integer.
DEFSNG declares variable as a single precision real number type.
DEFDBL declares variable as a double precision real number type.
The specified initial character of the variable is one uppercase alphabetic character. For any of the formats (1) to (3) listed above, it is necessary to make the declaration before the variable name is described in the program block. Complex sentences cannot be described.
The maximum of 16 variables can be defined at one time.
Regarding to the definition of variables, see Section 1.5 Variables.

DIM — Statement

Function — Declares array variables.

Format — DIM_ARRAYNAME_AS_TYPE
Array name: Name of array
Type: INTEGER, REAL, DOUBLE

Explanation — Declares as either one-dimensional array or two-dimensional array.
Regarding to the definitions of array variables, see Array Variables in Section 1.5 Variables.

DP — Statement

Function   Displays the table list in the GCUD output window.
Format   DP_TABLELIST
Table list: Allows specifying variable name, array variable name, numerical value and character string constant.
Explanation

(1) Items are separated by either a comma (,) or semicolon (;).

(2) Gives equation values in decimal numbers.

(3) The output content length of each item should be within 270 digits. The output content length should be within 4096 bytes.

Error occurs when it exceeds the limit.

(4) A new line will take place each time the DP statement is executed and completed.

(5) Some character string constants are enclosed within quotation marks.

(6) Output items of exponents cannot be used.

(7) Separators

(a) Semicolons (;)

The output element following the semicolon (;) will be displayed immediately after the previous output element.

(b) Commas (,)

Since each line of the GCUD output window is partitioned with TAB, when commas (,) are used as the separators, the following area is output.

Example:
```
DIM IC (3) AS INTEGER
DEFINT IA, IB
DP “IB value is”;IB
DP IA, IB
DP IC(0), IC(1)
END
```

END — Statement

Function   Shows the very end of the main program.
Format   END
Explanation   The END statement must always be declared at the very end of the main program. Do not omit it.
When the very end of the main program does not have an END, the error “End is required” will occur.

FOR/NEXT — Statement

Function   Puts sequence of statements in the FOR to NEXT loop and repeats specified number of times.
Format   FOR variable = initial value TO final value [STEP increment]
    Statement
NEXT variable
Variable: Numeric variable
    Specify the same variables for FOR and NEXT as counter.
Initial value, final value, increment:
    Numerical value or numeric variable
    If operations under STEP are omitted, the increment will be regarded as 1.

Explanation Used in pair, FOR and NEXT statements execute as described below.

(1) Calculates initial value, final value and increment.
(2) Substitutes variable with initial value.
(3) Executes statements between the FOR statement and the corresponding NEXT statement. However, when either the GOTO statement or GOSUB statement is executed during the process, the control can be moved out of the FOR loop (part that enclosed by the FOR and NEXT statements).
(4) After reaching the NEXT statement corresponding to the FOR, the variable will be incremented (increased when the variable value is positive and decreased when it is negative).
(5) Compares the value of the variable with the final value and executes as follows depending on the increment.

When increment is positive:

Go back to (3) when variable is less than or equal (≤) to final value.
Execute the statement after NEXT statement when variable is greater than (>) the final value.

When increment is negative or zero:

Go back to (3) when the variable is greater than or equal (≥) to the final value.
When variable is less than the final value, execute the statement after the NEXT statement.

Calculation will stop when the final value and value of the increment are entered into the FOR statement. If the values of variables in the equations are changed during the process from FOR to NEXT, the final value and increment will also change.
When the program is exited by the GOTO statement during the process between the FOR and NEXT, the values of the variables will be saved and can be used again.
When the program is exited between the FOR and NEXT while processing (5), the values of the variables will be saved.
When the values of the variables are changed in the process before the NEXT statement, those values are used to repeat processes (2) and (3). Zero increment causes an infinite loop.
Also, if increment is set as a numerical value with decimal points, there is the risk that value of the final value will not be calculated due to an error in calculating real numbers.

Notes on programming

When using one pair of the FOR and NEXT statements in another FOR to NEXT range, the former pair must be within the range of the latter FOR to NEXT. Both the line and execution order must be correct.

GOSUB/RETURN Statement

Function Performs divergence to subroutine and reversion from subroutine.
Format GOSUB label
RETURN
Explanation The GOSUB statement moves the control from the specified label to the subroutine. The subroutine processing is completed with the execution of the RETURN statement. The program is moved to the statement that follows the GOSUB statement.
By using the GOSUB statement, the same process content can be used repeatedly in the program.
Some subroutines are able to call other subroutines.
Error will occur when the specified label is not in the program. Error will also occur when the RETURN statement is executed without executing the GOSUB statement. Furthermore, error will occur when the GOSUB statement is used to move the control to the block subroutine (FOR/NEXT, IF..THEN/ENDIF, IF..THEN/ELSE/ENDIF, WHILE/END WHILE).

GOTO

Function Diverges unconditionally to the specified label.
Format GOTO label
Explanation Diverges unconditionally to the specified label.
Error will occur at time of executing the GOTO statement when the specified divergence destination label is not in the program. Error will also occur when the GOTO statement is used to move the control to the block (FOR/NEXT, IF..THEN/ENDIF, IF..THEN/ELSE/ENDIF, WHILE/END WHILE).

Notes on programming

Avoid creating an infinite loop with the GOTO statement such as LA@GOTO LA@ (it is a waste of execution time).
Use the WHILE/END WHILE statement to create an infinite loop.

IF...THEN/ENDIF, IF...THEN/ELSE/ENDIF, IF...THEN/ELSEIF...THEN/(ELSE/)ENDIF Statement

Function Creates a divergence in compliance with equation results or specified conditions.
Format IF equation THEN
Statement
[ELSE
Statement]
ENDIF
Statement: Can be composed into multiple lines.
Multiple IF statements are also possible.
Explanation When the equation result is TRUE (other than zero), execute the statement from THEN onward, and execute the ELSE statement when it is FALSE (zero).
Relational expression such as (A>0) is often used for the equation. Other equations can be used but the result must be expressed in numerical value.
(1) When the result is TRUE (≠0), execute the text in the multiple lines after THEN up to either ELSE or END.
(2) When the result is FALSE (=0), execute statement in multiple lines after ELSE to ENDIF.
Processes following ELSE can be omitted (the program after THEN will stop by executing ENDIF).

LET Statement

Function Replaces the variable on the left side of the equation with the calculation results of right side of the equation.
Format (1) LET variable name = equation
(2) Variable name = equation
Variable name: Numeric variable name
Equation: Numerical formula
LET can be omitted.
Explanation None

READ Statement

Function Reads values from DATA statements and allocates to variables.
Format READ variable name [,variable name, …]
Variable name: Numeric
Explanation The READ statement is always used in combination with the DATA statement.
The READ statement allocates data that have been set by the DATA statement to the variables one by one.
Error will occur when there are no data to allocate to the READ statement variables.
Use the RESTORE statement to repeatedly read out the same DATA statement data or to specify the DATA statement for read-out.

REM **Statement**

Function Adds remarks in the program.
Format (1) REM character string
(2) ! character string
Explanation Adds remarks in the program. They are ignored at time of execution.
Only ASCII characters can be used for the REM statement character strings.

RESTORE **Statement**

Function Specifies the DATA statement read by the READ statement.
Format RESTORE [label]
Explanation Specifies the pointer (read-out location) of the DATA statement used by the next READ statement.
Sets the pointer to the first DATA statement in the program block when labels are omitted.
Sets the pointer to the first DATA statement following the specified label in the program block when labels are specified.

WHILE/END WHILE **Statement**

Function Repeats while conditions are met.
Format WHILE equation
    Statement
END WHILE
Explanation While equation conditions are TRUE (≠0), the statement between WHILE and END WHILE statements are repeatedly executed.
While equation conditions are FALSE (0), it moves to the statement in the line following the END WHILE statement.
When conditions for the relational expression or logical expression specified in the first WHILE statement are not met, the statement between the WHILE and END WHILE statements will not be executed even once.
Relational expression such as (A>0) is often used for the equation. Other equations can be used but the results must be expressed in numerical values.
The processes from the WHILE to END WHILE can be multiplexed in the same way as the FOR to NEXT processes. When multiplexing, change to the nested structure (see FOR to NEXT statements).
In the WHILE to END WHILE loop, it is possible to exit the loop by a divergence created by the GOTO statement, but it is not possible to enter the loop.

2.3 Commands

The three categories of commands are described below.

- Script commands for peak detection stop time
  Command used only for script for peak detection stop time
- Script command for fixed period
  Command used only for fixed period script
- Common commands
  Commands that can be used by both fixed period and peak detection stop time scripts

Commands used by GC8000 user script are shown in Table 5.

Table 5 List of commands

No.	Command Format	Category
1	DO_OFF	Common
2	DO_ON	
3	GET_ALARM_1	
4	GET_ALARM_2	
5	GET_ALARM_A	
6	GET_ALARM_C	
7	GET_ALARM_STS	
8	GET_DHM	
9	GET_GC_COMM_STS	
10	GET_S_AREA	
11	GET_S_HEIGHT	
12	GET_S_CALM_STS	
13	GET_S_CONC	
14	GET_S_END_H	
15	GET_S_END_T	
16	GET_S_RT	
17	GET_S_START_H	
18	GET_S_START_T	
19	MSS_CAL	
20	MSS_STR	
21	MSS_STR_SEQ	
22	MSS_VAL	
23	OMC_PAUSE	
24	OMC_STOP	
25	RANGE_S	
26	READ_AI	
27	READ_DI	
28	READ_DO	
29	READ_GC_AI	
30	READ_GC_DI	
31	READ_NV_DBL	
32	READ_NV_INT	
33	READ_NV_SNG	
34	WRITE_NV_DBL	
35	WRTIE_NV_SNG	
36	WRITE_NV_INT	
37	OMC_RUN	Script for fixed period
38	WAIT	
39	GET_C_AREA	Script for peak detection stop time
40	GET_C_CALM_STS	
41	GET_C_CONC	
42	GET_C_END_H	
43	GET_C_END_T	
44	GET_C_HEIGHT	
45	GET_C_RT	
46	GET_C_START_H	
47	GET_C_START_T	
48	GET_STR_NO	
49	PUT_C_CONC	

Regarding to command content, see the following for details.

DO_OFF — Command

Function — Switches off the specified DO number.
Format — DO_OFF(N)
N: DO number (1 to 32)
Return value: None
Explanation — Omitted

DO_ON — Command

Function — Switches on the specified DO number.
Format — DO_ON(N)
N: DO number (1 to 32)
Return value: None
Explanation — Omitted

GET_ALARM_1 — Command

Function Acquires level 1 alarm status.
Format GET_ALARM_1
Return value: Integer
Return 1 for level 1 alarm, 0 if other.
Explanation Omitted

GET_ALARM_2 — Command

Function Acquires level 2 alarm status.
Format GET_ALARM_2
Return value: Integer
Return1 for level 2 alarm, 0 if other.
Explanation Omitted

GET_ALARM_A — Command

Function Acquires level 1 & level 2 alarm status.
Format GET_ALARM_A
Return value: Integer
Return 1 for level 1 and level 2 alarm, 0 if other.
Explanation Omitted

GET_ALARM_C — Command

Function Acquires concentration alarm status.
Format GET_ALARM_C
Return value: Integer
Return 1 for concentration alarm, 0 if other.
Explanation Omitted

GET_ALM_STS — Command

Function Acquires occurrence status of specified alarm number.
Format GET_ALM_STS(N)
N: Alarm number (1 to 400)
Return value: Integer
Return 1 when the alarm occurs, 0 if other.
Explanation Omitted

GET_C_AREA — Command

Function Acquires analysis results of specific peak during calculation (area).
Format GETC_AREA(N)
N: Peak number (1 to 999)
Return value: Single precision real number
Explanation Omitted

GET_C_CALM_STS — Command

Function Acquires the concentration alarm status of specified peak.
Format GET_C_CALM_STS(N)
N: Peak number (1 to 999)
Return value: Integer
Return 1 for concentration alarm, 0 if other.
Explanation Omitted

GET_C_CONC **Command**

Function Acquires analysis results of specific peak during calculation (concentration).
Format GET_C_CONC(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_C_END_H **Command**

Function Acquires analysis results of specific peak during calculation (height at stop time).
Format GET_C_END_H(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_C_END_T **Command**

Function Acquires analysis results of specific peak during calculation (stop time).
Format GET_C_END_T(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_C_HEIGHT **Command**

Function Acquires analysis results of specific peak during calculation (height).
Format GET_C_HEIGHT(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_C_RT **Command**

Function Acquires analysis results of specific peak during calculation (retention time).
Format GET_C_RT(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_C_START_H **Command**

Function Acquires analysis results of specific peak during calculation (peak start level).
Format GETC_START_H(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_C_START_T **Command**

Function Acquires analysis results of specific peak during calculation (peak start time).
Format GET_C_START_T(N)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_DHM **Command**

Function Acquires the current date, hour and minute and assigns acquired results into DATE, HOUR and MIN.
Format GET_DHM
Return value: None
Explanation Used only with GCUD.

GET_GC_COMM_STS **Command**

Function Acquires the MODBUS communication status with the specified analyzer ID.
Format GET_GC_COMM_STS(GC_ID)
GC_ID: Analyzer ID (1 to 240)
Return value: Integer
Return 0 for communication failure, 1 for in communication, –1 for unregistered.
Explanation Omitted

GET_S_AREA **Command**

Function Acquires the latest analysis results of specified stream and peak (area).
Format GET_S_AREA(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_S_HEIGHT **Command**

Function Acquires the latest analysis results of specified stream and peak (height).
Format GET_S_HEIGHT(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to99)
Return value: Single precision real number type
Explanation Omitted

GET_S_CALM_STS **Command**

Function Acquires specified stream and occurrence status of peak concentration alarm.
Format GET_S_CALM_STS(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Integer
Return 1 for occurrence, 0 if other.
Explanation Omitted

GET_S_CONC **Command**

Function Acquires the latest analysis results of specified stream and peak (concentration).
Format GET_S_CONC(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_S_END_H **Command**

Function Acquires the latest analysis results of specified stream and peak (peak stop level).
Format GET_S_END_H(M, N)
M: Stream number (1 to 31)
N: Peak number (1to 999)
Return value: Single precision real number type
Explanation Omitted

GET_S_END_T **Command**

Function Acquires the latest analysis results of specified stream and peak (peak stop time).
Format GET_S_END_T(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_S_RT **Command**

Function Acquires the latest analysis results of specified stream and peak (retention time).
Format GET_S_RT(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_S_START_H **Command**

Function Acquires the latest analysis results of specified stream and peak (peak start level).
Format GET_S_START_ H(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_S_START_T **Command**

Function Acquires the latest analysis results of specified stream and peak (peak start time).
Format GET_S_START_T(M, N)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
Return value: Single precision real number type
Explanation Omitted

GET_STR_NO **Command**

Function Acquires stream number during calculation.
Format GET_STR_NO
Return value: Integer
Explanation Omitted

MSS_CAL **Command**

Function Performs calibration measurement of specified number.
Format MSS_CAL(N)
N: Calibration number (1 to 6)
Return value: None
Explanation Omitted

MSS_STR **Command**

Function Changes measurement status to stream specification.
Format MSS_STR(M, N)
M: Stream number (1 to 31)
N: Number of repetitions (0: continuous, 1 to 999)
Return value: None
Explanation Omitted

MSS_STR_SEQ — Command

Function — Changes measurement status to stream sequence.
Format — MSS_STR_SEQ(N)
N: Stream sequence number (1 to 8)
Return value: None
Explanation — Omitted

MSS_VAL — Command

Function — Performs validation measurement of specified number.
Format — MSS_VAL(N)
N: Validation number (1 to 6)
Return value: None
Explanation — Omitted

OMC_PAUSE — Command

Function — Changes operation mode of GCM to which corresponding SYS belongs to PAUSE.
Format — OMC_PAUSE
Return value: None
Explanation — Omitted

OMC_RUN — Command

Function — Changes operation mode of GCM to which corresponding SYS belongs to RUN.
Format — OMC_RUN
Return value: None
Explanation — Omitted

OMC_STOP — Command

Function — Changes operation mode of GCM to which corresponding SYS belongs to STOP.
Format — OMC_STOP
Return value: None
Explanation — Omitted

PUT_C_CONC — Command

Function — Assigns the analysis results (concentration) during calculation to specified peak
Format — PUT_C_CONC(N, V)
N: Peak number (1 to 999)
V: Concentration value (0.000 to 9999.999)
Return value: None
Explanation — Omitted

RANGE_S — Command

Function — Changes the peak range of specified stream.
Format — RANGE_S(M, N, V)
M: Stream number (1 to 31)
N: Peak number (1 to 999)
V: Range number (1 to 31)
Return value: None
Explanation — Omitted

READ_AI **Command**

Function Acquires the input value (0.0 to 1.0) of specified AI channel.
Format READ_AI (N)
N: AI number (1 to 16)
Return value: Single precision real number type
Explanation Omitted

READ_DI **Command**

Function Acquires the ON/OFF of specified DI channel.
Format READ_DI(N)
N: DI number (1 to 32)
Return value: Integer
Return 1 for ON, 0 for OFF.
Explanation Omitted

READ_DO **Command**

Function Acquires the ON/OFF of specified DO number.
Format READ_DO(N)
N: DO number (1 to 32)
Return value: Integer
Return 1 for ON, 0 for OFF.
Explanation Omitted

READ_GC_AI **Command**

Function Acquires the AI input value specified by the specified analyzer ID.
Format READ_GC_AI(GC_ID, N)
GC_ID: Analyzer ID (1 to 240)
N: AI number (1 to 16)
Return value: Integer
Return 0.0 to 1.0 in case of single precision real number.
Return –1.0 × 1038 in case of invalid (failed acquisition due to communication failures, unregistered, etc.)
Explanation Omitted

READ_GC_DI **Command**

Function Acquires the DI ON/OFF specified by the specified analyzer ID.
Format READ_GC_DI (GC_ID, N)
GC_ID: Analyzer ID (1 to 240)
N: DI number (1 to 32)
Return value: Integer
Return 1 for ON, 0 for OFF.
Return –1 in case of invalid (failed acquisition due to communication irregularities, unregistered, etc.)
Explanation Omitted

READ_NV_DBL **Command**

Function Reads the data in double precision real number from the element number specified by the double precision real number-type nonvolatile memory.
Format READ_NV_DBL(N)
N: Element number to read out data (0 to 255)
Return value: Double precision real number type
Return double precision real number data read out from specified address.
Explanation Omitted

READ_NV_INT **Command**

Function Reads data in integer from the element number specified by the integer nonvolatile memory.

Format READ_NV_INT(N)
N: Element number to read out data (0 to 1023)
Return value: Integer
Return integer data read out from specified address.

Explanation Omitted

READ_NV_SNG **Command**

Function Reads the data in single precision real number from the element number specified by the single precision real number type nonvolatile memory.

Format READ_NV_SNG(N)
N: Element number to read data (0 to 511)
Return value: Single precision real number type
Return single precision real number-type data from specified address.

Explanation Omitted

WAIT **Command**

Function Suspends script execution for N seconds.

Format WAIT(N)
N: WAIT time (1 to 864000, Unit: 0.1 sec)
WAIT time = in order to set to 1 second, set parameter to 10.
Return value: None

Explanation When the WAIT command is called in the script, it will remain in standby mode until N elapses. After N elapses, the lines following the executed WAIT command in the script will be executed.
The WAIT command cannot be used in the script commands for peak detection stop time (due to possible delay in analysis result output).
Error will occur if the WAIT command is used in the script commands for peak detection stop time.

WRITE_NV_DBL **Command**

Function Writes the data in double precision real number into the element number specified by the double precision real number type nonvolatile memory.

Format WRITE_NV_DBL(N, D)
N: Element number to read out data (0 to 255)
D: Write data (DOUBLE type)
Return value: None

Explanation When data type of write data differs from the command specifications, it will be a syntax error.
(Example: When an integer variable is specified in the second parameter of the WRITE_NV_DBL command)

W'RITE_NV_SNG **Command**

Function Writes the data in single precision real number into the element number specified by the single precision real number type nonvolatile memory.

Format WRITE_NV_SNG(N, D)
N: Element number to read data (0 to 511)
D: Write data (REAL type)
Return value: None

Explanation See WRITE_NV_DBL.

WRITE_NV_INT **Command**

Function Writes data in integer into the element number specified by the integer nonvolatile memory.

Format WRITE_NV_INT(N, D)
N: Element number to read out data (0 to 1023)
D: Write data (INTEGER type)
Return value: None

Explanation See WRITE_NV_DBL.

3. Error Codes

Table 6 List of error codes

Error Code	Content	Remarks
0	Successful	
1	Undefined error	
2	-	Unused (Pending)
3	-	Unused (Pending)
4	-	Unused (Pending)
5	-	Unused (Pending)
6	Correspondence between FOR and NEXT, WHILE and END WHILE, IF and ENDIF is not correct.	
7	Too long line	
8	Syntax error	
9	Undefined variable or array	
10	Double definition of variable or array	
11	Inconsistent data type	
12	Nesting level exceeds 100.	
13	Divided by zero	
14	Script cannot be found.	
15	Excess in parameter range	
16	Runtime stack overflow	
17	Runtime stack underflow	
18	Too large array	
19	Too much data defined by DATA statement	
20	Too little data defined by DATA statement	
21	Operand error in DEFINT, DEFSNG and DEFDBL statements	
22	Error in RETURN statement (RETURN that does not correspond to GOSUB statement)	
23	-	Unused (Pending)
24	Operand error in GOSUB and GOTO statements	
25	Undefined label	
26	Double definition of label	
27	End is required.	
28	Not GC8000 specific command	
29	-	Unused (Pending)
30	Invalid return value	

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