GOT Series

Human Machine Interface

Hardware Manual

Graphic Operator Terminals
F940GOT, F943GOT
Handy Series

▲ MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

Foreword

- This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the F940GOT Handy Series. It should be read and understood before attempting to install or use the unit.

- Further information can be found in the GOT-F900 Series Operation Manual, GOT-900 Series Hardware Manual and manual of the associated PLC.

- If in doubt at any stage of the installation of F940GOT Handy Series always consult a professional electrical engineer who is qualified and trained to the local and national standards which apply to the installation site.

- If in doubt about the operation or use of F940GOT Handy Series please consult the nearest Mitsubishi Electric distributor.

- This manual is subject to change without notice.

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F940GOT Handy Series
(F94*GOT-*BD-RH-E)

Hardware Manual

Manual number	: JY992D99901
Manual revision	: A
Date	: August 2001

Guidelines for the Safety of the User and Protection of the F940GOT Handy Series (F94*GOT-*BD-RH-E)

This manual provides information for the use of the F940GOT Handy Series. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;

a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, trained and qualified to the local and national standards required to fulfill that role. These engineers should be fully aware of all aspects of safety with regards to automated equipment.

b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.

c) All operators of the completed equipment should be trained to use that product in a safe and co-ordinated manner in compliance to established safety practices. The operators should also be familiar with documentation which is related to the actual operation of the completed equipment.

Note : Note: the term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual.

Notes on the Symbols Used in this Manual

At various times through out this manual certain symbols will be used to highlight points of information which are intended to ensure the users personal safety and protect the integrity of equipment. Whenever any of the following symbols are encountered its associated note must be read and understood. Each of the symbols used will now be listed with a brief description of its meaning.

Hardware Warnings

1) Indicates that the identified danger **WILL** cause physical and property damage.

2) Indicates that the identified danger could **POSSIBLY** cause physical and property damage.

3) Indicates a point of further interest or further explanation.

Software Warnings

4) Indicates special care must be taken when using this element of software.

5) Indicates a special point which the user of the associate software element should be aware of.

6) Indicates a point of interest or further explanation.

- Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

- All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

- Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

Contents

Associated Manual Lists

Further information can be found in the following manuals.

	Manual Title	Manual Number	Description
⊙	GOT-F900 Series Operation Manual	JY992D94701	This manual contains explanations for the operation and use of the GOT-F900 series graphic operation terminals.
⊙	GOT-F900 Series Hardware Manual (CONNECTION)	JY992D94801	This manual contains explanations for the wiring and installation, etc. of the GOT-F900 series graphic operation terminals.
○	FX-PCS-DU/WIN-E Operation Manual	JY992D68301	This manual contains explanations for the operation of FX-PCS-DU/WIN-E screen creation software.
○	SW*D5C-GOTR-PACKE Operating Manual	-	This manual contains explanations for the operation of GT-Designer (SW*D5C-GOTR-PACKE) screen creation software.

⊙: Indispensable manual

○: Either manual is necessary.

MEMO

1. Introduction

1.1 Introduction

The F940GOT Handy Series (hereafter called "Handy GOT") is an all-in-one type Handy GOT equipped with a touch key display unit (F94*GOT-*WD-E) and mechanical keys (operation switches) available for command input to the machine. The Handy GOT can connect to MELSEC FX, A, QnA and Q PLCs as well as a host of third party manufactured units.

STOP

Note:

For details of the system configuration and connection with a PLC, personal computer or other equipment, refer to the chapter for Handy GOT (F94*GOT-*BD-H-E) in the GOT-F900 SERIES HARDWARE MANUAL (CONNECTION).

Using Example

?
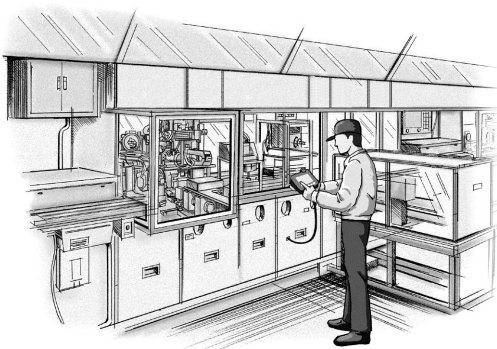
Note:

Screens displayed on the display unit can be created using the screen creation software which runs on a personal computer.

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1.1.1   Product Components

1) Operation switches
   These switches give direct commands to inputs on the PLC, when immediate response from the machine such as operation and stop is required.
   Application Examples:
   • Start/stop
   • Preparation for operation
   • Setup change
   • Error reset
   • Mode selection between automatic and manual
     Note:
     The name of these operation switches can be personalized using a transparent sheet and a name base sheet offered as accessories.
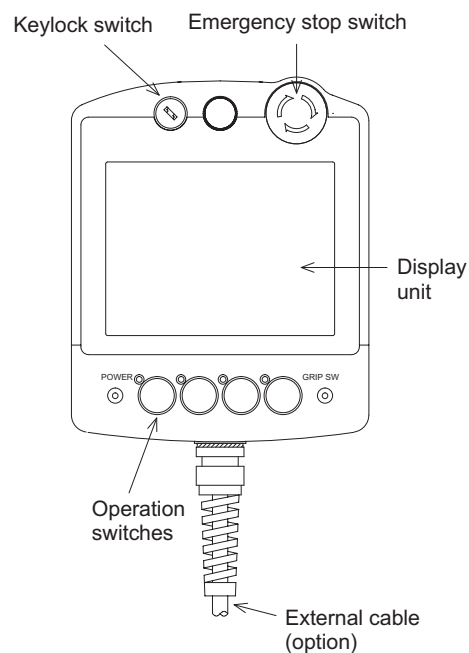
2) Display unit
   The display unit is touch-key type LCD equivalent to that of a standard type F940GOT.
   All functions offered in the standard type F940GOT are available. The operator can easily monitor ON/OFF status of bit devices in the PLC, set such bit devices to ON/OFF, monitor the set value and the current value of word devices of the PLC, and change such values of word devices.
   This display unit can be used to change the setup, or set values, and perform troubleshooting, as well as give guidance to the operator.
   Application Examples:
   • Selection of manual operation
   • manual operation
   • One-cycle operation
   • Monitoring
   • Force turning ON/OFF
   • Change of set values
   • Troubleshooting

Keylock switch   Emergency stop switch

Display unit

POWER   GRIP SW

Operation switches

External cable (option)

1.2 Product Lists

Table 1.1: Product Lists

Production Name	Description
F940GOT-SBD-RH-E F940GOT-LBD-RH-E	Handy GOT main unit This type uses RS-422 communication for connecting to PLC. - SBD type is 8 Colors - LBD type is White and black
F943GOT-SBD-RH-E F943GOT-LBD-RH-E	Handy GOT main unit This type uses RS-232C communication for connecting to PLC. - SBD type is 8 Colors - LBD type is White and black

1.2.1 Model Name

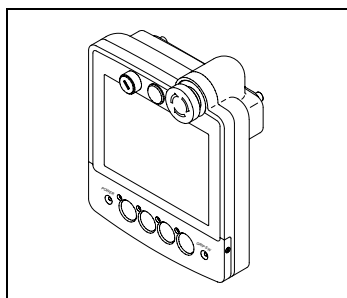The model name of the Handy GOT is expressed as follows.

F94*GOT-*BD-RH-E
     A   B

Table 1.2: Notes on Model Name

		Description
A	0	RS-422 communication for connecting to PLC
	3	RS-232C communication for connecting to PLC
B	S	STN type 8 colors liquid crystal
	L	STN type black and white liquid crystal

1.2.2 Handy GOT Main Unit

Accessories:

- Sheets to change switch names
  A transparent sheet and a mount sheet are offered as accessories so that operation switch names can be changed.
  For the name changing procedure, subsection 3.7.2.

- Ferrite filter for CE EMC
  For compliance to CE EMC regulations it is necessary to add a ferrite filter on the external cable for F940GOT-*BD-RH-E or F943GOT-*BD-RH-E.
  Further information can be found in the Notification of CE marking sheet in the product box and section 3.2.4 of this manual.
 This ferrite filter is TDK ZCAT2436-1330A-M-BK.
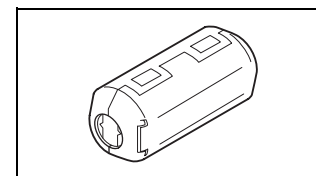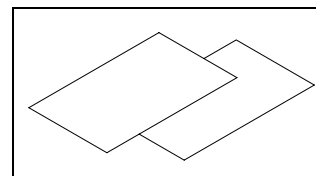
1.3 Options

1.3.1 External Cable

These external cable containing independent wires for communications, DC power supply, operation switches, grip switch, keylock switch and the emergency stop switch. One of those wired below is always necessary.

Table 1.3: External Cable

Model Name	Description
F9GT-RHCAB-3M	37-pin D-sub connector on one side,
F9GT-RHCAB-6M	- 3M: Cable length is 3m (9' 10") - 6M: Cable length is 6m (19' 8")
F9GT-RHCAB-10M	- 10M:Cable length is 10m (32' 9")

For 37pin D-sub

STOP
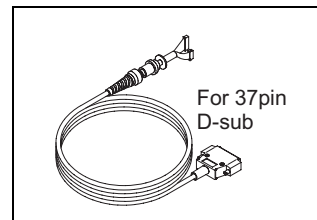
Note:

When using F9GT-RHCAB-*M external cable, one of the following relay cables is necessary.

1.3.2 Other Options

Order the following options upon necessity.

1) Relay cable for PLC

- F9GT-RHCAB2-150
  This cable connects an FX0/FX0S/FX0N/FX1S/FX1N/FX2N/FX2NC (with 8-pin MINI DIN connector), and is equipped with an external cable (with 37-pin D-Sub connector) for power supply, operation switch and emergency switch.
  Cable length is 1.5 m (4' 11").

To PLC

For power supply or operation switch

STOP
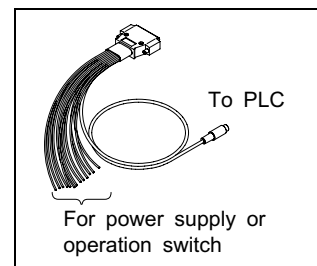
Note:

This cable cannot be used for the F943GOT-*BD-RH-E (RS-232C communication type Handy GOT).

- F9GT-RHCAB3-150
  This cable connects an FX/FX2C/A/QnA Series PLC or motion controller (with 25-pin D-Sub connector), and is equipped with an external cable (with 37-pin D-Sub connector) for power supply, operation switch and emergency switch
  Cable length is 1.5 m (4' 11").
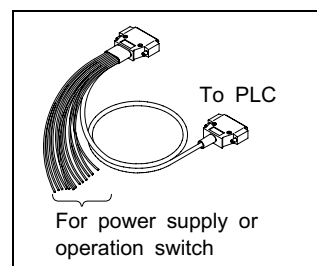

To PLC

For power supply or operation switch

STOP

Note:

This cable cannot be used for the F943GOT-*BD-RH-E (RS-232C communication type Handy GOT).

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- F9GT-RHCAB5-150
  This cable connects a Q Series PLC or motion controller (with 6-pin MINI DIN connector), and is equipped with an external cable (with 37-pin D-Sub connector) for power supply, operation switch and emergency switch
  Cable length is 1.5 m (4' 11").

STOP   **Note:**
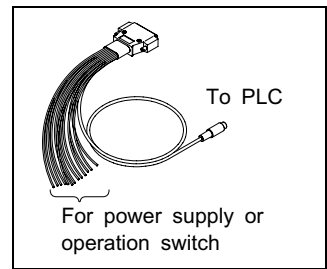
   This cable cannot be used for the F940GOT-*BD-RH-E (RS-422 communication type Handy GOT).

2) Protective sheets F9GT-40PSC (5 sheets in 1 set)
   Adhere one disposable sheet to the display screen for protection against dirt and abrasion.
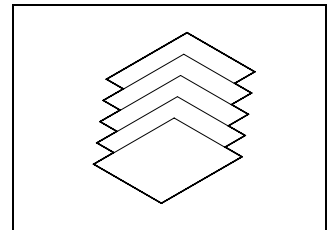
3) Screen creation software

Table 1.4:   Screen Creation Software

| Model Name	Description
FX-PCS-DU/WIN-E	SW0PC-FXDU/WIN-E Version V2.52 or more (3.5 FD)
GT Designer	SW5D5C-GOTR-PACKE Version 5.05F or more (CD-ROM)
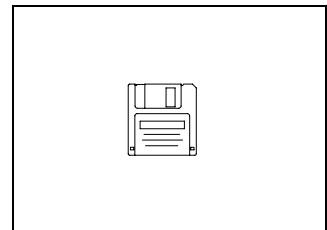
1.3.3   Spare Parts

1) FX$_{2NC}$-32BL Battery
   This battery is used to back up the alarm history, sampling and the current time data.
   For replacement, refer to chapter 4.
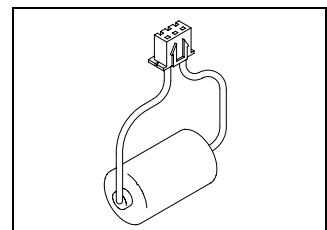
## 1.4   Dimensions and Each Part Name

1.4.1   Each Part Name of Front Panel and Dimensions

Dimensions: mm (inches)   MASS: 0.87 kg (1.91 lbs)
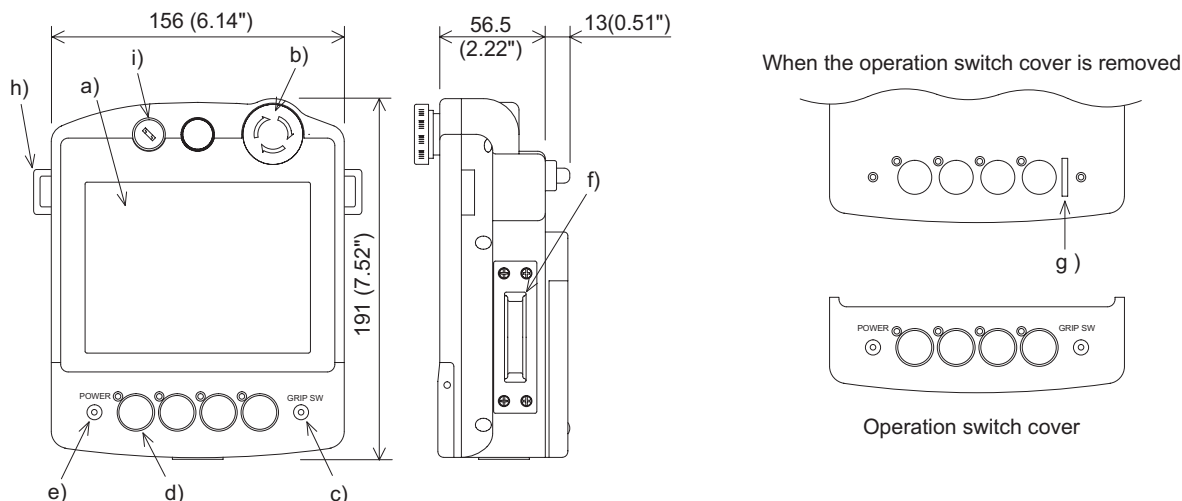
a) Touch key LCD unit
This display unit offers the functions equivalent to those offered by the display unit of the standard type F940GOT series. Further information of standard type F940GOT series can be found in the GOT-F900 Series Operation Manual.

b) Emergency stop switch
Independent contact, 24V DC specification.

c) Grip switch LED
LED for confirming ON/OFF status of the grip switch. The parameters for controlling the LED can be set in the screen creation software and PLC program.

d) Operation switches
Direct connection to inputs in the PLC.
The name of these operation switches can be personalized using a transparent sheet and a name base sheet offered as accessories.
Each of these switches is equipped with a green LED which indicates its status. The green LED lighting command is transferred between the PLC through serial communication.
These LEDs can be controlled by user program in PLC.

e) POWER LED
Lit while 24V DC power is supplied to the Handy GOT.

f) Grip switch
A grip switch is provided on the side of the Handy GOT. The 3-positioned operation switch (OFF/ON/OFF) turns ON when pressed halfway and turns OFF when pressed all the way or when released.

g) Operation switch name sheet insertion slot
Can be seen when the operation switch cover is removed from the lower portion of the Handy GOT.

h) Strap holders
Loops for the strap

i) Keylock switch
2-positioned switch. A key can be inserted or removed to lock the switch position.

1.4.2   Rear Panel

When the rear cover is removed
(enalarged view)

Not used
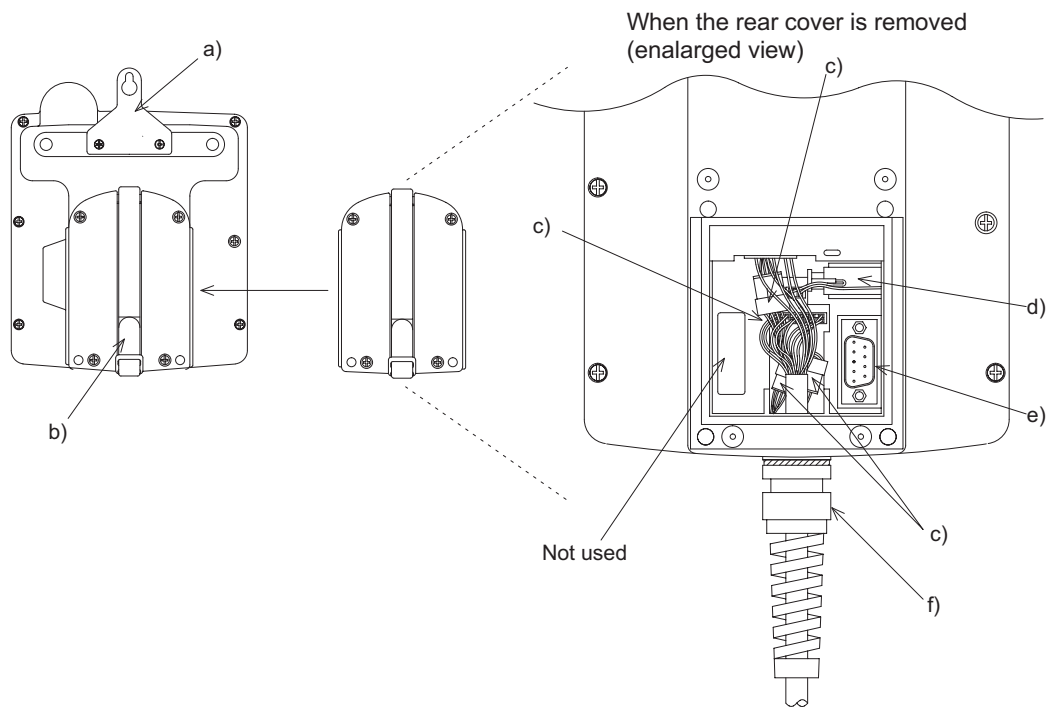
a) Metal hook for mounting on a wall
Offered to mount the Handy GOT on a wall.

b) Hand strap
Adjustable length strap allowing comfortable holding of the Handy GOT.

c) Port for communications signal, the DC power supply, the operation switches and the emergency switch

d) FX$_{2NC}$-32BL Battery
Built in to back up data.
For replacement, refer to chapter 4.

e) Port for personal computer (9-pin D-Sub, male) (for RS-232C communication)
Offered to transfer screen data created using the screen design software or use the two-port interface function.

f) External cable
Offered to connect a PLC, power supply or operation switch to ports outlined in "c)".

MEMO

2. Specifications

Caution

During abnormal communication (including cable break) when monitor is executed within the Handy GOT, communication between the Handy GOT and programmable controller CPU is interrupted and it is impossible to operate switches or devices in the PLC through the Handy GOT.
Communication and operation resumes when the Handy GOT system is correctly configured.
DO NOT configure emergency stop or safety features to operate through the Handy GOT, and be sure that there is no adverse consequences in the event of a Handy GOT - PLC communications malfunction.

Note:

- Do not lay signal cables near high voltage power cables or allow them to share the same trunking duct.
  Otherwise effects of noise or surge induction are likely to take please. Keep a safe distance of more than 100 mm from these wires.

- Operate touch switches on the display screen by hand.
  DO NOT use excessive force, or attempt operate them with hard or pointed objects.
  The tip of a screw driver, pen or similar object for example may break the screen.

2.1 General Specifications

Table 2.1: General Specifications

Item	Specifications
Operating Temperature	0 ~ 40 °C (32 ~ 104 °F)
Storage Temperature	-20 ~ 60 °C (-4 ~ 140 °F)
Humidity	35 ~ 85% Relative Humidity, No condensation
Vibration Resistance - intermittent vibration	Conforms to IEC 1131-2; 10 ~ 57 Hz: 0.075 mm Half Amplitude 57 ~ 150 Hz: 9.8 m/s^2 Acceleration Sweep Count for X, Y, Z: 10 times (80 min. in each direction)
Vibration Resistance - Continuous vibration	Conforms to IEC 1131-2; 10 ~ 57 Hz: 0.035 mm Half Amplitude 57 ~ 150 Hz: 4.9 m/s^2 Acceleration Sweep Count for X, Y, Z: 10 times (80 min. in each direction)
Shock Resistance	Conforms to IEC 1131-2: 147m/s^2 Acceleration, 3 times in each direction X, Y, and Z
Noise Immunity	1000 Vp-p, 1micro second, 30 ~ 100 Hz, tested by noise simulator
Dielectric Withstand Voltage	500 V AC > 1 min., tested between power terminals and ground
Insulation Resistance	5 MΩ > at 500 V DC, tested between power terminals and ground
Ground	Grounding register 100 Ω or less (Class D)
Protection	IP 54

2.2 Power Supply Specifications

Table 2.2: Power Supply Specifications

Items	Specifications
Power Supply Voltage	24V DC, +10% -15%
Power Supply Ripple	200 mV or less
Current Consumption	Ratings: 300 mA at 24V DC (200 mA at 24V DC when backlight is turned OFF)
Fuse	Fuse 1.0 A built-in Handy GOT (impossible to change)
Max. Allowable Momentary Power Supply Failure period	5 ms; If less than 5 ms, the Handy GOT will continue operation. If 5 ms or more, the Handy GOT will shut down.
Battery	Built-in, FX$_{2NC}$-32BL type lithium battery. (Approximately 3 years life) Guaranteed term is 1 year.

2.3   Screen Hardware Specifications

Table 2.3:   Screen Hardware Specifications

Items	F94*GOT-SBD-RH-E	F94*GOT-LBD-RH-E
Display Device	STN color liquid crystal	
Resolution	320 × 240 (dot), 40 characters × 15 lines	
Dot Pitch	0.36 mm (0.014") Horizontal × 0.36 mm (0.014") Vertical.	
Effective Display Size	115 mm (4.53") × 86 mm (3.39"); 6 (5.7 inch) type	
Number of Colors	8 colors	White and Black
Life of liquid crystal	Approximately 50,000 hours (Operating temperature: 25°C / 77°F) Guaranteed term is 1 year.	
Backlight	Cold cathode tube	
Life of Backlight	40,000 hours or more (Operating temperature: 25°C / 77°F) Guaranteed term is 1 year.	
Touch Keys	Maximum 50 touch keys / screen, 20 × 12 matrix	
Interface — With PLC	F940GOT-*BD-RH-E: RS-422 F943GOT-*BD-RH-E: RS-232C	
Interface — With personal computer	Conforming to RS-232C	
Number of Screens	User screen: 500 screens or less System screen: Allocated screens No. 1001-1030.	
User Memory	Flash memory 512 KB (built-in)	

2.4   Switch Specifications

Table 2.4:   Switch Specifications

Item	Description
Operation switch	N/O contact × 4 points, 10mA/24V DC (Operation life time: Approximately 1,000,000 times)
Emergency stop switch	2 N/C contacts, 1A/24V DC (resistive load), independent wiring (Operation life time: Approximately 100,000 times)
Keylock switch	2-position, 1A/24V DC (resistive load), independent wiring (Operation life time: Approximately 100,000 times)
Grip switch	3-position (OFF/ON/OFF), 2 N/O contacts, independent wiring 1A/24V DC (resistive load) (Operation life time: Approximately 500,000 times)

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3.   Installation and Wiring

This section describes installation of the Handy GOT and wiring of the power supply and the switches.
Thoroughly understand the specifications before performing installation and wiring.

⚠ **Caution:**

Cut OFF all phases of power source externally, before installation or wiring work in order to avoid electric shock or damage to the product.

3.1   Installation Method

⚠ **Note:**

*   Do not mount the GOT in an environment that contains dust, soot corrosive or conducive dust, corrosive or flammable gas, or expose the unit to high temperatures, dew condensation, rain and wind or impact and vibration.
    If the GOT is used in such a place, electrical shock, fire, malfunction, damage or deterioration may be caused.

*   Make sure that the power is turned off, before securely connecting any cables. Poor connection may cause malfunction.
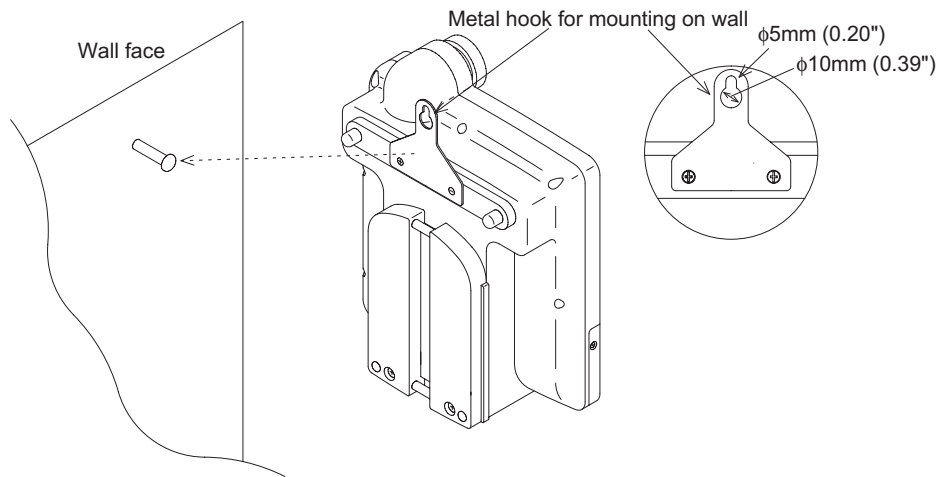
3.1.1   Holding

When holding the Handy GOT for operation, place your hand through the hand strap provided on its rear face. You can adjust the length of the hand strap.

Hand strap
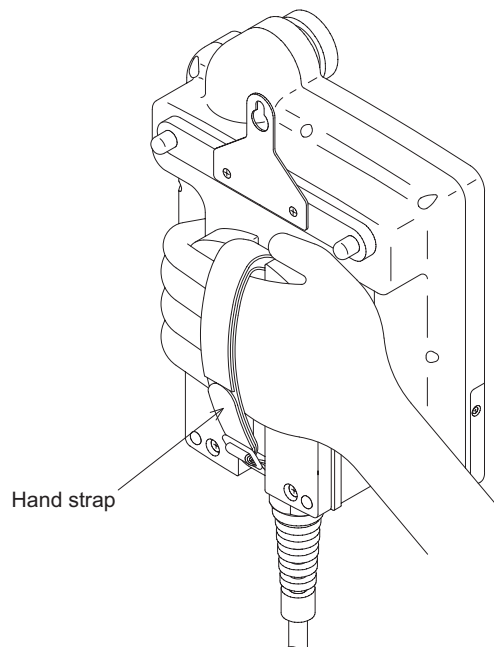
3.1.2   Hanging on Wall

When operating the Handy GOT while keeping it hung on the wall, use the metal fixture for wall hanging provided on the rear face of the Handy GOT.

On the wall face, the weight of the main unit (approximately 0.87 kg/1.91 lbs) and a load of approximately 1 ~ 3 kg (2.20 ~ 6.61 lbs) which varies depending on the communication cable length are applied. While taking this into consideration, attach a suitable metal fixture on the wall.

3.1.3   Flat Surface Mounting

When using the Handy GOT on a flat surface, such as a desk or shelf, keep the Handy GOT parallel to the surface so that it does not drop and, fix the communication cable to the desk.

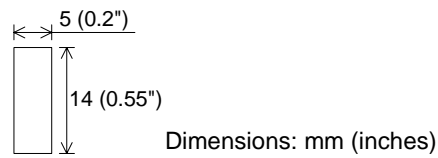It is recommended to fix the external cable.
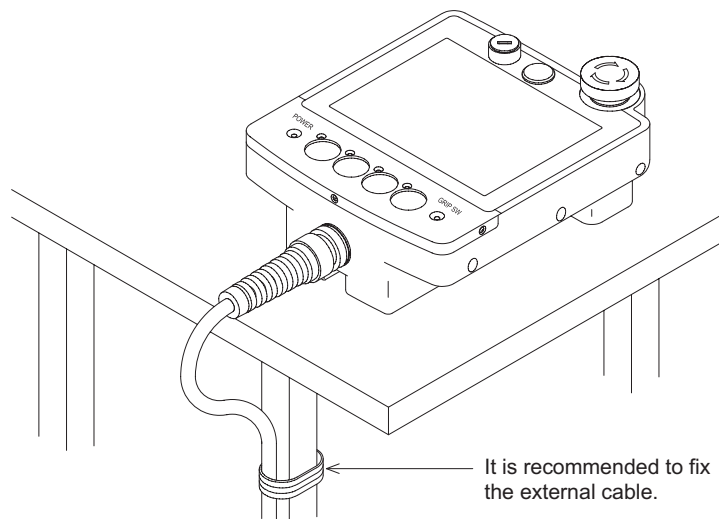
3.1.4   Installation of Strap for Drop Prevention

A strap to help prevent accidental drops or for shoulder/hand carry (prepared by the user) can be attached to the loops.
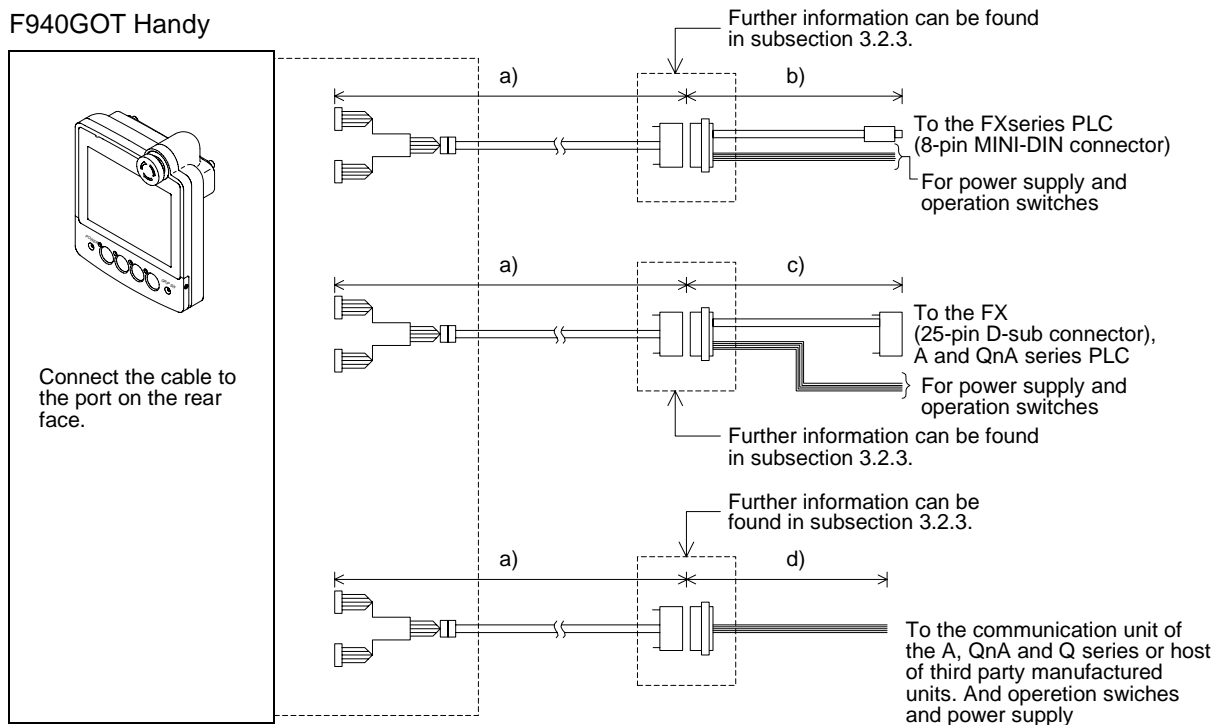

Strap
(prepared by the user)

Loops

Dimension of the loop

5 (0.2")

14 (0.55")

Dimensions: mm (inches)
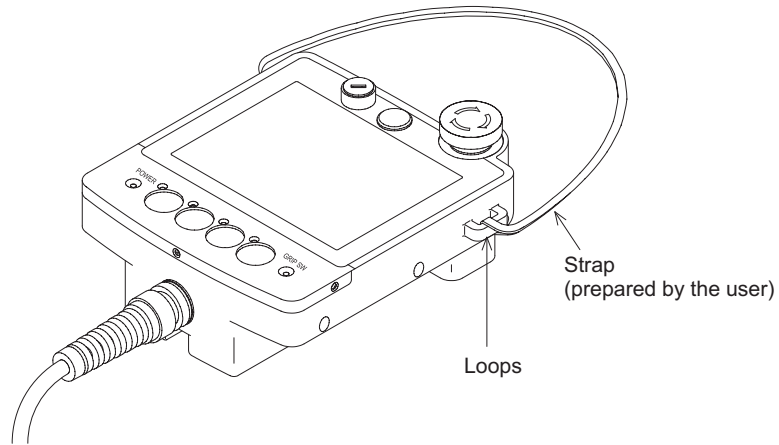
3.2   Connection Configuration

3.2.1   Connection to PLC by F940GOT-*BD-RH-E (RS-422)

Connection of Handy GOT (F940GOT-*BD-RH-E) to PLC is shown below.

F940GOT Handy

Connect the cable to the port on the rear face.

Further information can be found in subsection 3.2.3.

a)   b)

To the FXseries PLC (8-pin MINI-DIN connector)

For power supply and operation switches

a)   c)

To the FX (25-pin D-sub connector), A and QnA series PLC

For power supply and operation switches

Further information can be found in subsection 3.2.3.

Further information can be found in subsection 3.2.3.

a)   d)

To the communication unit of the A, QnA and Q series or host of third party manufactured units. And operetion swiches and power supply

a) External cable (with 37-pin D-Sub connector on one side)
   F9GT-RHCAB-3M (3m/9' 10"), F9GT-RHCAB-6M (6m/19' 8"),
   F9GT-RHCAB-10M (10m/32' 9")

b) Relay cable for PLC connection (with 8-pin MINI DIN connector on PLC side)
   F9GT-RHCAB2-150 (1.5m/4' 11")

c) Relay cable for PLC connection (with 25-pin D-Sub connector on PLC side)
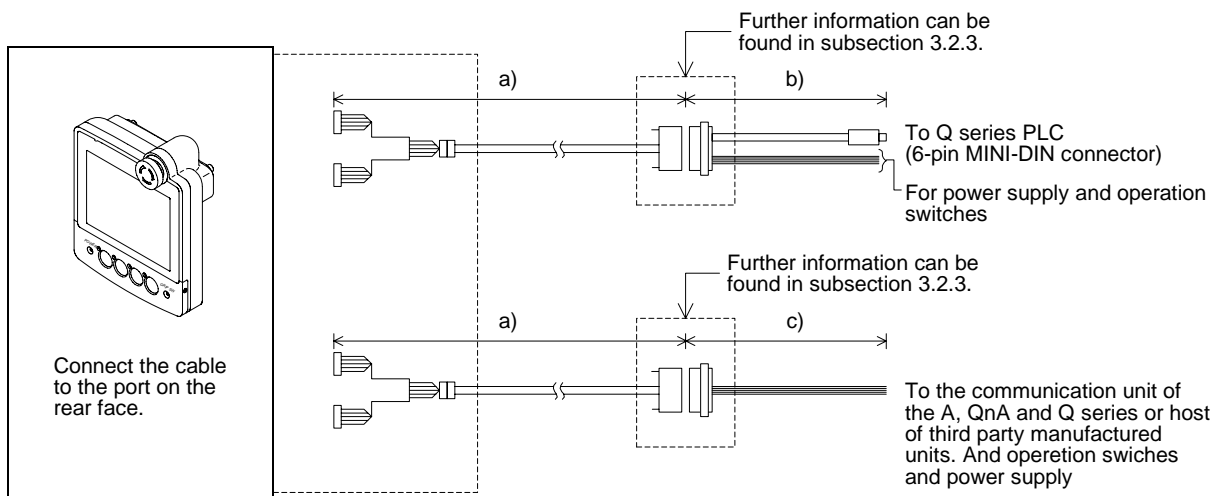   F9GT-RHCAB3-150 (1.5m/4' 11")

d) Cable prepared by user

Note:

The connection distance between the Handy GOT and the PLC ("a) + b)", "a) + c)" or "a) + d)") should be within 11.5 m (37' 9").

3.2.2   Connection to PLC by F943GOT-*BD-RH-E (RS-232C)

Connection of the Handy GOT (F943GOT-*BD-RH-E) to a PLC is shown below.

Connect the cable to the port on the rear face.

Further information can be found in subsection 3.2.3.

To Q series PLC (6-pin MINI-DIN connector)

For power supply and operation switches

Further information can be found in subsection 3.2.3.

To the communication unit of the A, QnA and Q series or host of third party manufactured units. And operetion swiches and power supply

a) External cable (with 37-pin D-Sub on one side)
   F9GT-RHCAB-3M (3m/9' 10")

b) Relay cable (with 6-pin MINI DIN on one side)
   F9GT-RHCAB5-150 (1.5m/4' 11")

c) Cable prepared by user

Note:

The connection distance between the Handy GOT and the PLC ("a) + b)" or "a) + c)") should be within 6 m (19' 8").

3.2.3   Signal Allocation of Connector

The signal allocation within connector of an external cable are shown below.

F9GT-RHCAB-□M
37-pin D-Sub, male
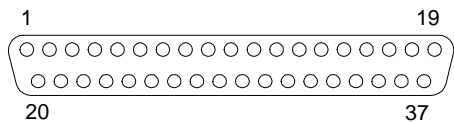
Arrangement of color
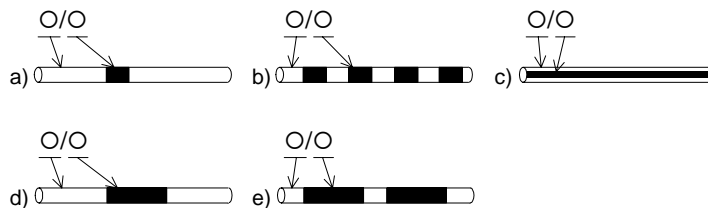
Table 3.1:   Name of communication, power supply and switches

External Cable (F9GT-RHCAB-*M)			Signal Name		Description
Pin No.	Color of wire	Arrangement of color	F940GOT Handy (RS422)	F943GOT Handy (RS232C)	
1	Shield		FG (shield)		Frame ground
2	Yellow/Blue	a)	TXD+ (SDA)	SD (TXD)	Note 1
3	Yellow/Red	a)	TXD- (SDB)	ER (DTR)	
4	White/Blue	a)	RTS+ (RSA)	RD (RXD)	
5	White/Red	a)	RTS- (RSB)	DR (DSR)	
6	Gray/Blue	a)	RXD+ (RDA)	RS (RTS)	
7	Gray/Red	a)	RXD- (RDB)	CS (CTS)	
8	Orange/Blue	a)	CTS+ (CSA)	NC	
9	Orange/Red	a)	CTS- (CSB)	NC	
10	Orange/Red	c)	SG		Signal ground
11	–	–	NC		Not used
12	White/Red	b)	SW-COM		Common for Operation swatches
13	Gray/Blue	b)	SW1		Operation switches
14	Gray/Red	b)	SW2		
15	Orange/Blue	b)	SW3		
16	Orange/Red	b)	SW4		
17	–	–	NC		Not used
18	Gray/Blue	d)	DC24V G		24V DC power supply "-"
19	Gray/Red	d)			
20	Pink/Red	d)	ES1-1		Emergency stop switch
21	Pink/Blue	d)	ES1-1		
22	Orange/Red	e)	ES1-2		
23	Orange/Blue	e)	ES1-2		
24	White/Red	d)	DSW-1		Grip switch
25	White/Blue	d)	DSW-1		
26	Yellow/Red	d)	DSW-2		
27	Yellow/Blue	d)	DSW-2		
28	White/Blue	b)	KSW-C		Common for keylock switch
29	Yellow/Red	b)	KSW-1		Keylock switch
30	Yellow/Blue	b)	KSW-2		
31	Pink/Red	b)	Spare SW		Spare
32	Pink/Blue	b)	Spare SW		
33,34,35	–	–	NC		Not used
36	Orange/Blue	d)	DC 24V+		24V DC power supply "+"
37	Orange/Red	d)			

Note 1:

These are signals for communication with the PLC. When connecting to a port other than the programming port of the FX, A, QnA or Q series PLC, refer to the manual of the connected module. Also use a relay cable. For relay cable details, refer to subsection 1.3.2.

3.2.4   Caution for CE EMC

For compliance to CE EMC regulations it is necessary to add a ferrite filter on the external cable for F940GOT-*BD-RH-E or F943GOT-*BD-RH-E.
The filter should be attached as shown right with the filter surrounding the external cable.
The recommended ferrite filter is the TDK ZCAT2436-1330A-M-BK or equivalent.

110mm
(4.33" or less)

Ferrite filter
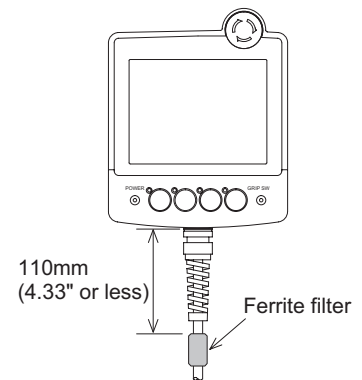
3.3   Installation of External Cable

This section explains the procedure to installation optional external cable to the Handy GOT main unit.

1) Remove rear cover
   Remove the mounting screws "a)", and open the rear cover.
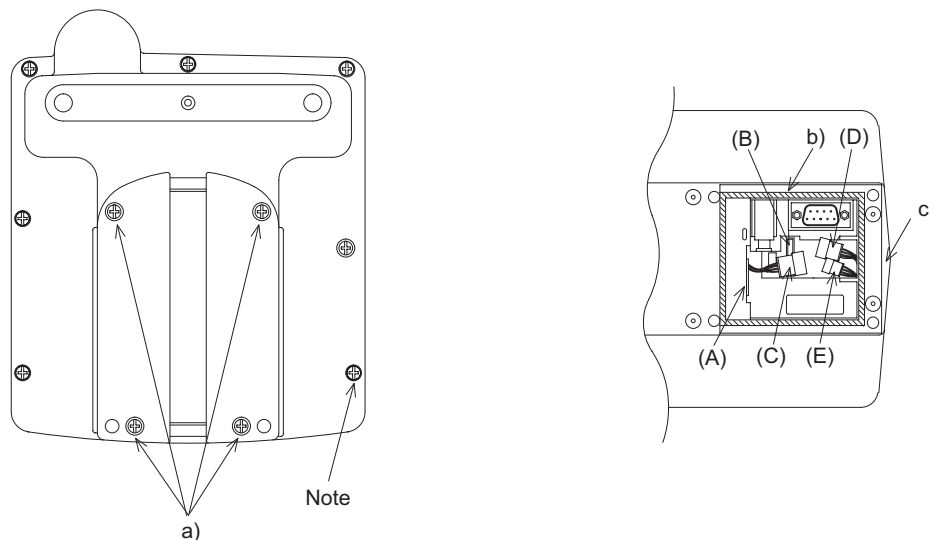
a) Rear cover mounting screws, (M3 × 8mm, 4 screws)

b) Packing

c) Installation hole

(A)Port for power supply (CN1; 8-pin type)

(B)Port for communication and operation switches (CN2; 20-pin type)

(C)Connector for grip switch (CN4; 5-pin type)

(D)Connector for emergency stop switch (CN5; 4-pin type)

(E)Connector for keylock switch (CN6; 3-pin type)

Note:

- Never remove any screw (among seven screws located around the rear face of the Handy GOT) other than the mounting screws "a)".
  If such a screw is removed, the waterproof ability may deteriorate or failure may occur.

- When installing rear cover, securely tighten mounting screws with a torque of 0.49 ~ 0.68 N·m if tightened more than this, the cover may crack, and the water and dustproof proprieties may be lost.

- Before closing the rear cover, make sure that the packing "b)" has not come off.

2) Connect an external cable
   Insent an external cable into the installation hole "c)" of the Handy GOT, and connect it to "(A)", "(B)", "(C)", "(D)" and "(E)".

When pushing the cable through,
make each connector face downward.

3) Tighten the hexagon nut.

Packing
Hexagon nut for
cable mounting
Hexagon nut
for cable secoring

23.8mm (0.94")
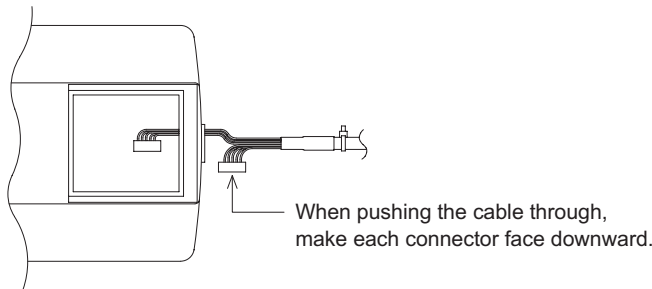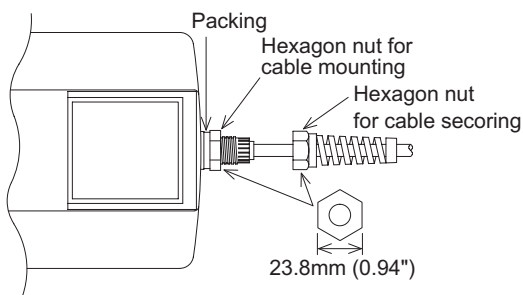
Make sure to tighten the hexagon nut for cable mounting with a sufficient force to avoid looseness.
As guideline, tighten it until the packing is crushed by 0.5 mm (0.02") or more.

4) Pull lightly on the cable until it naturally stops.

Pulling direction
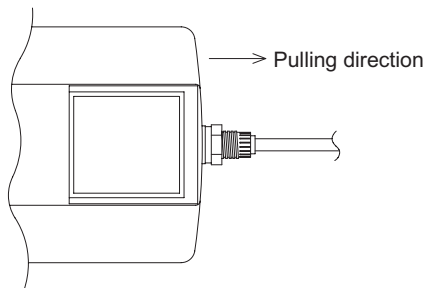
5) Securely tighten the hexagon nut for cable so that the cable will not come out or the waterproof ability will not be deteriorated.

Note

Note:

STOP
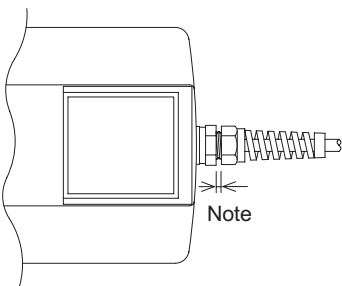
As guideline, make sure that clearance is 3.5 mm (0.14") or less.

6) Attach rear cover

    a) Before closing the rear cover, make sure that the packing b) has not come off.

    b) Attach the rear cover.

    c) Tighten four mounting screws.
       Make sure the tightening torque is 0.49 to 0.68 N·m.

3.4   Processing Panel of Control Box or Cabinet

3.4.1   Using F940GOT Handy

1) Installing a connector on the panel of control box or cabinet.
   Connect an FX/A/QnA Series PLC using a relay cable for connection to PLC as shown
   below.
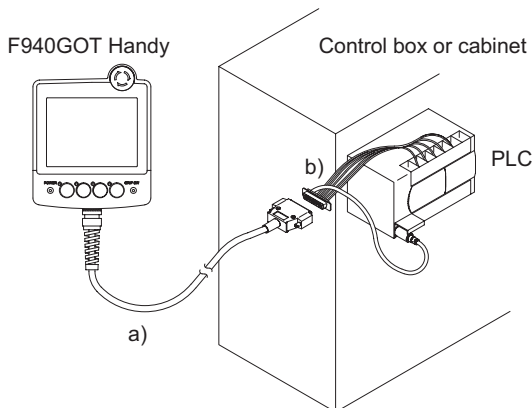
a) External cable (with 37-pin D-Sub, male connector)

Table 3.2:   External Cable

Model Name	Length
F9GT-RHCAB-3M	3m (9' 10")
F9GT-RHCAB-6M	6m (19' 10")
F9GT-RHCAB-10M	10m (32' 9")

b) Relay cable for connection to PLC

Table 3.3:   Relay Cable

Model Name	Length	Applicable
F9GT-RHCAB2-150	1.5m (4' 11")	FX Series (FX0, FX0S, FX0N, FX1S, FX1N, FX2N, FX2NC)
F9GT-RHCAB3-150		FX (FX, FX2C), A, QnA Series

STOP

Note:

When connecting to a port or unit other than the programming port of an FX, A or QnA
series PLC, make a cable corresponding to the configuration of the communications port in
question. For allocation of Handy GOT communication signals, refer to subsection 3.2.3.

3.4.2 Using F943GOT Handy

Installing a connector on the panel of control box or cabinet
Connect a Q Series PLC using a relay cable for connection to PLC as shown below.
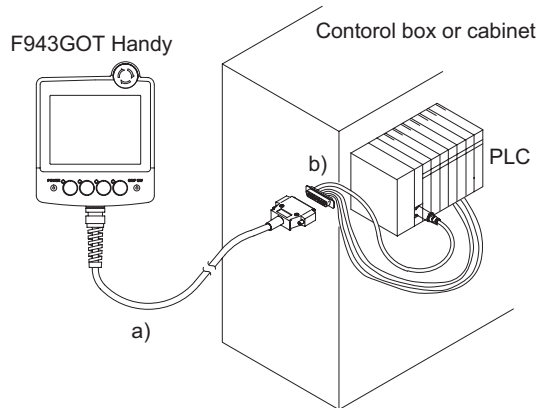
a) External cable (with 37-pin D-Sub, male connector)
F9GT-RHCAB-3M (3m /9' 10")

b) Relay cable for connection to Q series PLC
F9GT-RHCAB5-150 (1.5m /4' 11") for Q series PLC

Note:

When connecting to a port or unit other than the programming port of a Q series PLC, make a cable corresponding to the configuration of the communications port in question. For allocation of Handy GOT communication signals, refer to subsection 3.2.3.

3.4.3   Appearance Shape of Relay Cable

1) F9GT-RHCAB2-150 relay cable for FX (FX0, FX0S, FX0N, FX1S, FX1N, FX2N, FX2NC) Series PLC
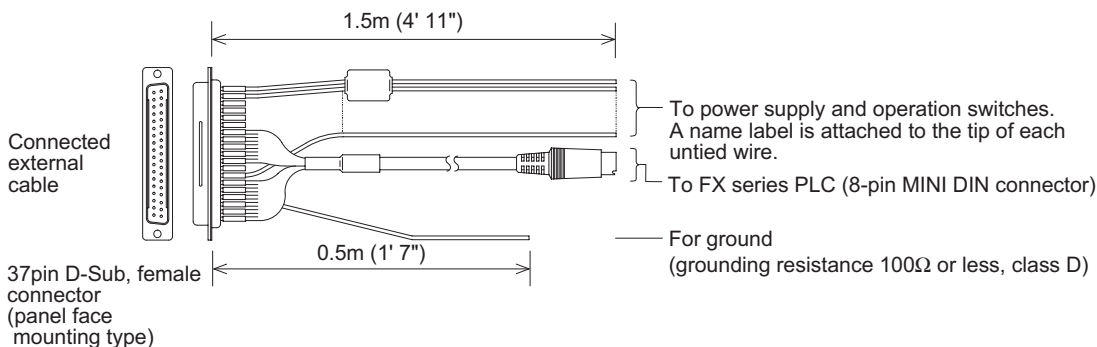
2) F9GT-RHCAB3-150 relay cable for FX (FX, FX2C), A, QnA series PLC
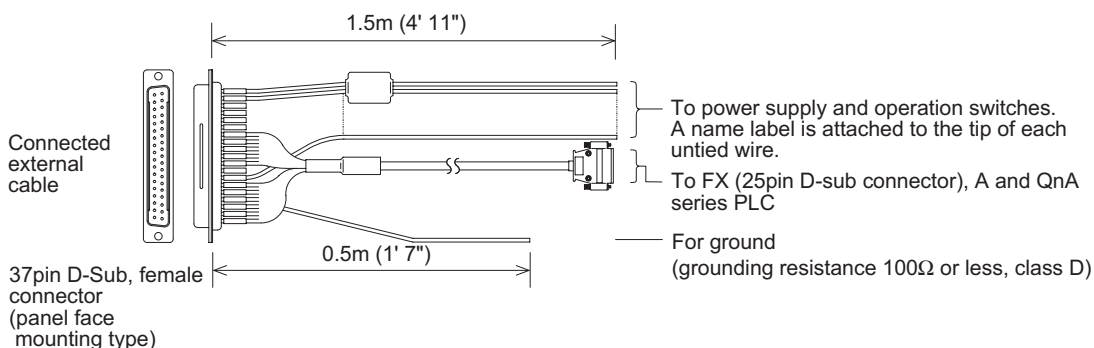
3) F9GT-RHCAB5-150 relay cable for Q series PLC
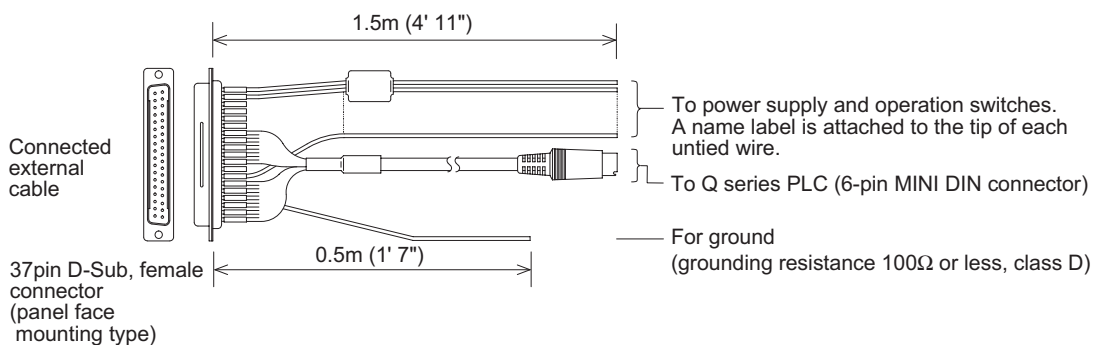
3.4.4   Panel Cut Dimension for Relay Cable

When mounting the relay cable connector on the panel of a control box or cabinet, prepare panel of control box or cabinet as follows.

Panel cut size

63.5 (2.5")

59.1 (2.33") or more

2-φ3.2±0.1
(0.13"±0.004")

11.4 (0.45") or more

4-R3.4 (0.13")

10°

//// indicates the cut area.

Unit: mm (inches)

(Panel thickness: 0.8 ~ 1.3mm / 0.03" ~ 0.05")
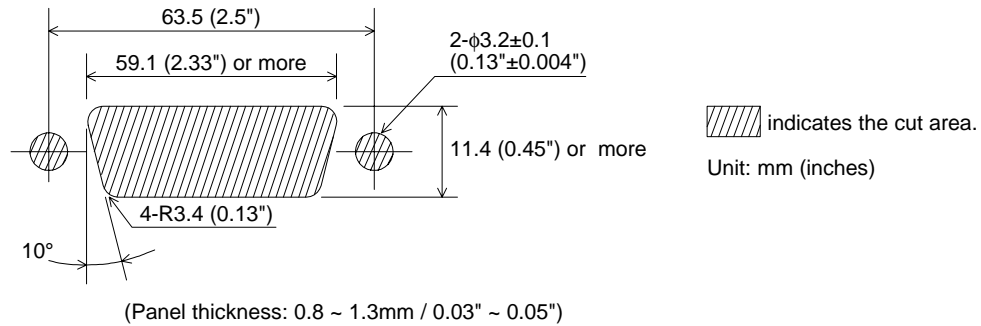
Insert a jack socket into a hole shown above, and tighten it with nuts M3 (0.12").

M3 (0.12")

4.8 (0.19")

M3 (0.12")

Jack socket

Jack socket

Connected to
external cable

Panel face on
which cable
is mounted

Nut (M3)

Cable side
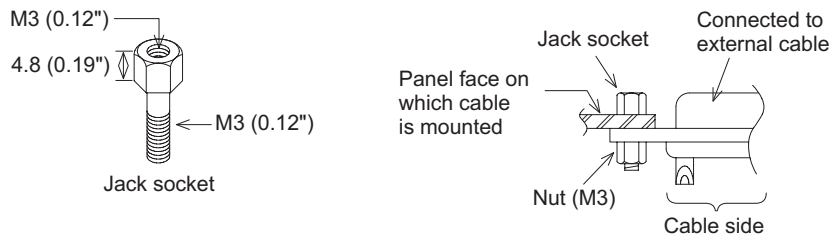
3.5   Outline of Internal Wiring

The Handy GOT is equipped with the following switches and indicator LEDs shown below.

1) Switch Assignment

The figure below shows the switch assignment. Each switch is expressed in abbreviations as follows.
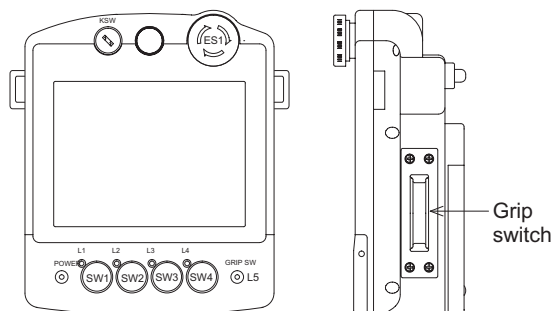
Grip switch

Table 3.4:   Abbreviation of Switch and LED

Abbreviation	Name	Reference
SW1~SW4	Operation switches	3.7
ES1	Emergency stop switch	3.8
L1~L4	Indicator LEDs for operation switches	3.7
L5	Indicator LED for grip switch	3.9
DSW1, DSW2	Grip switch	
KSW1, KSW2	Keylock switch	3.10

Switches Requiring External Wiring

The following switches have to be connected to the PLC or external input equipment through the operation switch connector.

- Operation switches

- Emergency stop switch

- Grip switch

- Keylock switch

LEDs not Requiring External Wiring

Because the following switch and LEDs are connected to the display unit CPU and ready for serial communication with the PLC through the communication port, they do not have to be wired.

- LED for grip switch

- LEDs for operation switches

2) Internal Wiring of Switches

Each switch on the previous page is wired inside the Handy GOT as shown below.
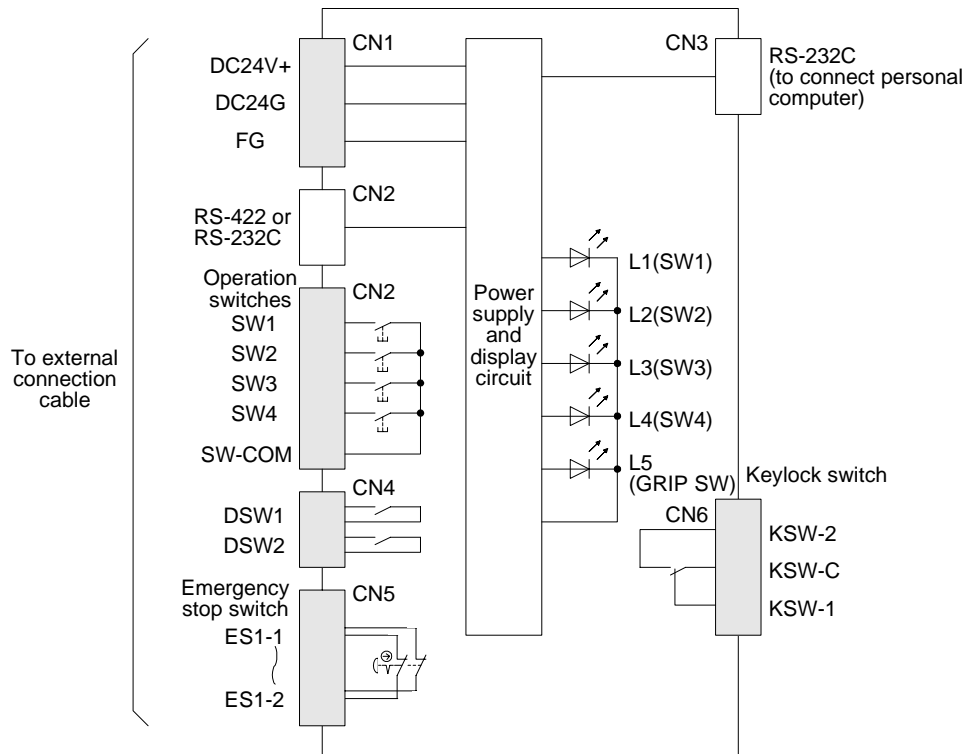
3.6   Wiring of Power Supply

Note:

- Insure correct termination of DC power source, incorrect connection may result in unit failure or the GOT being burnt.

- Attach a fuse of 2 A to the 24V DC power supply.

- Perform Class D grounding to the Handy GOT (grounding register 100Ω or less).
  Never perform common grounding of the GOT and a strong power system.

Note:

- Feed power to the GOT by an external power supply.
  (The service power supply of the programmable controller cannot be used.)

- Even if instantaneous power interruption of less than 5 ms occurs, the GOT continues its operation. When power interruption for considerable period of time or voltage drop occurs, the GOT stops its operation. However, when the power supply is recovered, the GOT automatically restarts its operation. (The screen displayed just after recovery is determined by the working environment originally set.)

The power is supplied from the external power supply to the Handy GOT.
The current consumption is 300 mA at 24V DC. (Refer to section 2.2.)
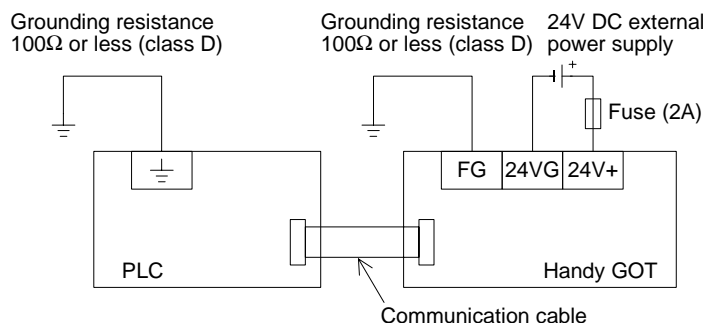
Note:

When the input power for the PLC main unit is equivalent to the input power for the external power supply, grounding may be performed by connecting the frame ground of the Handy GOT to the ground terminal of the PLC.
When the input power is different (PLC: 200V AC, external power supply: 100V AC), perform dedicated grounding to each of the PLC and Handy GOT separately.
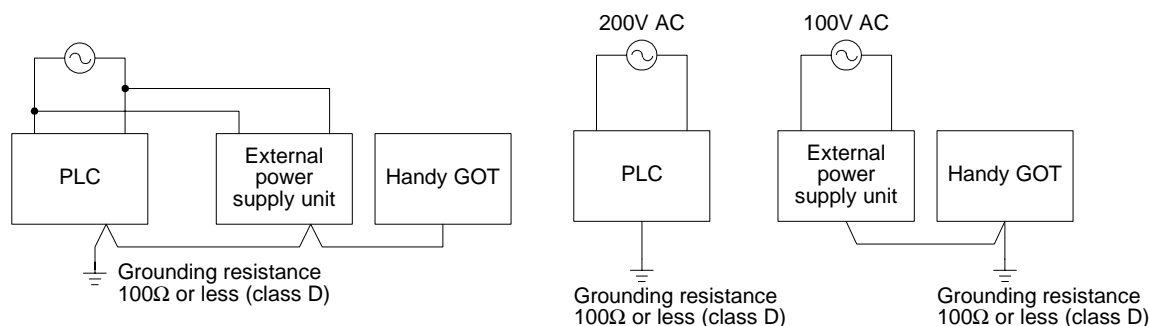
Table 3.5:   Allocation of Signal 24V+ / 24VG /FG

Signal Name in Diagram	External Cable
	F9GT-RHCAB-☐M (Pin No.)
24V+	36, 37
24VG	18, 19
FG	1

3.7   Wiring and Handling of Operation Switches (SW1 to SW4)

This section explains the wiring and the use of the operation switches and the grip switch as well as control of the LEDs for confirming pressing of the switches.

3.7.1   Handling of Operation Switches

This section explains the use of the operation switches and control of the LEDs for confirming pressing of the switches.
The switches should be wired by the user. LED indication is executed through communication.

1) Wiring the Operation Switches
The operation switches are assigned as follows, and connected to the PLC through an external cable.

Connection example
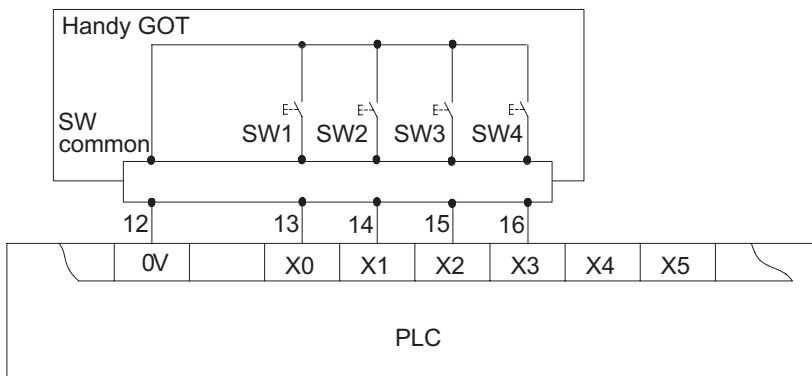
Table 3.6: Allocation of Signal Operation Switches

Signal name	External cable
	F9GT-RHCAB-☐M (Pin No.)
SW-COM	12
SW1	13
SW2	14
SW3	15
SW4	16

2) How to Use the Operation Switches
Because the operation switches SW1 to SW4 are directly connected to inputs of the PLC, they can be controlled freely by programs in the PLC in the same way as general inputs.

- An operation switch is taken into the PLC as a momentary type switch with N/O contact.
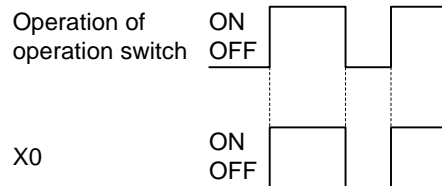
- When you would like to treat input of an operation switch as N/C contact or an alternate type switch, create a proper program in the PLC.

3) Lighting of LEDs for Confirming Operation
A green LED is provided for each of four operation switches SW1 to SW4 and one grip switch so that pressing of each switch can be confirmed.
Each LED is assigned to a bit device by the screen creation software. When the value of a bit device is "1", the corresponding switch is lit. When the value is "0", the corresponding switch is extinguished.

Table 3.7: Assignment of Devices Controlling the LEDs

Device	Name	Remarks
M100	Operation switch SW1 (green)	← Set this device using the screen creation software.
M101	Operation switch SW2 (green)	
M102	Operation switch SW3 (green)	
M103	Operation switch SW4 (green)	
M104	Grip switch (green)	

a) Setting in the screen creation software
The head device for the LEDs of the operation switches should be set in the screen creation software.
For the details, refer to section 3.11.

b) Program example
The operation switches SW1, SW2, SW3 and SW4 are assigned to X0, X1, X2 and X3 respectively. The grip switch is wired to X4.
The device of "Output Indicator" is set to M100 in the screen creation software.
In a PLC program, inputs X0 to X4 are assigned to M100 to M104 using the OUT instruction.


```
   X0
   ─┤├────────( M100 ) . . . . . When the SW1 is pressed, the LED lights in green.
    ·
    ·
    ·
    ·
   X3
   ─┤├────────( M103 ) . . . . .When the SW4 is pressed, the LED lights in green.
   X4
   ─┤├────────( M104 ) . . . . . The LED of the grip switch lights in green.
```
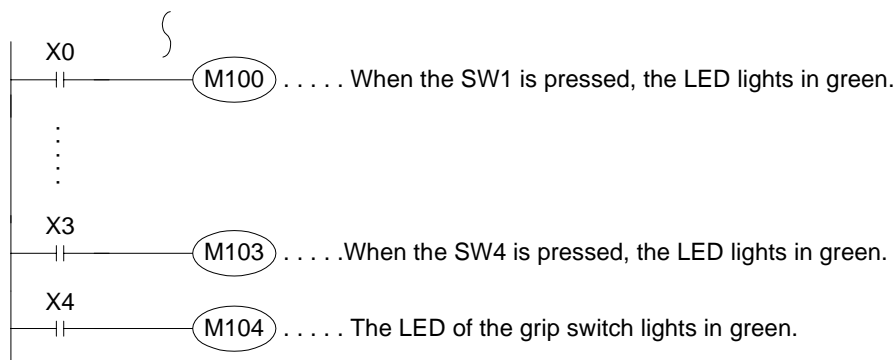
3.7.2 Preparation of Operation Switch Name Sheet

This section explains how to prepare the operation switch name sheet.

1) Preparing the Name Sheet

a) Use a name sheet and an OHP sheet (transparent sheet) offered as accessories.

b) Write switch names on the mount sheet.
The mount sheet is of actual dimensions.
If you would like to make additional mount sheets, refer to the following dimensions.

Unit : mm (inches)
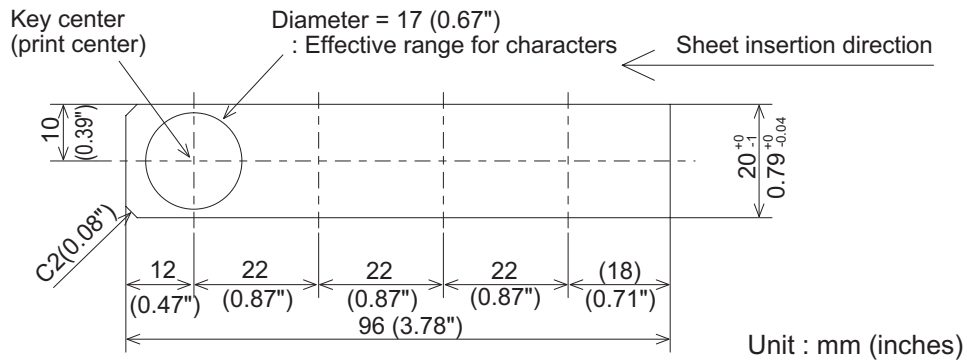
c) When the work in b) is completed, copy the contents of the name sheet base on an OHP sheet in the actual dimensions (100%) using a copy machine.
When using a different OHP sheet, use the following type. Make sure that the selected OHP sheet can be used in a copy specification.

[Recommended OHP sheet]
Material: Polyester film
Thickness: 0.1mm (0.004")

2) Attaching the Sheet

a) Remove the operation switch cover.
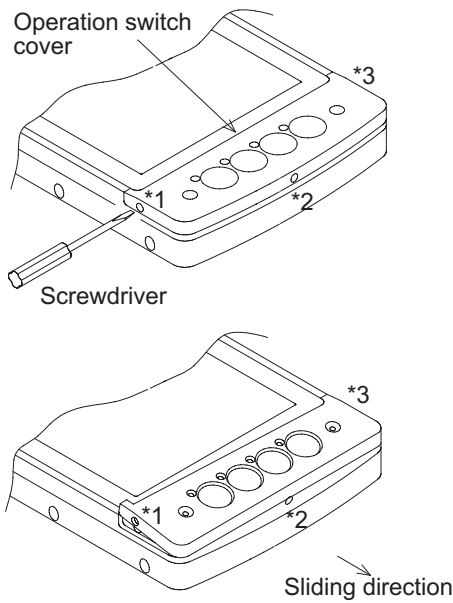
Insert a screwdriver into the clearance *1 or *3 between the operation switch cover and the main unit, then slowly push the switch cover up.
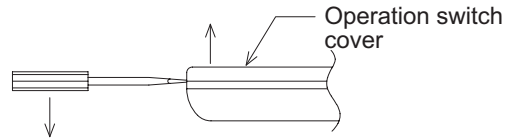
When the either side *1 or *3 comes off, pull it in the sliding direction shown on the left to remove it.

b) Insert the sheet.

Insert it into the following position shown below of the Handy GOT.
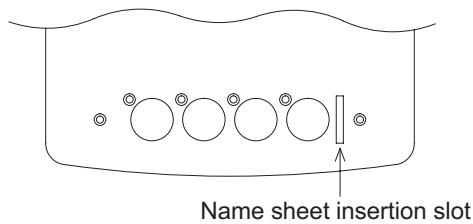
c) Attach the operation switch cover.
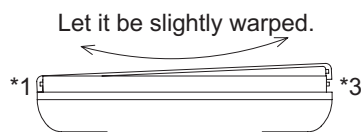
Align the operation switch cover with a protrusion in the position *1 or *3 shown in the figure in a) above, then attach the operation switch cover while flexing it slightly.

3.8   Wiring and Handling of Emergency Stop Switch (ES1)

The emergency stop switch is assigned as shown below.

1) Connection Example
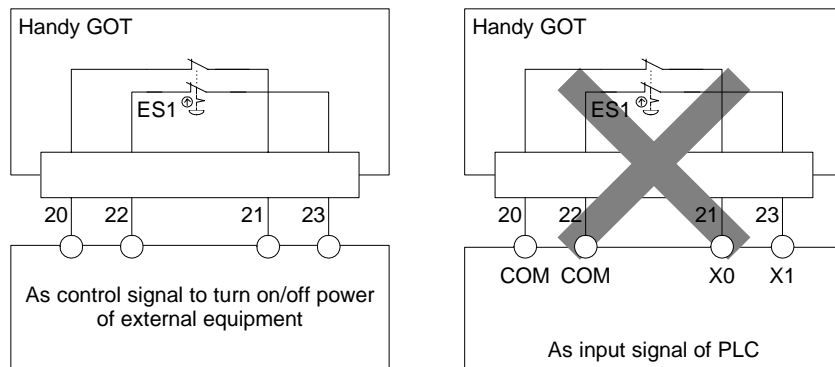
When turning on and off the power of external equipment, make sure that the load is 24V DC, 1 A (contact specifications) or less.

Make sure to construct the emergency stop circuit outside the PLC.

Table 3.8:   Allocation of Signal Emergency Stop Switch

Signal name	External cable
	F9GT-RHCAB-□M (pin no.)
ES1-1	20
ES1-1	21
ES1-2	22
ES1-2	23

Caution

The emergency stop switch is the N/C contact type.
If the Handy GOT is attached and removed using a connector, when it is removed from the machine, the switches turn OFF from ON. This is the status in which the emergency stop switch is pressed. This fact should be taken into consideration in the design.

3.9   Wiring and Handling of Grip Switch (DSW)

The grip switch is provided on the side of the Handy GOT and wired to the input of the PLC or other device.
The ON/OFF status of the grip switch can be monitored by the PLC.

The grip switch is a twin contact type which performs 3-positioned operation (OFF/ON/OFF). The ON/OFF status is shown below.

Grip switch seen from the side
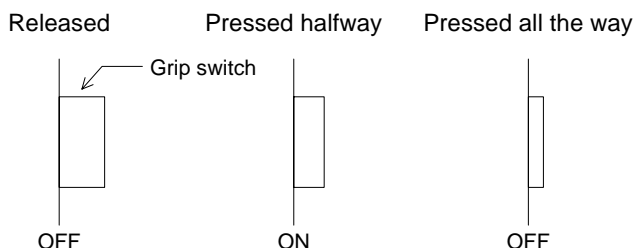
3.9.1   Wiring of Grip Switch

1) Connection Example
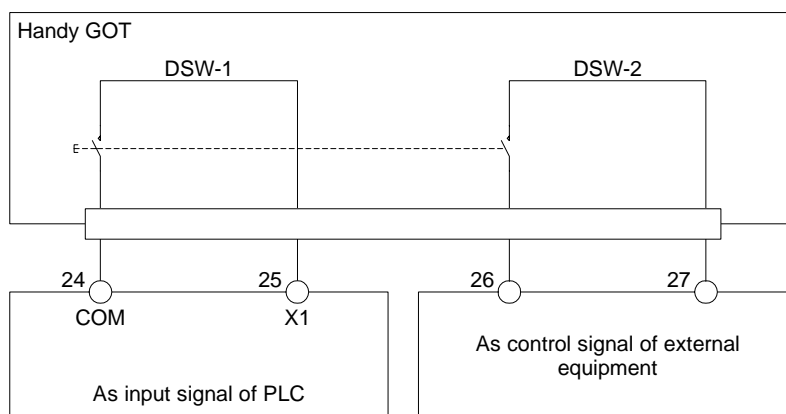
When turn on and off the control signal of external equipment, make sure that the load is 24V DC, 1A (contact specification) or less.

Table 3.9: Allocation Of Signal Grip Switch

Signal name	External cable
	F9GT-RHCAB-☐M (pin no.)
DSW-1	24
DSW-1	25
DSW-2	26
DSW-2	27

3.9.2   Setting of Grip Switch LED

The grip switch LED provided on the front face of the Handy GOT can be set as follows in the main unit or screen creation software.

1) Setting in Main Unit of Handy GOT

The following screen is displayed, when selecting "OTHER MODE"-"SET-UP MODE"-"HANDY GOT SETTING".

```
┌───────────────────────────────────────┬─────────┐
│ HANDY GOT SETTING                      │   END   │
├───────────────────────────────────────┴─────────┤
│                                                  │
│  GRIP SWITCH:      │ USE │                       │
│                                                  │
│  PUSH BUTTON WRITE: │ DOES NOT WRITE │           │
│                                                  │
│  SWITCH OFF ACTION:                              │
│      │ TOUCH SWITCH OFF │                         │
│                                                  │
│  LED ACTION:                                     │
│      │ CONCURRENTLY WITH GRIP SWITCH │            │
│                                                  │
└──────────────────────────────────────────────────┘
```

When using RH model of Handy GOT, these settings are invalid

Select one among "CONCURRENTLY WITH GRIP SWITCH", "CONCURRENTLY WITH BIT DEVICE" or "ALWAYS OFF".

2) Setting in Screen Creation Software (GT Designer)

a) Select "Common"-"Auxiliary Setting"-"Project".

b) Click "Handy GOT settings" tab.

For the details, refer to section 3.11.

STOP **Note:**

When the screen data is transferred from the screen creation software to the Handy GOT, the contents above are replaced with the contents set in the screen creation software. Have in mind that the setting about the grip switch is overwritten.

3) LED Action

The method of controlling ON/OFF status of the grip switch LED is selected here.

Table 3.10: LED Action

Selection item	Description
CONCURRENTLY WITH GRIP SWITCH	The LED is always lit without regard to the position of the grip switch.
CONCURRENTLY WITH BIT DEVICE	The LED is lit or extinguished by a bit device of the PLC.
ALWAYS OFF	The LED is always extinguished.

When "LED ACTION" is set to "CONCURRENTLY WITH BIT DEVICE", the setting to assign a bit device of the PLC is required. For the details, refer to section 3.7.

3.10   Handling of Keylock Switch (KSW)

The keylock switch is wired to the input of the PLC or the device.

1) Connection Example
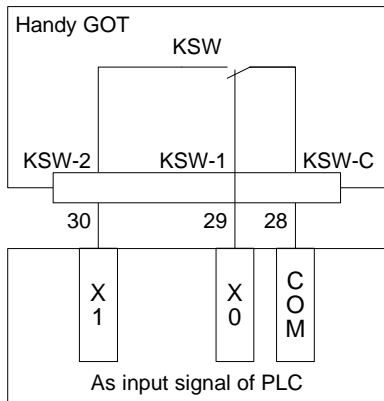
In case the key is in the left position

When turn on and off the control signal of external equipment, make sure that the load is 24V DC, 1A (contact specification) or less.
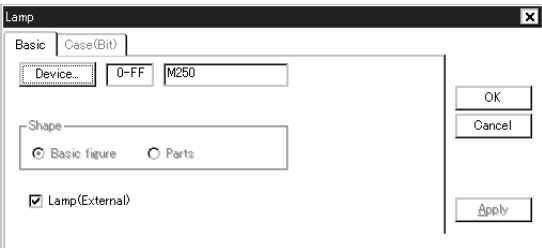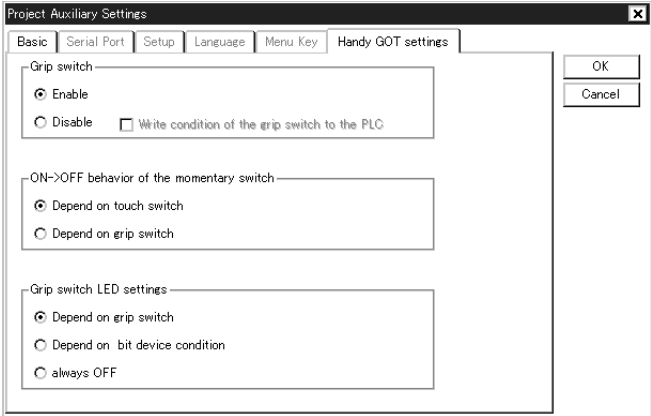
Table 3.11: Allocation Of Signal Keylock Switch

Signal name	External cable
	F9GT-RHCAB-☐M (pin no.)
KSW-C	28
KSW-1	29
KSW-2	30

- A key can be inserted/removed when it is in the left position, but cannot when in the right position because it is locked.

- Two keys are offered with the unit.

3.11   Setting in Screen Creation Software

The setting in the screen creation software is required to turn on and off the LED of the operation switches and the grip switch from connected equipment. This section describes the setting method.
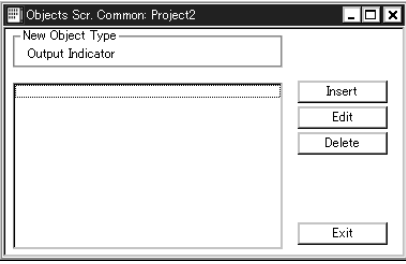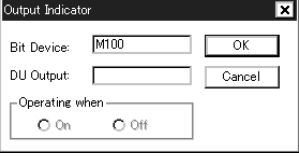
1) GT Designer
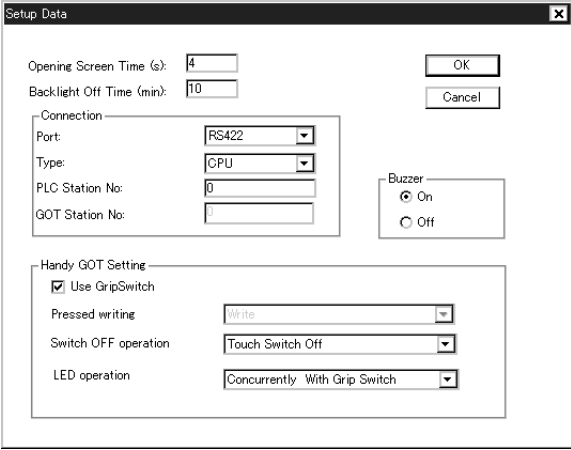
Operation		Display (screen name)
[Setting]	a) It is supposed that the GT Designer has started up and the screen data to be set is read. b) Open a user screen to be set. (Any screen is available as far as it has been already created.) Refer to Caution on setting of "Lamp (External)" below.	
[LED setting] Operation switch	c)) Select "Draw"-"Animation Display"-"Lamp" from the tool bar.	The "Lamp" dialog box appears.
	d) On the "Basic" tab, click "Lamp (External)" to display the check mark (✓), click the [Device] button, input a bit device to be assigned, then click [OK]. Refer to Caution on setting of "Lamp (External)" below.	

[LED setting]
Grip switch
	e) From the tool bar, select "Common"-"Auxiliary Setting"-"Project".
	f) The setting varies depending on the version of the screen creation software.
	    Click the "Handy GOT settings" tab.
	    Select one for "Grip switch LED settings".
		The "Project Auxiliary Settings" dialog box appears.

	The settings for "Grip switch" and "ON->OFF behavior of the momentary switch" are invalid when using the RH model of Handy GOT.	

Caution on setting of "Lamp (External)"

1. The contents of "Lamp (External)" you have set are not displayed on the screen.

2. The check box is valid only in the Handy GOT. Never set the check box in any other series.

3. Set only one lamp for all screens of the created screen data.

4. Make sure that the bit device assigned on the "Basic" tab in "Lamp" dialog box is not included in the read/write device range set in "Common"-"System Information".

2) DU/WIN

Operation		Display (screen name)
[Setting]	a) It is supposed that the DU/WIN has started and the screen data to be set has been read. b) Select "Common Screen" on the "Screen List" window (by clicking it to be highlighted). If the window is closed, select "View/Project"-"Screen List" from the tool bar.	The "Screen List" window appears.
[LED setting] Operation switch	c) Click the [Objects] button.	The "Objects Scr. Common" window appears.
	d) Select "Object"-"Indicator"-"Output Indicator" from the tool bar. 	"Output Indicator" is displayed in the "New Object Type" field on the "Objects Scr. Common" window.
	e) Click the [Insert] button. Input a bit device to be assigned, and click [OK]. Refer to Caution on setting of "Output Indicator" below. Close all windows except the "Screen List" window.	The "Output Indicator" dialog box appears.

Operation		Display (screen name)
[LED setting] Grip switch	f) Select "View/Project"-"System Settings"-"Setup Data". g)Select one for "LED operation". **Setup Data** Opening Screen Time (s): 4 OK Backlight Off Time (min): 10 Cancel Connection Port: RS422 Type: CPU Buzzer PLC Station No: 0 ⦿ On GOT Station No: ○ Off Handy GOT Setting ☑ Use GripSwitch Pressed writing Write Switch OFF operation Touch Switch Off LED operation Concurrently With Grip Switch The settings for "Pressed writing" and "Switch OFF operation" under "Use GripSwitch" are invalid when using the RH model of Handy GOT.	The "Setup Data" dialog box appears.
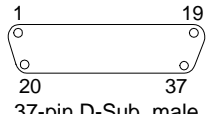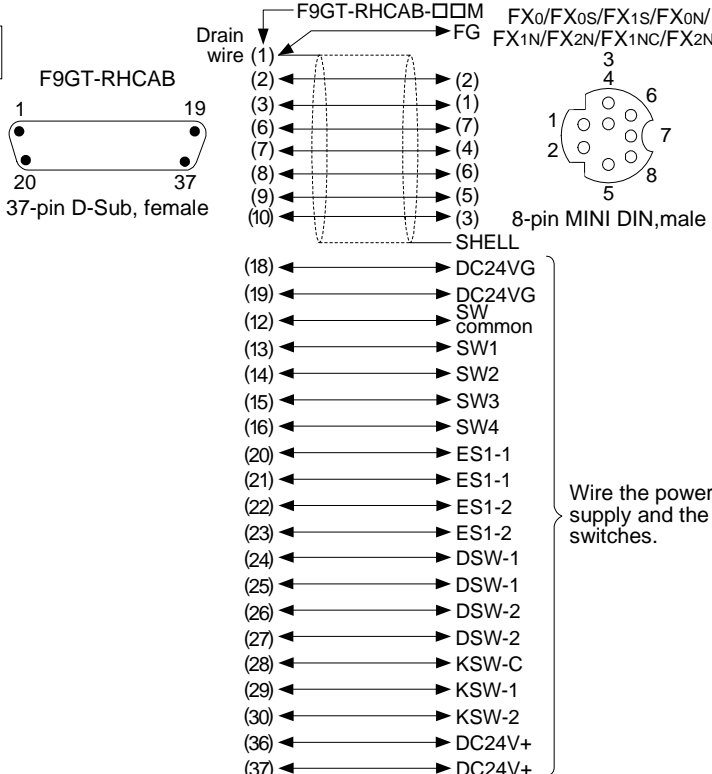
Caution on setting of "Output Indicator"

1.The contents of "Output Indicator" you have set are not displayed on the screen.

2.The check box is valid only in the Handy GOT. Never set the check box in any other series.

3.Set "Output Indicator" only on the common screen. Even if it is set on a user screen, it does not function.

4.Make sure that the bit device assigned on the "Output Indicator" dialog box is not included in the bit device range in set in "View/Project"-"System Settings"-"Interface Devices".

3.12 Cable Connection Diagram

1) Cable connecting the Handy GOT and the PLC

: Female type : Male type   The connector figure shows the engagement face.

No.	Model name	Application	Connection diagram	Application
(1)	F9GT-RHCAB-3M F9GT-RHCAB-6M F9GT-RHCAB-10M RS-422 connection RS-232C connection	Dedicated connector	The connector on the leader side of the Handy GOT is dedicated, and cannot be prepared by the user.	To F9GT-RHCAB2-150, F9GT-RHCAB3-150 or F9GT-RHCAB5-150 1 19 20 37 37-pin D-Sub, male
(2)	F9GT-RHCAB2-150 RS-422 connection			

: Female type   : Male type   The connector figure shows the engagement face.

No.	Model name	Application	Connection diagram	Application
(3)	F9GT-RHCAB3-150	RS-422 connection F9GT-RHCAB 1 ⎯ 19 20 ⎯ 37 37-pin D-Sub, female	F9GT-RHCAB-□□M Drain wire (1) → FG (2) ↔ (2) (3) ↔ (15) (4) ↔ (4) (5) ↔ (17) (6) ↔ (3) (7) ↔ (16) (8) ↔ (5) (9) ↔ (18) (10) ↔ (7) Hood (8) (21) (18) → DC24VG (19) → DC24VG (12) → SW common (13) → SW1 (14) → SW2 (15) → SW3 (16) → SW4 (20) → ES1-1 (21) → ES1-1 (22) → ES1-2 (23) → ES1-2 (24) → DSW-1 (25) → DSW-1 (26) → DSW-2 (27) → DSW-2 (28) → KSW-C (29) → KSW-1 (30) → KSW-2 (36) → DC24V+ (37) → DC24V+	FX/FX1/FX2/FX2C/A/ QnA Series 1 ⎯ 13 14 ⎯ 25 25-pin D-Sub, male Wire the power supply and the switches.
(4)	F9GT-RHCAB5-150	RS-232C connection F9GT-RHCAB 1 ⎯ 19 20 ⎯ 37 37-pin D-Sub, female	F9GT-RHCAB-□□M Drain wire (1) → FG (2) ↔ (1) (3) ↔ (5) (5) ↔ (7) ↔ (6) (4) ↔ (2) (10) ↔ (3) SHELL (18) → DC24VG (19) → DC24VG (12) → SW common (13) → SW1 (14) → SW2 (15) → SW3 (16) → SW4 (20) → ES1-1 (21) → ES1-1 (22) → ES1-2 (23) → ES1-2 (24) → DSW-1 (25) → DSW-1 (26) → DSW-2 (27) → DSW-2 (28) → KSW-C (29) → KSW-1 (30) → KSW-2 (36) → DC24V+ (37) → DC24V+	Q Series 3 1 5 2 6 4 6-pin MINI DIN, male Wire the power supply and the switches.

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4.   Maintenance

Cautions:

- Correctly install the battery for memory backup. Never charge, disassemble, heat, burn or short-circuit the battery. If the battery is handled in such a way, an explosion or fire may be caused.

- Always power OFF and remove the Handy GOT from any mounting location before starting replacement of the battery. Electric shock may occur if these precautions are not followed.

- Never disassemble or modify the Handy GOT. Disassembly or modification may cause failure, malfunction or fire. For repair, please contact a service representative.

Note:

Make sure to turn the power OFF before connecting/disconnecting cables.
If you connect/disconnect cables while the power is turned ON, failure or malfunction may occur.

4.1   Replacement of Battery

4.1.1   Notification of Low Battery Voltage

When the battery voltage drops, a control device (system information) set by the screen creation software turns ON. The control device interlocks with an auxiliary relay in the PLC. It is recommended to provide a lamp while utilizing the output of the PLC so that voltage drop can be monitored outside the Handy GOT.
For details of control devices, refer to the GOT-F900 SERIES OPERATION MANUAL.

Example: SW☐D5C-GOTRE-PACK is used
System information write device is set to D20
D24 b3: Battery voltage drop (which turns on when the battery voltage drops)
Use D24 in a PLC program as follows.

```
    M8000
  ───┤├───────────────────[MOV  D24  K2M20]

  Battery voltage drop
    M23
  ───┤├───────────────────(Y)  Indication outside PLC
```
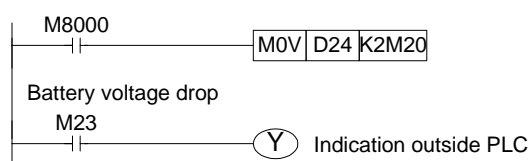
Example: FX-PCS-DU/WIN-E is used
Top control device No. is set to M0
M6: Battery voltage drop (which turns ON when the battery voltage drops)
Use M6 in a PLC program as follows.

```
  Battery voltage drop
    M6
  ───┤├───────────────────(Y)  Indication outside PLC
```
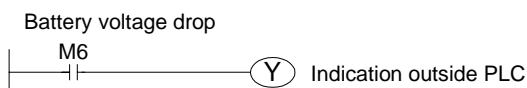
4.1.2   Procedure for Replacing Battery

For approximately one month after the control device for battery voltage drop turns ON, the battery backs up the alarm history, sampling and the current time. When the control device (system information) turns ON, replace the battery (FX2NC-32BL) soon.
The screen data is stored in the flash memory. Even if the battery is totally worn out, the screen data remains in the flash memory.

FX2NC-32BL
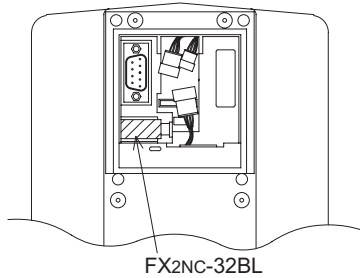
1) Turn off the power of the Handy GOT.

2) Open the small window of the rear panel.

3) Remove the existing battery from the holder and disconnect it.

4) Within 30 seconds, connect a new battery.

5) Insert the new battery into the holder and close the small window.

Battery life: Approximately 3 years
            (guaranteed for 1 year from the date of manufacture)

5. Diagnostics

5.1 Primly Check

1) Check "POWER LED"
   If the POWER LED is OFF, check cable(s), and check 24V DC power source capacity is sufficient.

2) Check display
   If the display screen is dark, adjust "LCD CONTRAST" in "SET-UP MODE".
   If the display screen remains dark even after adjustment, it is recommended to replace the backlight. In this case, please contact a service representative.

3) Check setting "PLC TYPE" in "SET-UP MODE"
   If this setting is incorrect, Handy GOT cannot communicate with the PLC correctly.

5.2 Check Error Messages

The table below shows the list of error messages displayed during manipulation or operation. Check the contents, and take proper action.

Table 5.1: Check Error Massages

Error message	Description	Action
CAN NOT WRITE PLC MEMORY.	The PLC is running in EPROM mode. Or the write-protect switch of the EEPROM is set to ON.	Run the PLC in RAM mode. Or set OFF the write-protect switch of the EEPROM.
PLC IS RUNNING.	A program is trying to be written from a personal computer using "DATA TRANSFER" in "OTHER MODE" while the PLC is running. Or an entry code has been registered.	Stop the PLC. Or enter the correct entry code.
DATA IS NOT FOUND.	There are no screen data or data files.	Create the data using the screen creation software.
DISPLAY SCREEN IS NOT AVAIL-ABLE.	Screen No. 0 (in the case of FX-PCS-DU/WIN-E) or screen No. 1 (in the case of DT-Designer) is not created yet. When a screen is to be changed over, there is no destination screen.	Create screen No. 0 or 1. Or change the changeover destination screen, or create the corresponding screen.

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