

# TOSHIBA

Leading Innovation >>>

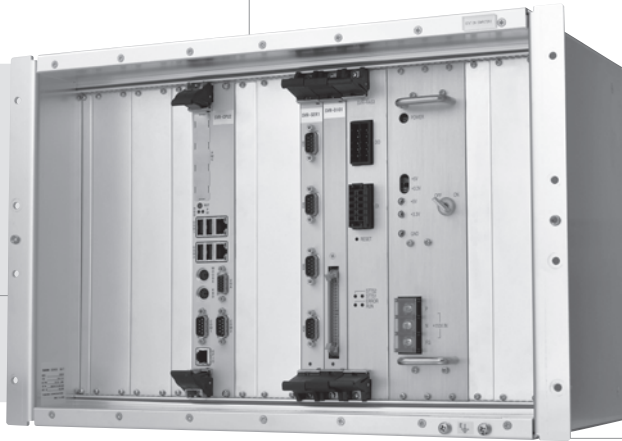
STATION COMPUTER

# GSU 100



# GSU100

## STATION COMPUTER



## FEATURES

GSU100 is a Station Computer used for station level processing and control in the substation as a main station server and/or communication server.

This Station Computer is designed to operate within Toshiba's GSC1000 Substation Automation System (SAS).

GSU100 performs control and supervision of the whole substation system including switchgear devices, transformers, control equipment, protection relays and ancillary equipment.

GSU100 can process all of the bay level data acquisition functions which are necessary for substation monitoring and control.

Communication functions and ports are provided for data exchange with a SCADA system located in a central or regional control center.

Ethernet LAN and TCP/IP protocol are used to communicate with other components within the SAS, such as the operator workstation, bay control units (BCU), etc.

Front End Processors (FEP) can be added depending on the scale of the substation. The FEP is connected to the same LAN as the Station Computer, Operator Workstation (OWS), Engineering Workstation (EWS) and other units.

The FEP acts as a co-processor, arbitrating data from Intelligent Electronic Devices (IEDs) and cooperating with the Station Computer which is the core processing unit of the system. The hardware and operating system of the Station Computer is the same as that used in the FEP.

The IEC 61850 protocol is applied for communication within the Substation Automation System.

## FUNCTIONS

GSU100 provides the following functions together with operator workstation, which performs the function of the client.

### Monitoring

- ▶ Status monitoring of substation equipment such as switchgear, protection relays, transformers, control equipment and ancillary equipment
- ▶ System monitoring
- ▶ Relay setting and monitoring (Fault monitoring)
- ▶ Measurement of I, V, P, Q, PF, f, Wh and varh
- ▶ Power quality monitoring (harmonic, sag, swell, interruption)
- ▶ Power apparatus monitoring

### Control

- ▶ Control of substation equipment such as switchgear, protection relays, transformer tap

### Record

- ▶ Event data saving and record
- ▶ Measuring data saving and trend record

### Operation and maintenance support

- ▶ Manual status setting
- ▶ Blocking function
- ▶ Safety tag
- ▶ Memorandum
- ▶ Online help
- ▶ Remote maintenance
- ▶ Busbar coloring

## Remote control centre interface

- ▶ IEC 60870-5-101
- ▶ IEC 60870-5-104

## System management

- ▶ Operation mode management
- ▶ Security management with password protection
- ▶ Database management
- ▶ Time management

## ◆ Integration into GSC1000

GSU100 Station Computer and Operator Workstation are integral components of the Substation Automation System type GSC1000. The typical system configuration of GSC1000 is shown in Figure 1.

An Ethernet LAN is used for the Station Bus to interface station level equipment with IEDs. IEC 61850 is applied for communication between the Station Computer (Server) and IEDs.

## HARDWARE

Industrial specification hardware is applied to the Station Computer. All necessary software and data for operation are stored in a flash disk, with only historical data such as event, alarm, measurement, being saved in a Hard Disk Drive (HDD), so ensuring continued operation even in the event of failure of the HDD. A shut down key switch is provided to perform power-down safely. When this switch is turned off GSU100 is powered down after all processing has been terminated.

### GSU100 consists of the following hardware modules:

- ▶ Processor: 32-bit Processor, 1 GHz, without cooling fan
- ▶ Flash disk: 2 GB
- ▶ RAM: 2 GB
- ▶ Hard disk: 320 GB
- ▶ Ethernet LAN: 2 ports for station bus (IEC 61850)  
Additional 2 ports for IEC 60870-5-104 or other utilities such as printer output (option)
- ▶ RS232C: 2 ports for RCC interface (IEC 60870-5-101)  
Additional 4 ports (option)
- ▶ Binary inputs
- ▶ Binary outputs
- ▶ RAS
- ▶ Fall back switch module: Max 6 modules (option)
- ▶ Power supply: 110/125Vdc or 220/250Vdc

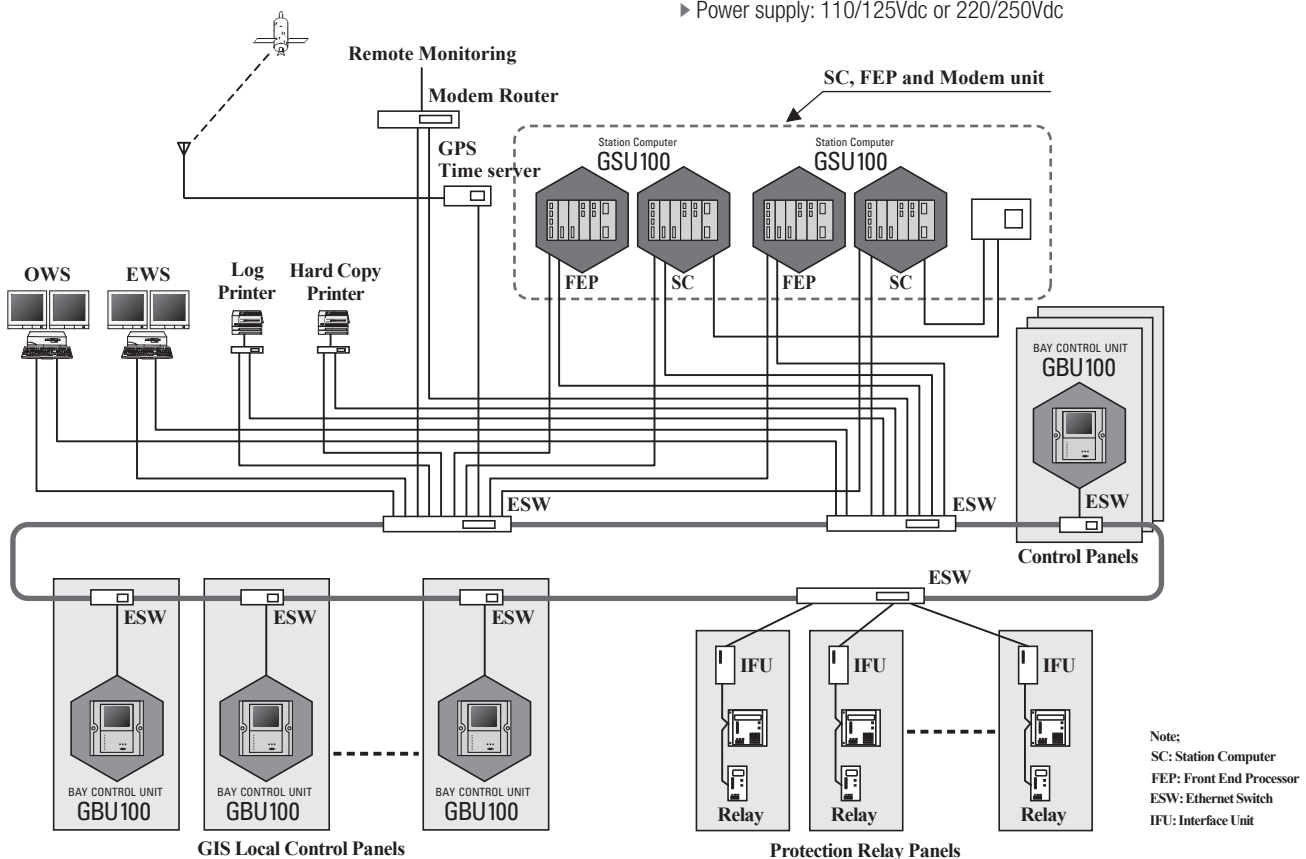


Figure 1 – Typical System Configuration of Substation Automation System GSC1000

### ◆ Ethernet interface

GSU100 is equipped with Ethernet interfaces for IEC61850 communication. Two ports of type 10/100BASE-TX are provided on the CPU module (SVR-CPU2 module) for hot-standby configuration.

An additional Ethernet interface module (SVR-ETH) with two ports of type 10/100BASE-TX is available as an option. These can be used for IEC 60870-5-104 communication or other functions such as printer connection, of which settings are configurable.

### ◆ Serial interface

GSU100 is equipped with a gateway function to communicate with a SCADA system located in a central or regional control centre. One option is to apply the IEC 60870-5-104 protocol with Ethernet interface as mentioned above.

Another option is to apply the IEC 60870-5-101 protocol with serial interface. Two RS232C ports are equipped on the CPU module (SVR-CPU2 module) for communication with IEC 60870-5-101 through modems (type GSMD1). A typical configuration is shown in Figure 2.

An additional four RS232C ports are available on an optional serial interface module (SVR-SER).

When two station computers are used for hot-standby configuration, and hot-standby communication routes are available between SCADA and SAS, fall back switch (FBS) modules can be applied for the switch-over function between the two station computers.

Figure 3 shows an example when two FBSs are applied. One FBS is equipped with three RS232C ports. One port is for communication with a modem and the other two are connected with gateway/server modules and/or an optional serial interface module (SVR-SER). Maximum 6 FBS modules are available as an option.

With all optional modules of serial interfaces, the GSU100 can communicate over maximum 6 communication routes with SCADA, and maximum 3 pairs of hot-standby configuration is available with all optional 6 sets of FBS modules.

Modem unit type GSMD1 is equipped with maximum 6 modem units.

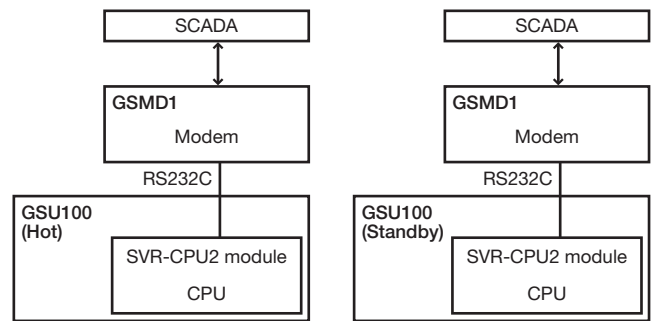


Figure 2 – Typical modem connection

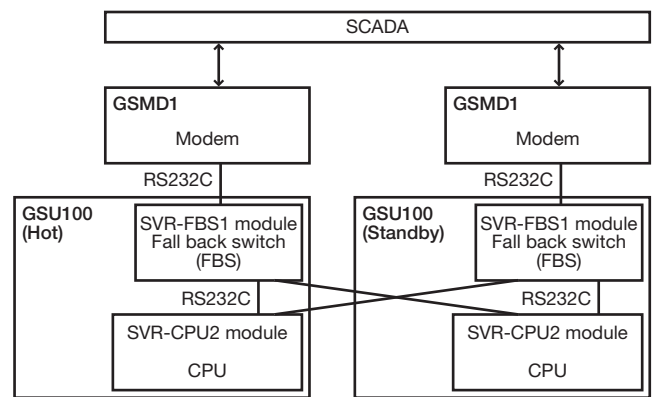


Figure 3 – Fall back switch configuration

**TECHNICAL DATA**


**Station Computer Unit**

<b>Ratings</b>	
DC power supply	110/125Vdc or 220/250Vdc (Normal range:-20% and +20% of rated voltage)
DC supply interruption permissible duration of DC supply voltage interruption to maintain normal operation	In accordance with IEC60255-11 Less than 50ms at 110Vdc
Restart time	Less than 120s
OS	Unix (Linux)
Language	English
Main processor	ULV Celeron M 1GHz
Memory (RAM)	2 GB
Interface	10/100BASE-T (RJ45): 2 ports (IEC 61850) (Additional 2 ports as option for IEC 60870-5-104 or other purposes such as printer output.) RS232C (D-sub 9-pin): 2 ports (IEC 60870-5-101) (Additional 4 ports as option) USB2.0: 4 ports
Interface for fall back switch (FBS) (Option)	RS232C (D-sub 9-pin): 3 ports for one FBS module for IEC 60870-5-101. (Maximum 6 modules)
Auxiliary storage unit	HDD: 320 GB Flash Disk: 2 GB
<b>Burden</b>	
DC power supply	Less than 50W
<b>Digital inputs of SVR-DIO</b>	
Number of channel	16 channels
Isolation	Photo-coupler
Input resistance	Approx. 3kΩ
Input voltage	12-24Vdc
Input current	Approx. 7.6mA at 24Vdc
Withstand voltage	500Vrms, 1min
<b>Digital Outputs of SVR-DIO</b>	
Number of channel	16 channels
Isolation	Photo-coupler
Rated voltage	12-24Vdc
Maximum voltage	50Vdc
Maximum load current	50mA
Output saturation voltage	1.2V typical
Withstand voltage	500Vrms, 1min
<b>Digital Inputs of SVR-RAS3</b>	
Number of channel	4 channels
Isolation	Photo-coupler
Rated voltage	110V/220Vdc
Input resistance	Approx. 100kΩ
<b>Digital Outputs of SVR-RAS3</b>	
Contact rating	110Vdc Make and carry: Max. 10A, 220Vdc for 0.5s(L/R ≥ 5ms) Break: Max. 0.1A, 220Vdc (L/R=40ms)
<b>Mechanical design</b>	
Weight	10kg
Installation	Flush mounting or rack mounting

## Modem Unit

Ratings	
DC power supply	110/125Vdc or 220/250Vdc (Normal range: -20% and +20% of rated voltage)
DC supply interruption permissible duration of DC supply voltage interruption to maintain normal operation	In accordance with IEC60255-11 Less than 50ms at 110Vdc
Interface	RS232C (D-sub 25-pin) for IEC60870-5-101 Maximum 6 units
Burden	
DC power supply	Less than 20W
Digital inputs of MDM-MD	
Mode of operation	Full duplex over 4-wire leased lines
Data Rate	1200bps
Transmit Level	+3dBm ~ -28dBm (adjustable per 1dBm)
Receive Level	0 ~ -40dBm
Mechanical design	
Weight	10kg
Installation	Flush mounting or rack mounting

**ENVIRONMENTAL PERFORMANCE**

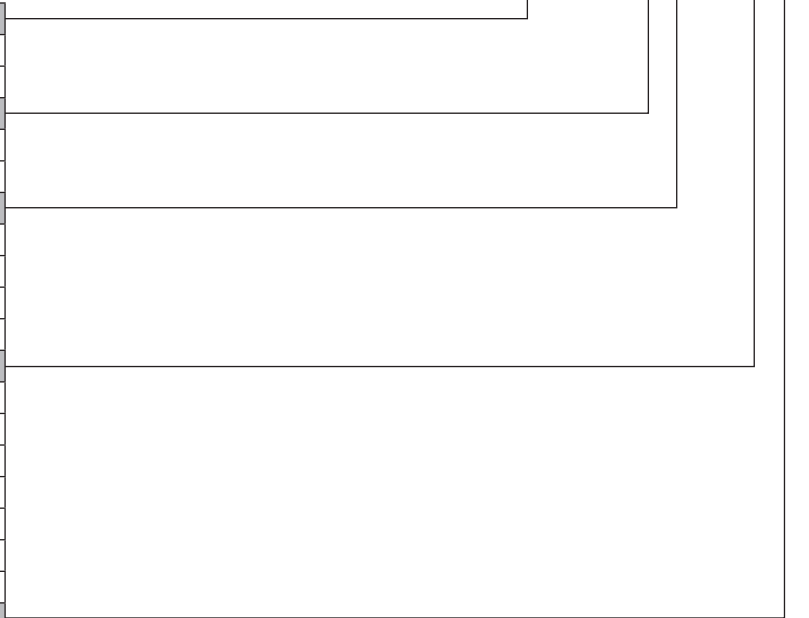
Test	Standards	Details
<b>Atmospheric Environment</b>		
Temperature	IEC60870-2-2	Class B2: Operating range: 5C to +40C.(With HDD) Class Ct1: Storage / Transit: -25C to +70C.
Humidity	IEC60870-2-2	Class B2: 5% to 85%.
Enclosure Protection	IEC60529	IP20
<b>Mechanical Environment</b>		
Vibration	IEC 60255-21-1	Response - Class 1 Endurance - Class 1
Shock	IEC 60255-21-2	Shock Response Class 1 Shock Withstand Class 1
Seismic	IEC 60255-21-3	Class 1
<b>High Voltage Environment</b>		
Dielectric Withstand	IEC60255-5	2kVrms for 1 minute between all terminals and earth. 2kVrms for 1 minute between independent circuits. 1kVrms for 1 minute across normally open contacts.
High Voltage Impulse	IEC60255-5	Three positive and three negative impulses of 5kV (peak), 1.2/50s, 0.5J between all terminals and between all terminals and earth.
<b>Electromagnetic Environment</b>		
High Frequency Disturbance	IEC60255-22-1	1MHz 2.5kV applied to all ports in common mode.
	IEC 61000-4-12	1MHz 1.0kV applied to all ports in differential mode.
Electrostatic Discharge	IEC60255-22-2 Class 3 IEC 61000-4-2	6kV contact discharge. 8kV air discharge. (With cover)
Radiated RF Electromagnetic Disturbance	IEC60255-22-3, IEC 61000-4-3	Field strength 10V/m for frequency sweeps of 80MHz to 1GHz. Additional spot tests at 80, 160, 450, 900 MHz.
Fast Transient Disturbance	IEC60255-22-4, IEC 61000-4-4	4kV, 2.5kHz, 5/50ns applied to all inputs.
Surge Immunity	IEC 60255-22-5, IEC 61000-4-5	1.2/50s surge in common/differential modes: PSU and I/O (RAS3) ports: 2kV/1kV (peak)1
Conducted RF Electromagnetic Disturbance	IEC 60255-22-6 IEC 61000-4-6	10Vrms applied over frequency range 150kHz to 80MHz. Additional spot tests at 27 and 68MHz.
Power Frequency Disturbance	IEC 60255-22-7, IEC 61000-4-16	300V 50Hz for 10s applied to ports in common mode. 150V 50Hz for 10s applied to ports in differential mode.
Conducted and Radiated Emissions	IEC 60255-25, EN 55022 Class A, IEC 61000-6-4	Conducted emissions: 0.15 to 0.50MHz: <79dB (peak) or <66dB (mean) 0.50 to 30MHz: <73dB (peak) or <60dB (mean) Radiated emissions (at 30m): 30 to 230MHz: <30dB 230 to 1000MHz: <37dB
<b>European Commission Directives</b>		
	89/336/EEC	Compliance with the European Commission Electromagnetic Compatibility Directive is demonstrated according to EN 61000-6-2 and EN 61000-6-4.
	73/23/EEC	Compliance with the European Commission Low Voltage Directive is demonstrated according to EN 50178 and EN 60255-5.

# ORDERING

## Station Computer

GSU100 - [ ] A - [ ] - [ ]

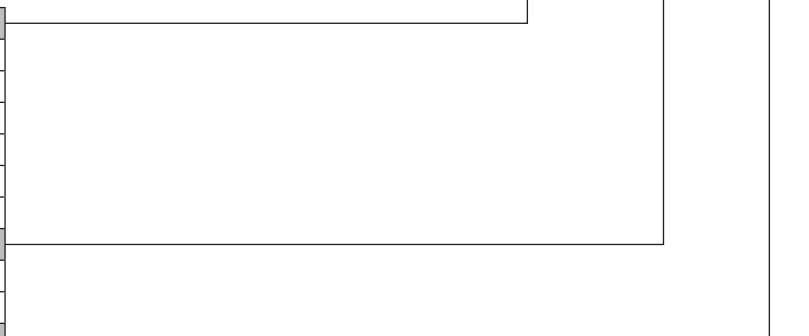
Model:	
Basic Standard model	100
with DIO module	101
DC power supply rating:	
110V/125V	1
220V/250V	2
Port number of station level LAN:	
2 Ethernet and 2 RS232C ports	0
2 Ethernet and 6 RS232C ports	1
4 Ethernet and 2 RS232C ports	2
4 Ethernet and 6 RS232C ports	3
Fall back switch (FBS):	
Channel 0	0
Channel 1	1
Channel 2	2
Channel 3	3
Channel 4	4
Channel 5	5
Channel 6	6
Hard Disk Driver:	
None	0
320GB HDD	1



## Modem Unit

GSMD1 - [ ] A - [ ] - [ ]

Model:	
1200bps, 1 modem unit provided	101
1200bps, 2 modem units provided	102
1200bps, 3 modem units provided	103
1200bps, 4 modem units provided	104
1200bps, 5 modem units provided	105
1200bps, 6 modem units provided	106
DC power supply rating:	
110V/125V	10
220V/250V	50
Miscellaneous:	
Simplex power supply	00
Duplex power supply	10





APPLICATION

Configuration

GSU100 Station Computer

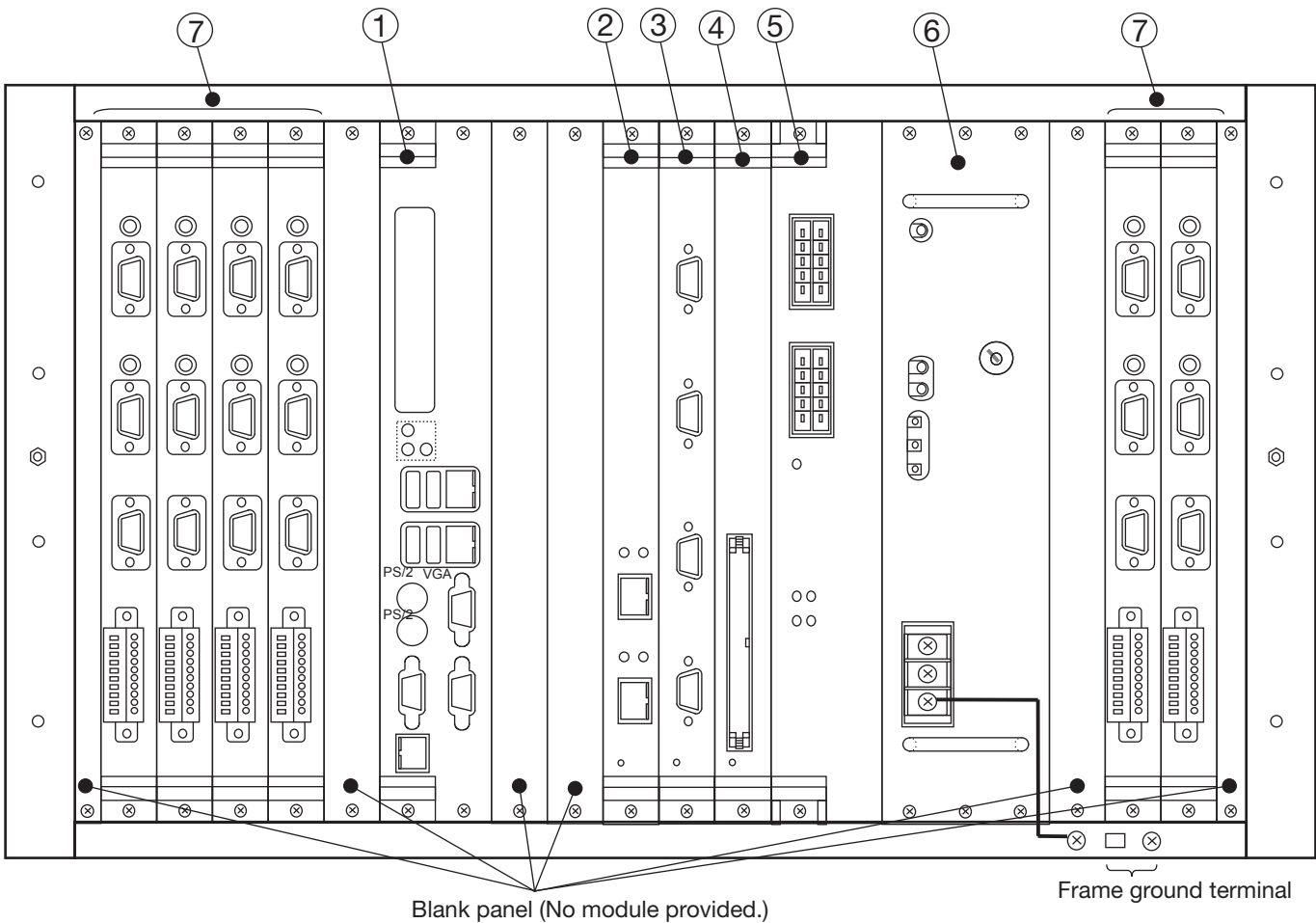


Figure 4 – Front View of GSU100 (SC Unit)

Table 1 List of modules (SC Unit)

No.	Module name	Description	Remarks
①	SVR-CPU2	CPU module with hard disk, two Ethernet and two RS232C serial interface ports, etc.	
②	SVR-ETH	Ethernet interface module (2 x ports)	Option
③	SVR-SER	Serial interface module (4 x RS232C ports)	Option
④	SVR-DIO	Digital input/output (binary I/O) module	
⑤	SVR-RAS3	RAS module	
⑥	SVR-PW3	DC power supply module	
⑦	SVR-FBS1	Fall back switch module (3 x RS232C ports for each module)	Option

GSU100

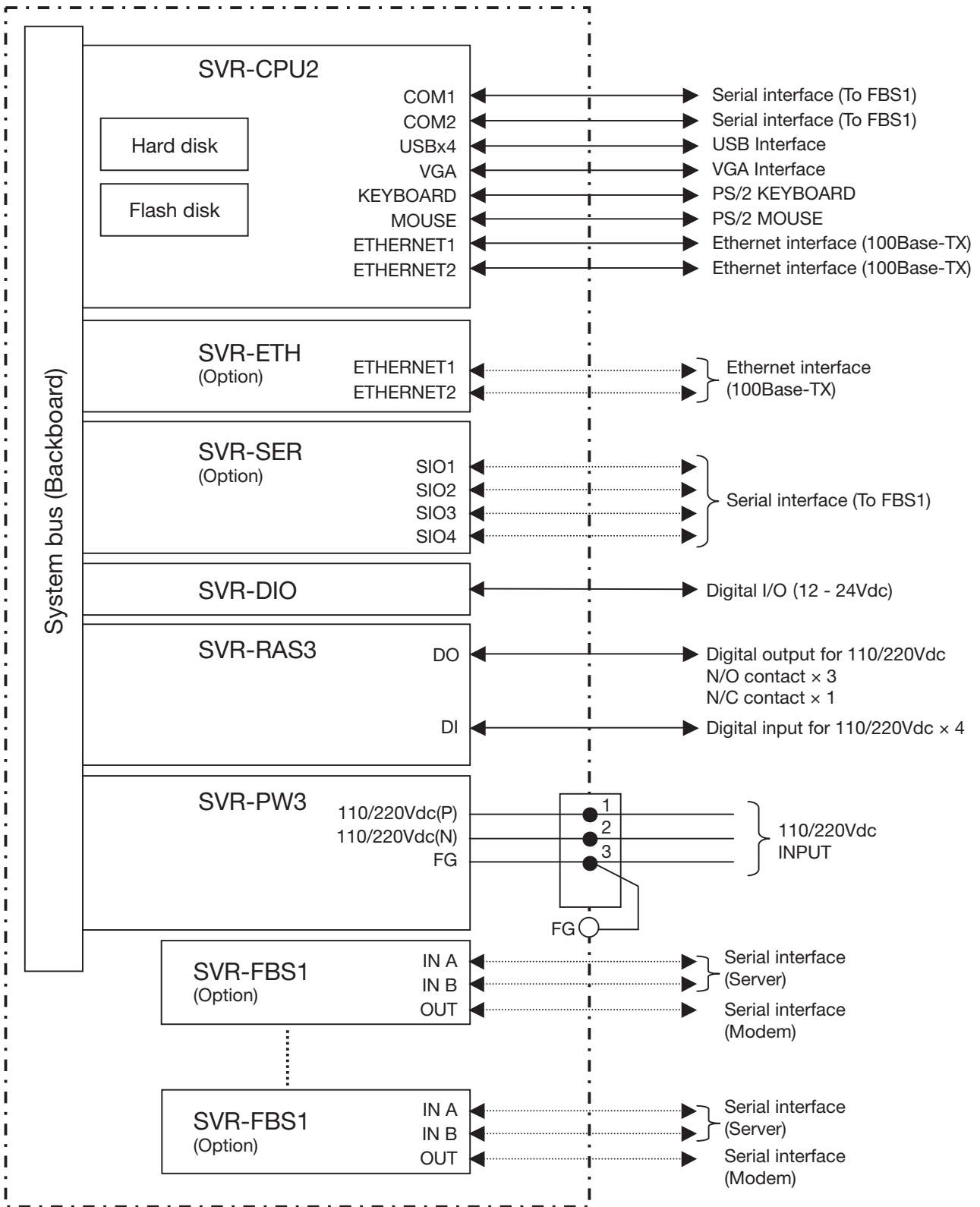


Figure 5 – Hardware Block Diagram

**SVR-DIO Module**

\*Pin array of I/O connector

40P Connector (Manufacturer:3M , Type:3432-5002LCSC)

(Upper side)			
Pin No.	Signal name	Pin No.	Signal name
40	DOCOM1(N)	39	DOCOM1(N)
38	DOUT15	37	DOUT14
36	DOUT13	35	DOUT12
34	DOUT11	33	DOUT10
32	DOUT9	31	DOUT8
30	DOCOM0(N)	29	DOCOM0(N)
28	DOUT7	27	DOUT6
26	DOUT5	25	DOUT4
24	DOUT3	23	DOUT2
22	DOUT1	21	DOUT0
20	DICOM1(P)	19	DICOM1(P)
18	DIN15	17	DIN14
16	DIN13	15	DIN12
14	DIN11	13	DIN10
12	DIN9	11	DIN8
10	DICOM0(P)	9	DICOM0(P)
8	DIN7	7	DIN6
6	DIN5	5	DIN4
4	DIN3	3	DIN2
2	DIN1	1	DIN0
(Lower side)			

OUTPUT

INPUT

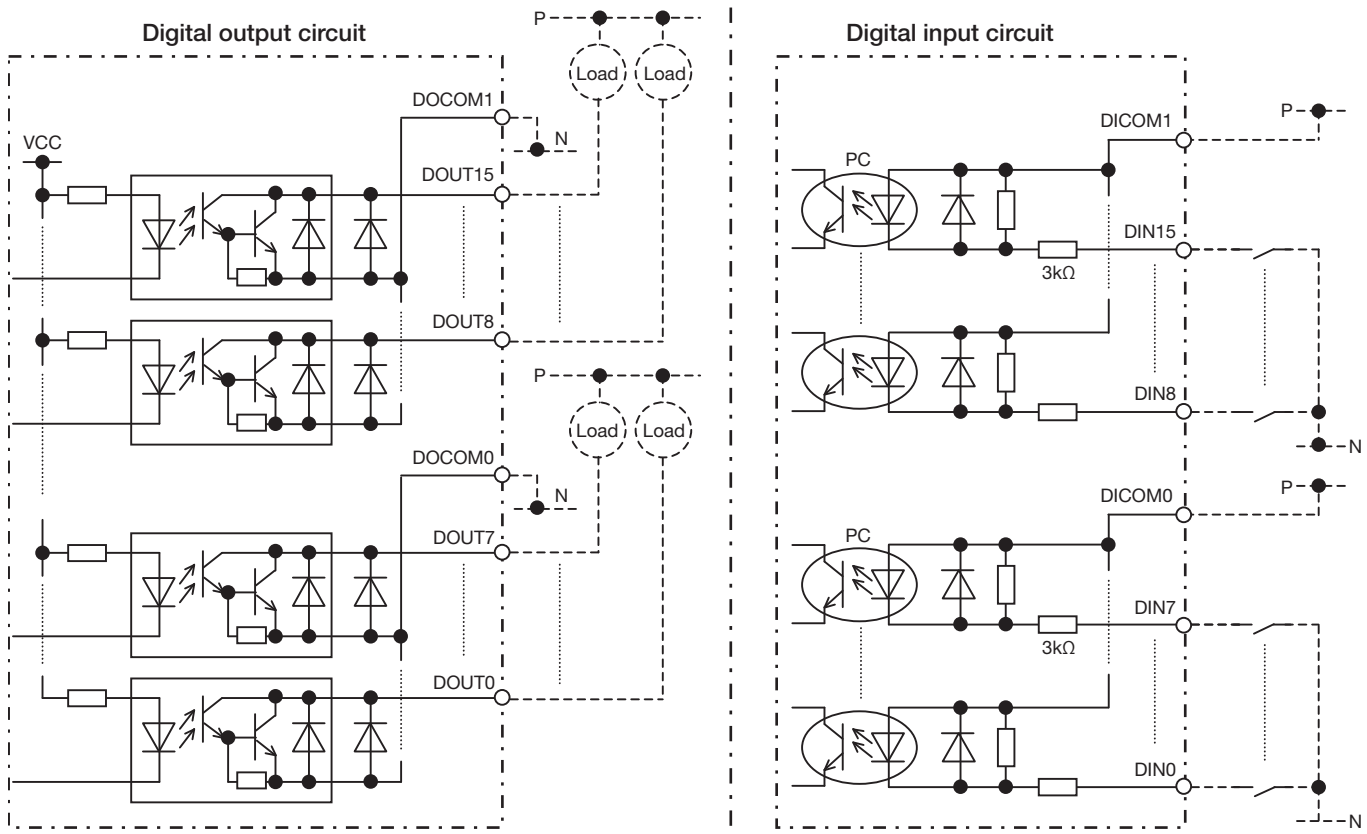


Figure 6 – External connection of SVR-DIO

## SVR-RAS3 Module

### \*Pin array of DO connector

10P Connector (Manufacturer: Tyco Electronics AMP , Type:1-316080-3)

(Upper side)			
Pin No.	Signal name	Pin No.	Signal name
1A	D00	1B	D02
2A		2B	
3A	Not used	3B	Not used
4A	D01	4B	D03
5A		5B	

(Lower side)

D00: N/O contact for general use, 110V/220Vdc

D01: N/O contact for general use, 110V/220Vdc

D02: N/O contact for unit failure alarm, 110V/220Vdc

D03: N/C contact for DC failure alarm, 110V/220Vdc

### \*Pin array of DI connector

10P Connector (Manufacturer: Tyco Electronics AMP , Type:1-316080-3)

(Upper side)			
Pin No.	Signal name	Pin No.	Signal name
1A	DI0P	1B	DI2P
2A	DI0N	2B	DI2N
3A	Not used	3B	Not used
4A	DI1P	4B	DI3P
5A	DI1N	5B	DI3N

(Lower side)

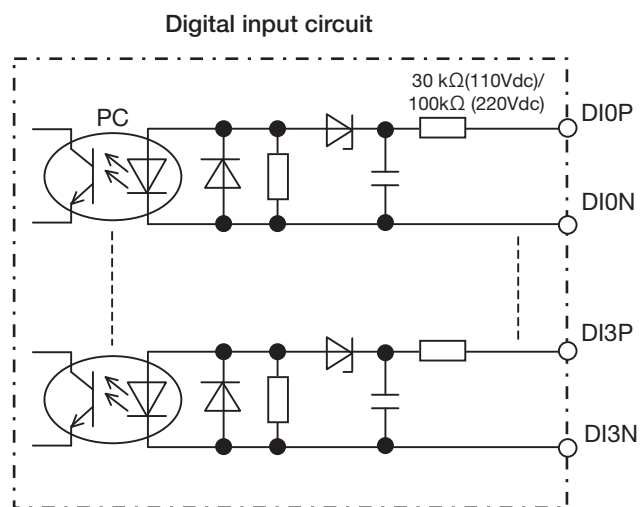


Figure 7 – External connection of SVR-RAS3

GSMD1 Modem unit (Option)

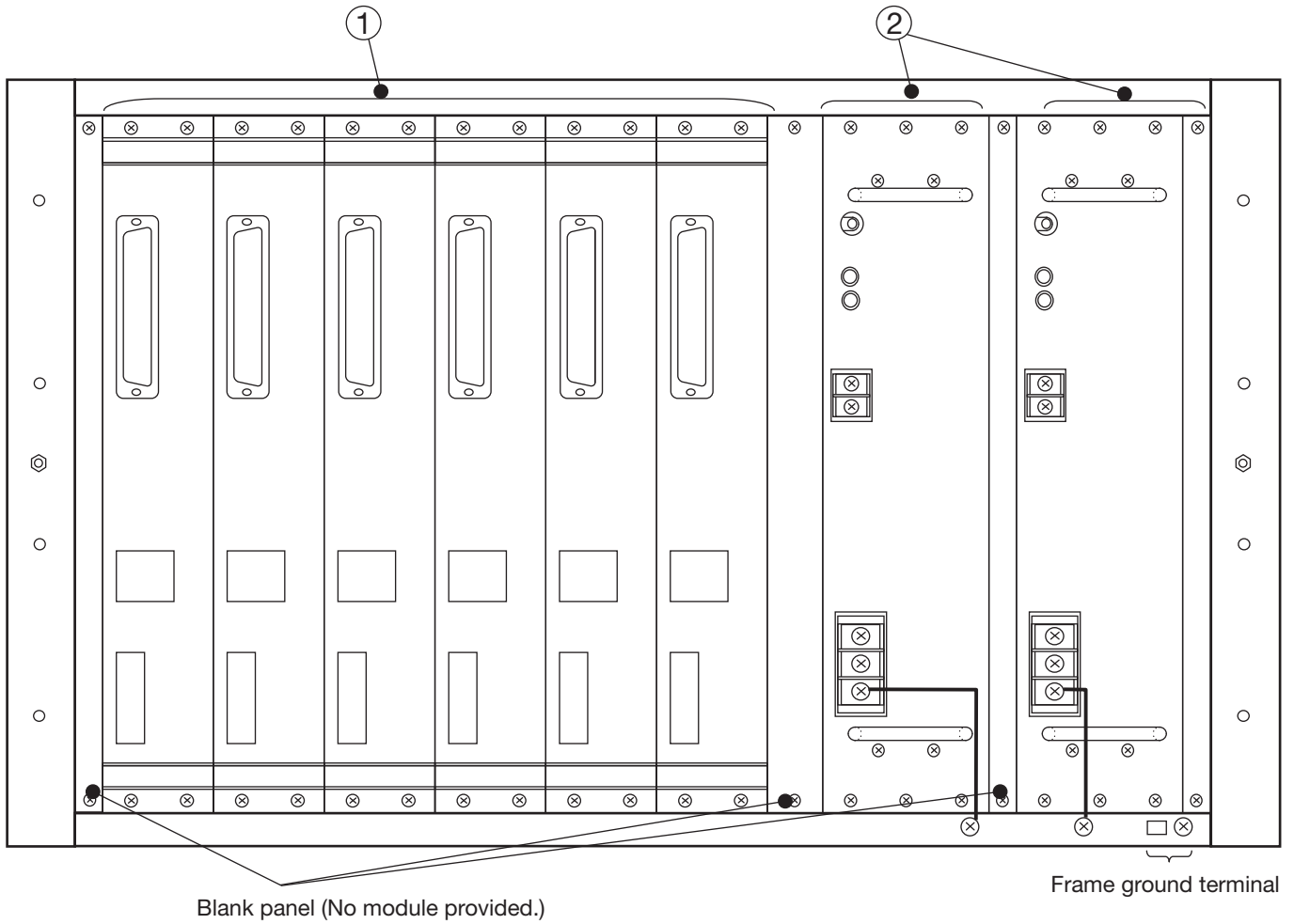


Figure 8 – Front View of Modem Unit

Table 2 List of modules (Modem Unit)

No.	Module name	Description	Remarks
①	MDM-MD1	Modem module	
②	MDM-PW1	DC power supply module	

### Modem Unit (Option)

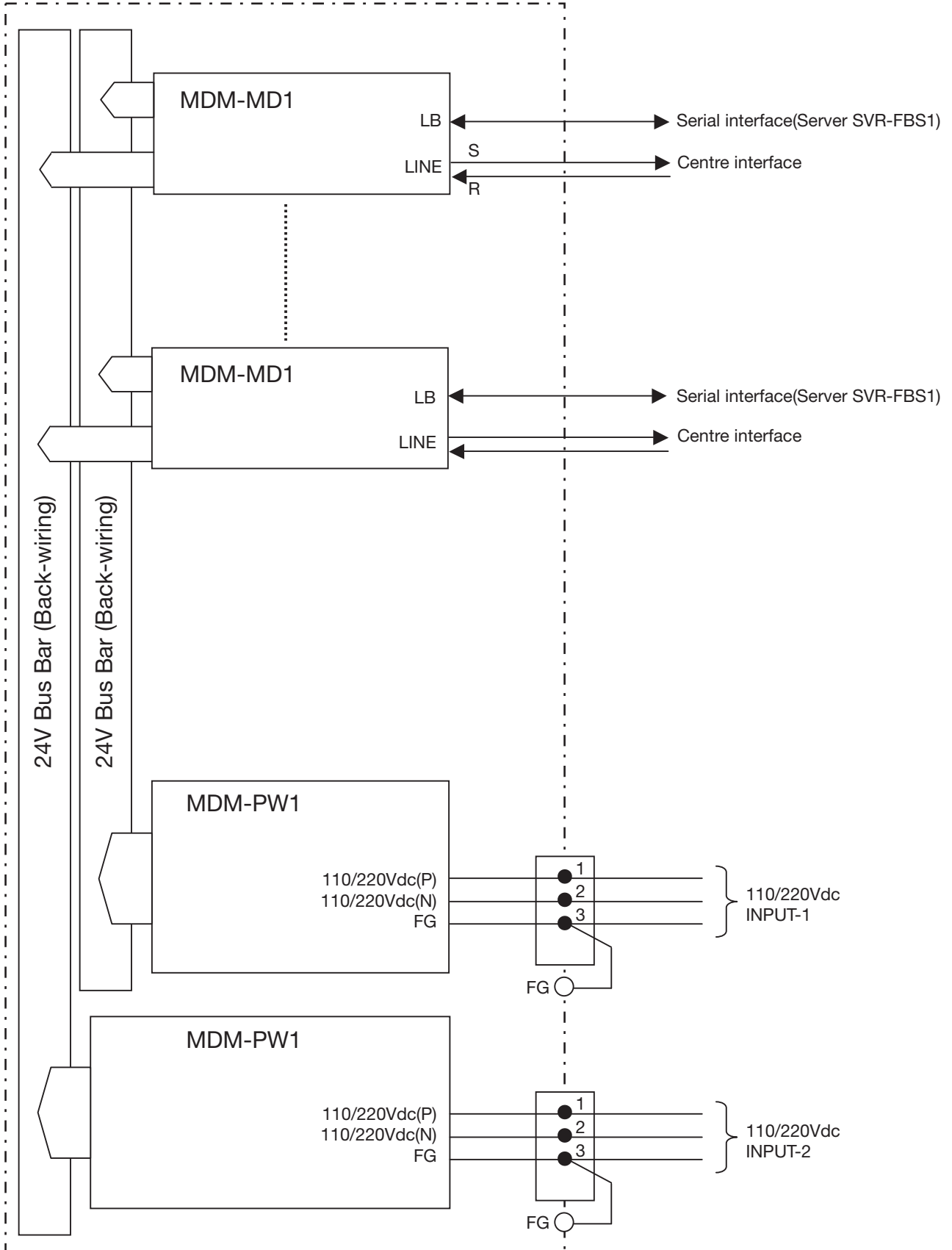
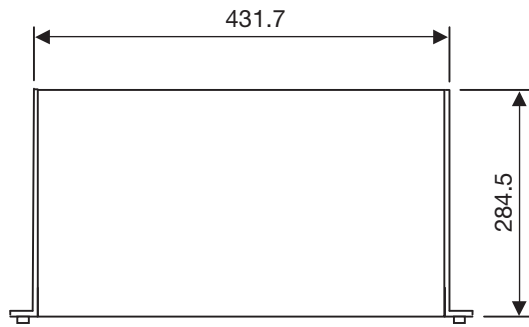
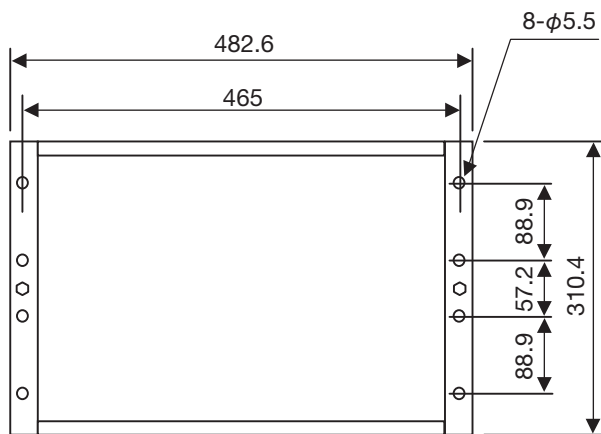


Figure 9 – Hardware Block Diagram of modem

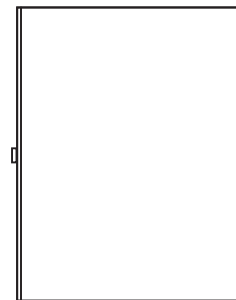
Case Outline



Top view

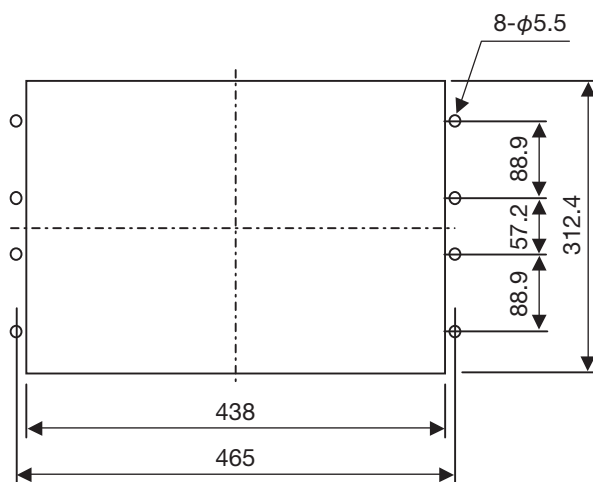


Front view



Side view

Panel Cutout



# TOSHIBA

## **TOSHIBA CORPORATION**

Transmission Distribution & Industrial Systems Company  
1-1, Shibaura 1-Chome, Minato-Ku, Tokyo 105-8001, Japan  
Tel +81-3-3457-3644 Fax +81-3-5444-9166  
<http://www.toshiba-relays.com>

The data given in this catalog are subject to change without notice.

Printed in Japan

**6 6 4 8**

1003A1