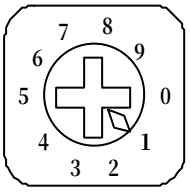
Chapter 4 Performance specification

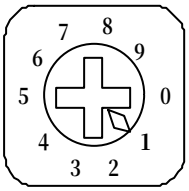
4.1 Operation mode setting

The operation mode of this module is set with operation mode switch on the front, and interlocking/stand-alone mode or operation mode for each channel is determined according to the operation mode. Setting method of operation mode is after selecting required mode adjusting switch values of operation mode with power off, set by power on. Operation mode is unchangeable even if switch values of operation mode are changed during operation, so surely after power off, change the switch values. [Table4.1] & [Table4.2] describe the operation modes according to switch values.

[Table4.1] Operation mode of G3L-CUEA/G4L-CUEA

Switch type	Switch value of operation mode	Operation mode		Remark	
		RS-232C	RS-422		
 Applicable module (G3L-CUEA/G4L-CUEA)	0	User defined communication	User defined communication	Off-line mode [Note3]	Interlocking mode[Note1]
	1	Dedicated communication	Dedicated communication		
	2	User defined communication	User defined communication		Stand-alone mode[Note2]
	3	Dedicated communication	Dedicated communication		
	4	User defined communication	Dedicated communication		
	5	Dedicated communication	User defined communication		
	6	GMWIN	User defined communication		
	7	GMWIN	Dedicated communication		
	8	Loop-Back	Loop-Back	Self-diagnosis mode	
		Flash writing mode Ver. 2.0 [Note4]			
	9	On-line mode Ver. 2.0 [Note5]			

[Table4.2] Operation mode of G6L-CUEB/G6L-CUEC

Switch type	Switch value of operation mode	Operation mode		Remark
 Applicable module (G6L-CUEB/CUEC)	0	User defined communication	Off-line mode	G6L-CUEC doesn t support GMWIN service (supports only G6L-CUEB)
	1	Dedicated communication		
	2	GMWIN service		
	3	Loop-Back		
	4 ~ 7	Not used		
	8	Flash writing mode Ver. 2.0		Not used in Ver.1.0[Note6]
	9	On-line mode Ver. 2.0		

Remark

[Note1] In interlocking mode, main channel is set to RS-232C, RS-422 channel is operated as data path of channel RS-232C (channel RS-422 disabled), and transmission spec. is operated according to setting value of RS-232C.

[Note2] RS-232C/RS-422 channels are operated separately in stand-alone mode

[Note3] Off-line mode sets the operation mode with mode switch. (existing mode)

[Note4] Supported only in Ver.2.0 or later and used for downloading of library file of other company's dedicated communication protocol with flash memory of Cnet I/F module.

[Note5] Supported only in Ver.2.0 or later and used for setting the operation mode of module with Frame Editor.

[Note6] When setting in mode not used, do not set Cnet I/F module because both channels of RS-232C/RS-422 are not operated.

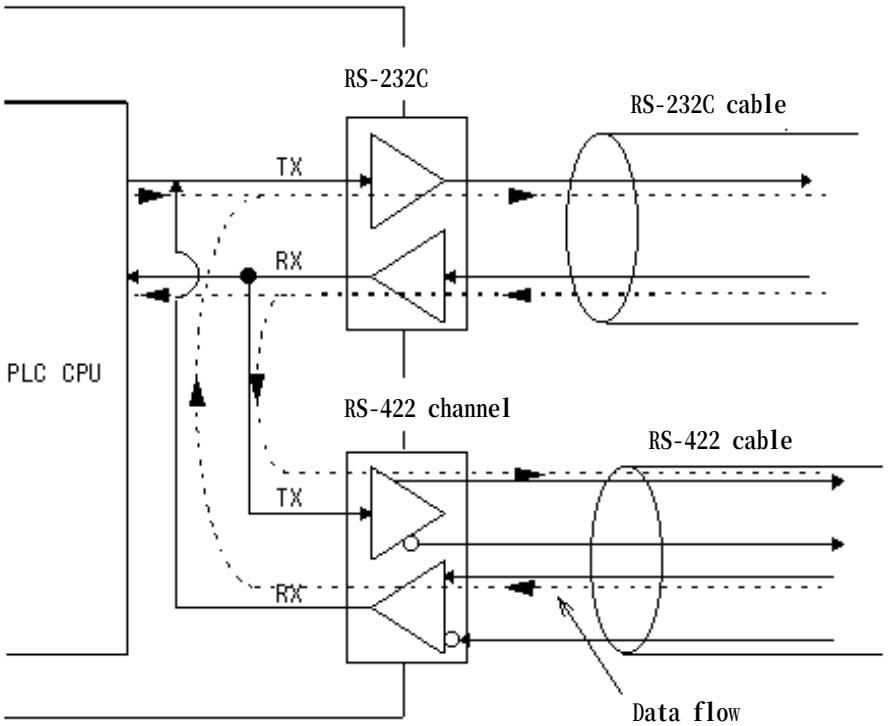
[Note7] Separate setting of operation mode for GM7 series isn't required, however, the operation is decided according to communication parameter of GMWIN.

4.1.1 Channel operation in interlocking mode

In interlocking mode, channels RS-232C and RS-422 are operated as interlocked with each other. In other words, the data received via channel RS-232C is sent via channel RS-422, and the data received via channel RS-422 is sent via channel RS-232C in reverse.

In interlocking mode, main channel is automatically set to RS-232C, data is transmitted/received via channel RS-232C only, and the data is received via channel RS-422 is automatically sent via channel RS-232C without receiving into Cnet I/F module.

[Figure4.1] Data flow in interlocking mode



Remark

[Note1] In interlocking mode, data is transmitted/received in accordance with setting values of channel RS-232C transmission spec. and the transmission spec. of RS-422 can be ignored.

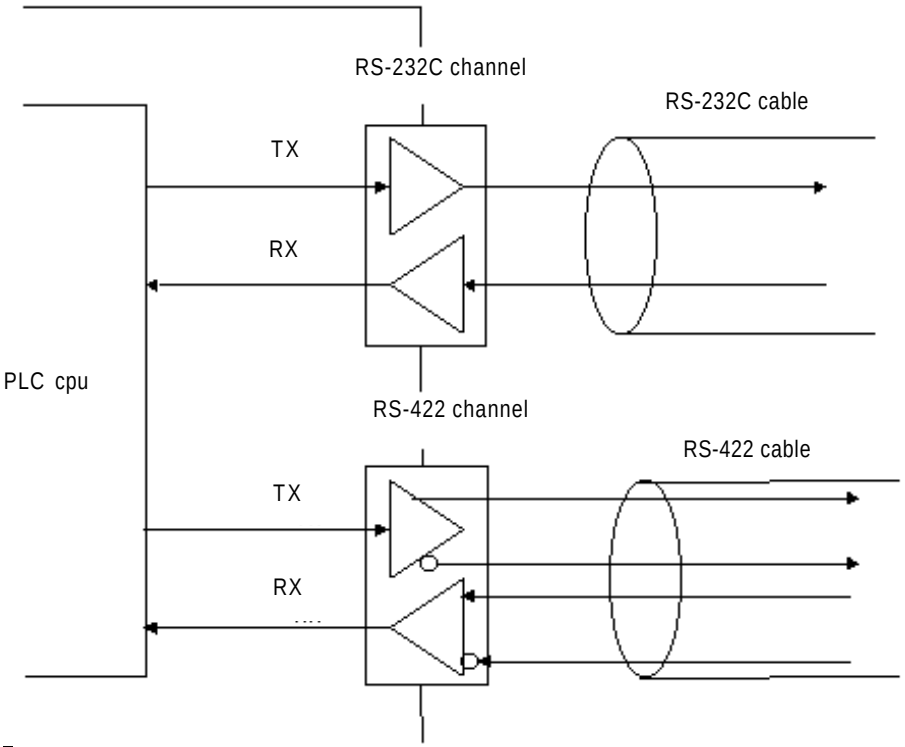
[Note2] In interlocking mode, modem can not be connected to RS-232C. During connecting modem, it must be used only after setting to the stand-alone mode. In case that modem is set to be used in interlocking mode, channel RS-232C is operated as in null modem mode.

[Note3] GM6 and GM7 series don t support interlocking mode.

4.1.2 Channel operation in stand-alone mode

In stand-alone mode, channels RS-232C and RS-422 are operated independently to allow simultaneous Tx / Rx in separate transmission specifications. Therefore, transmission specifications can be set per RS-232C and RS-422 channel, and the operation is started/stopped according to channels. Data flow of each channel in stand-alone mode is as below.

[Figure 4.2] Data flow in stand-alone mode



Remark

[Note1] Mode change during operation is unavailable. The mode switch value of the front shall be set to required position surely after power off.

[Note2] Each operation per channel shall be started surely after setting transmission spec. of channels RS-232C and RS-422 and writing for each channel of RS-232C and RS-422 in Frame Editor.

4.1.3 Channel operation in self diagnosis mode(Loop-Back)

Loop-Back diagnosis is a function to check if communication channel is normally operated by itself without connection with external devices, and is operated only if the mode switch is in Loop-Back mode. For the details of operation method, see 'Chapter 9 Diagnosis function'.

4.2 Method of serial interface

4.2.1 RS-232C interface

Channel RS-232C uses 9-pin connector (Female) for communication with external devices. The names and functions of pins and data directions are as shown in the figure below.

[Figure 4.3] Pin specifications of 9-pin connector for RS-232C

Pin No.	Name	Contents	Signal direction (Cnet<-->external devices)	Description
1	CD	Carrier Detect	←	Reports carrier detection of DCE to DTE
2	RxD	Received Data	←	Received data signal
3	TxD	Transmitted Data	→	Transmitted data signal
4	DTR	Data Terminal Ready	→	Reports communication ready of DTE to DCE
5	SG	Signal Ground	↔	Ground line for signal
6	DSR	Data Set Ready	←	Reports communication ready of DCE to DTE
7	RTS	Request To Send	→	Requests data transmission from DTE to DCE
8	CTS	Clear To Send	←	Reports data transmission available from DCE to DTE
9	RI	Ring	←	Reports ringing tone received from DCE to DTE

Channel RS-232C can communicate with external devices directly and also with remote communication devices using modem. When connecting modem, communication type of RS-232C must be set to 'modem' with Frame Editor, and when not using modem, it must be set to null modem. But when the channel mode is as interlocked, modem can not be connected because it is operated as in null modem even if set to modem.

Remark

[Note1] DTE:Data Terminal Equipment (Cnet I/F module)

[Note2] DCE:Data Communication Equipment (external modem)

1) How to connect RS-232C connector during modem connection

Cnet I/F module can communicate with devices of long distance as connected with modem. Modem and RS-232C channel shall be connected as in [Figure4.4] below.

[Figure 4.4] Cable connection between RS-232C and modem

Cnet(9-PIN)		Connection No. and signal direction	Modem side(25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI[Note]		RI	22

[Note] No. 9, RI signal is not used in Cnet I/F module.

2) How to connect connector for RS-232C in null modem mode

In null modem, connector can be connected in 7-wire (with handshake) or 3-wire (without handshake) type. [Figure 4.5] as of 7-wire connection shows connection drawing when controlling CD(Carrier Detect) signal line by external devices.

[Figure 4.5] Connection of 7-wire type (with handshake)

Cnet(9-PIN)		Connection No. and signal direction	Computer/communication devices
Pin No.	Name		Name
1	CD		CD
2	RXD		RXD
3	TXD		TXD
4	DTR		DTR
5	SG		SG
6	DSR		DSR
7	RTS		RTS
8	CTS		CTS
9	RI		RI

If CD signal is not controlled by external devices, it must be connected in 3-wire type connection as in [Figure 4.6]. Recent PC does not control CD signal line, so when connecting with PC, it must be connected in 3-wire type.

[Figure 4.6] Connection of 3-wire type (without handshake)

Cnet(9-PIN)		Connection No. and signal direction	Computer/communication devices
Pin No.	Name		Name
1	CD		CD
2	RXD		RXD
3	TXD		TXD
4	DTR		DTR
5	SG		SG
6	DSR		DSR
7	RTS		RTS
8	CTS		CTS
9	RI		RI

Remark

[Note1] When in null modem communication via RS-232C channel, wiring without handshake shall be performed on the side of Cnet I/F module as in [Figure4.6] even if only 3 wires are used in external devices.

[Note2] If not wired as in [Figure4.6], transmission in Cnet I/F module isn't available, however, receiving via Cnet I/F module is allowed.

4.2.2 RS-422 interface

Channel RS-422 uses 6-pin connector (Terminal Block) for communication with external devices. The names and functions of pins and data directions are as shown in [Figure 4.7] below.

[Figure 4.7] Pin specifications of 6-pin connector for RS-422

Pin No.	Name	Signal direction (Cnet<-->external devices)	Description
1	RDA(RXA)	←	Received data(+)
2	RDB(RXB)	←	Received data(-)
3	SDA(TXA)	→	Transmitted data(+)
4	SDB(TXB)	→	Transmitted data(-)
5	S.G(SG)	—	Ground line for signal
6	F.G	—	Ground line for frame

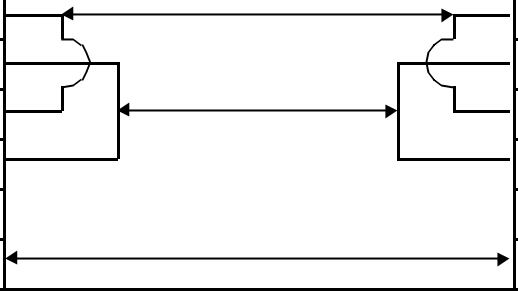
❑ Contents in ( ) of the name mean terminal specification of G7L-CUEC.

Channel RS-422 is designed as available to connect RS-422 and RS-485(multi-drop) with external devices. When RS-422 channel is used as multi-drop, set channel RS-422 to RS-485 communication in setting menu of RS-422 communication type of Frame Editor, and use the terminals of RS-422 as connected as shown in [Figure4.9].
[Figure4.8] shows an example of connecting communication cable in RS-422 communication.

[Figure 4.8] RS-422 connection

Computer link side		Signal direction (Cnet<--->external devices)	External communication device
Pin No.	Name		
1	RDA(RXA)	←	SDA
2	RDB(RXB)	←	SDB
3	SDA(TXA)	→	RDA
4	SDB(TXB)	→	RDB
5	S.G(SG)	↔	S.G
6	F.G	↔	F.G

[Figure 4.9] RS-485 connection

Computer link side		Signal direction	External communication
Pin No.	Name	(Cnet<--->external devices)	device
1	RDA(RXA)		SDA
2	RDB(RXB)		SDB
3	SDA(TXA)		RDA
4	SDB(TXB)		RDB
5	S.G(SG)		S.G
6	F.G		F.G

[Figure4.9] shows how to connect RS-485 multi-drop communication. In case of multi-drop communication, to connect with external devices, RDA and SDA, RDB and SDB of RS-422 channel shall be connected each other. At this time half-duplex communication is run sharing Tx/Rx line, so RS-422 channel mode shall be applied as set to RS-485 in Frame Editor.

Remark

[Note1] G7L-CUEC does not use Frame Editor and is designed to be set automatically by communication parameter of GMWIN.

4.3 How to set transmission specifications

4.3.1 Setting items

Transmission specifications of transmission speed and data type of data/stop bit are set by Frame Editor in this module. Accordingly, user is required to set the following items in accordance with the transmission specifications of the system to be used. Transmission specifications set via Frame Editor are to write by Cnet I/F module. Since the contents with the writing completed are saved in flash memory of computer link inside, they are still saved as unchanged if powered off until re-written in Frame Editor.

In stand-alone mode, channels RS-232C/RS-422 shall be set separately. In interlocking mode, only RS-232C needs setting because they are operated by transmission specifications of RS-232C channel.

[Table 4.3] Transmission specifications

Item		Setting value	Basic value[Note1]	Remark
Data type	Data Bit	7 or 8	8bit	If in stand-alone mode, 2 channels of RS-232C/RS-422 operate separately, and if in interlocking mode, they are operated in RS-232C setting mode.
	Stop Bit	1 or 2	1bit	
	Start Bit	1	1bit	
	Parity	Even/Odd/None	None	
Transmission speed(bps)		300/600/1200/2400/4800/ 9600/19200/38400/76800[Note2]	38400bps	
RS-232C channel mode		Modem/null modem[Note3]/ dedicated modem	Null modem	
RS-422 channel mode		RS-422 / RS-485[Note4]	RS-422	
Station No.		0 ~ 31[Note5]	0	*Dedicated mode *Other company's dedicated mode Ver.2.0

Remark

[Note1] Basic value means the basic value as set as released from the factory.

[Note2] 76800bps is provided for RS-422/RS-485 channel and serviceable in module Ver. 1.3 or later. Speed of RS-232C channel is allowed up to 38400bps.

[Note3] Modem mode can be set only if in operation mode separate. If in interlocking mode, it is operated with null modem mode.

[Note4] If set to RS-485, RS-422 channel is converted to half-duplex communication mode.

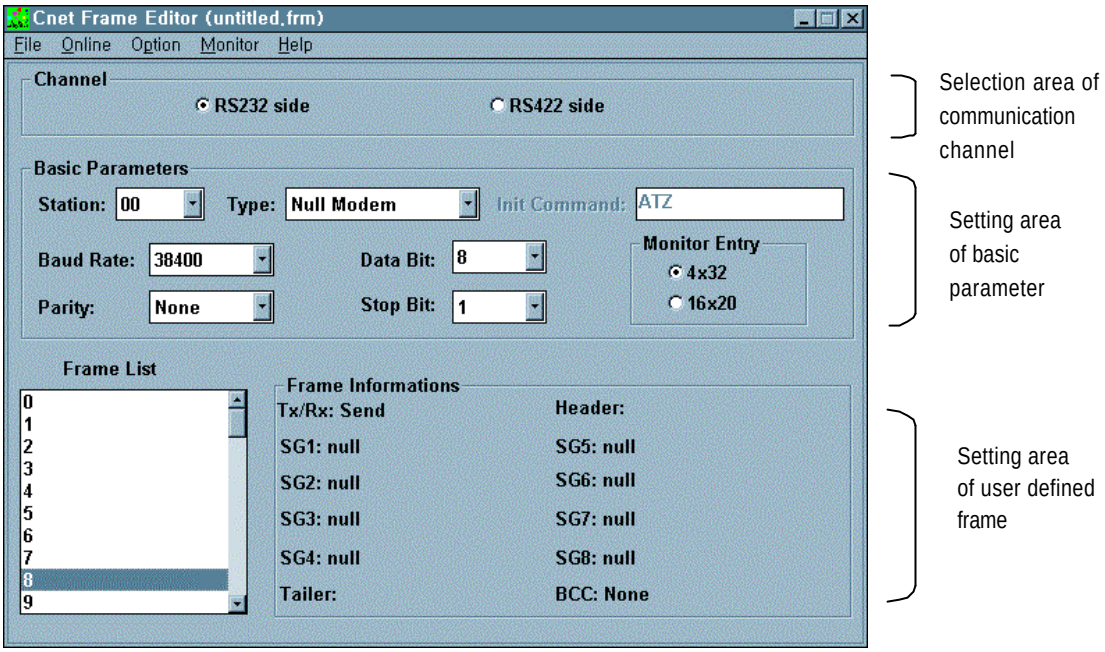
[Note5] Station No. is valid only in dedicated mode and other company's dedicated mode and can be set differently according to each channel of RS-232C/RS-422. In user defined and GMWIN modes, station No. set is insignificant.

4.3.2 How to set

Transmission specifications are set by Frame Editor with the setting sequence as below.

1) Run Frame Editor in Windows.

2) The following initial setting screen is displayed



3) Select communication channel to set in the above screen.

4) Select communication type referring to the table below.

[Table 4.4] Example of criteria for selection of communication type

Communication channel	Communication type	Selection criteria
RS-232C	Modem	For communication with remote PC or remote connection with GMWIN via public line (telephone line) using dial-up modem
	Null modem	For communication with local PC or external devices as connected with cable directly. (within 15m)
	Dedicated modem	For line-dedicated communication using dedicated modem
RS-422	RS-422	For 1:N communication of full-duplex type with external devices. (within 500m)
	RS-485	For multi-drop communication of half-duplex type with external devices. (within 500m)

5) Enter station No. for dedicated mode or other company's dedicated mode. Station No. can be set from 0 to 31.

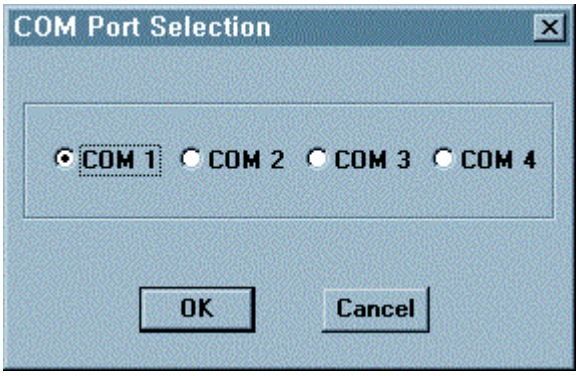
6) Set the other basic parameters(communication speed, data bit, parity, and stop bit) in accordance with the communication type.

7) If parameters have been set, write according to channels. First, connect GMWIN cable between CPU of PLC and PC.

Remark

[Note1] GMWIN cable shall be connected between RS-232C port of PLC CPU and PC. If linked with RS-232C port of Cnet I/F module, the connection via Frame Editor isn't available.

8) Select [Option]-[port] in Frame Editor to display the dialog box below. Continuously select serial port of PC side connected with GMWIN cable and click on the [OK] button.

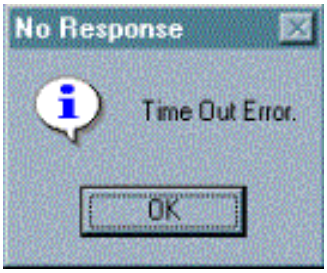


.

9) Select [Online]-[Connect] to connect with PLC. If the screen below is displayed, the connection is completed.

If the connection failed, two causes are expected as follows.

A) If no response in time



If the message above is displayed, RS-232C cable between PC and PLC may not be connected, or the connection status may be abnormal. Check the connection status of RS-232C cable to verify that RS-232C cable is correctly connected with loader port of PLC CPU.

B) If failed to open communication port

The message below is displayed as caused separately by abnormal setting of communication port.

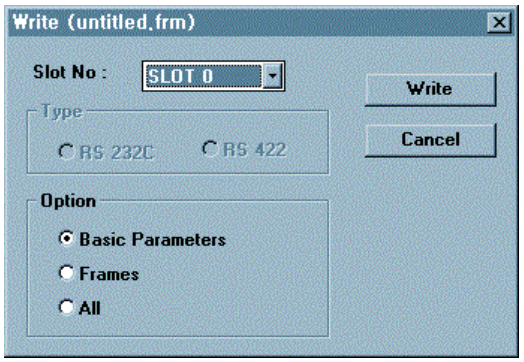
If the message 'Can't open port' is displayed, check communication port setting in option menu of Frame Editor if set as repeated with the mouse or other devices, and then try re-connection.

Remark

[Note1] PLC connection is unavailable with Frame Editor if connected with PLC in GMWIN program. If the message above 'Can't open port' is displayed, check if GMWIN is connected in GMWIN program.

[Note2] To the contrary, connection to GMWIN as connected via Frame Editor isn't allowed

10) After the connection is completed, select [Online]-[Write] to write parameters.



In Write dialog box as above, set the position where the module to be written is mounted with slot No., and select writing with communication option set to 'basic parameter'.

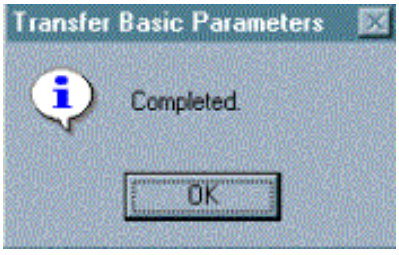
Remark

[Note1] If user defined frame has been prepared, let it set to frame in communication option to write frame only. Similarly to this, if 'All' is selected, basic parameter and frame can be written at a time.

[Note2] Check the power status of PLC prior to writing of parameter or frame. If powered off while writing, data in flash memory of Cnet I/F module may be crushed.

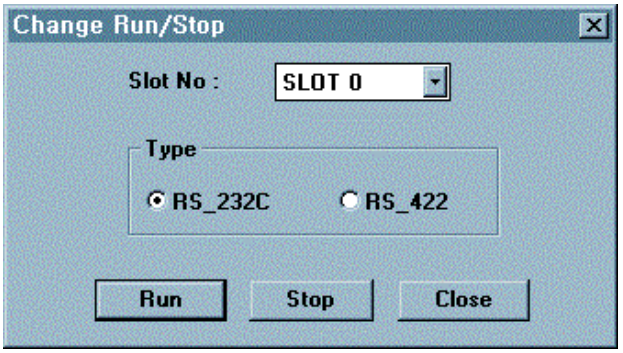
[Note3] Switch over PLC to STOP mode when writing parameter and frame. If writing while PLC running, writing error may occur. In this case, power off and then let it on back to perform writing again after switching over PLC to STOP mode

If writing of parameters is completed, the completion message as in the following figure is displayed.



If parameter writing is performed, Cnet operation of the correspondent channel stops. Therefore, after parameter writing is completed, select [Online]-[Change RUN/STOP] to switch operation of the correspondent channel over to run.

Select the slot No. of computer link module and the channel of operation to switch over in the dialog box for operation change and click on [Run] button to start the correspondent channel.



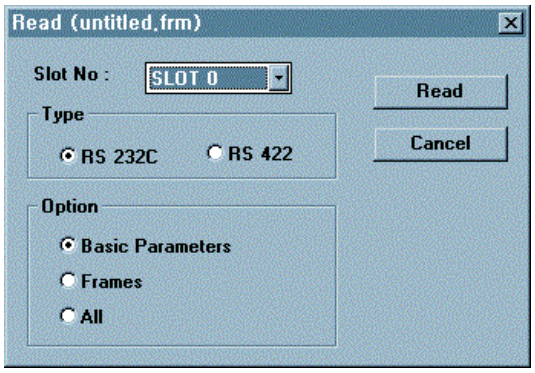
In these methods, run the correspondent channel to start operation after basic parameters are set and written according to channels RS-232C/RS-422.

4.3.3 Reading setting values

Basic parameters saved in flash memory of Cnet I/F module can be confirmed by reading through Frame Editor or checking through LED display.

How to read basic parameters through Frame Editor is specified as follows.(refer to 'Appendix A, LED indication specification' for checking through LED display.)

1) Select [Online]-[Connect] in basic screen of Frame Editor to finish the connection with PLC. How to connect is same as in 4.3.2.
2) Select [Online]-[Read] to display the dialog box below if the connection has been completed.
   Enter Cnet's slot No., communication type and communication option herein and then select [Read].

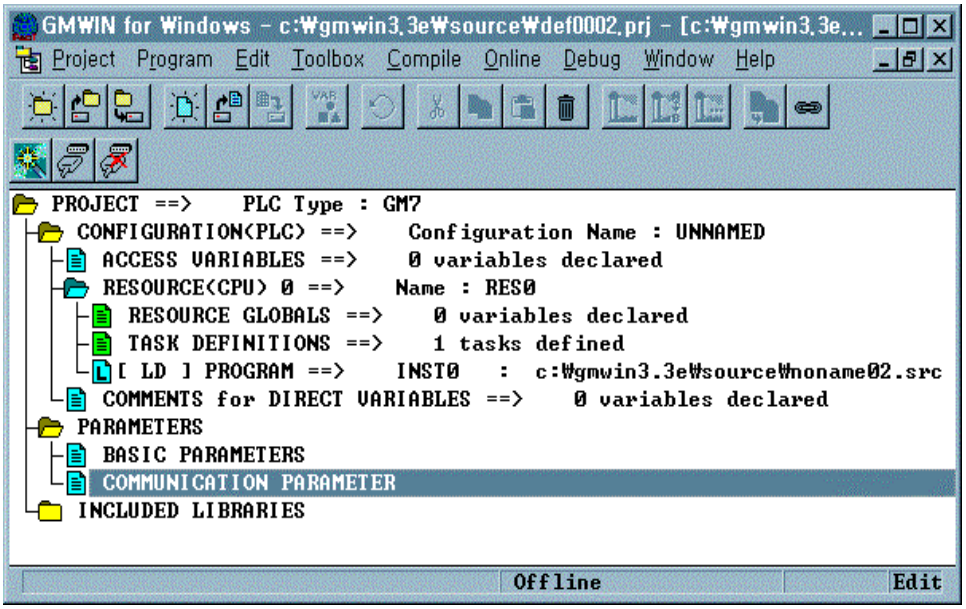


If reading is finished, the basic values which have been read are displayed in basic screen of Frame Editor and can be saved in a file.

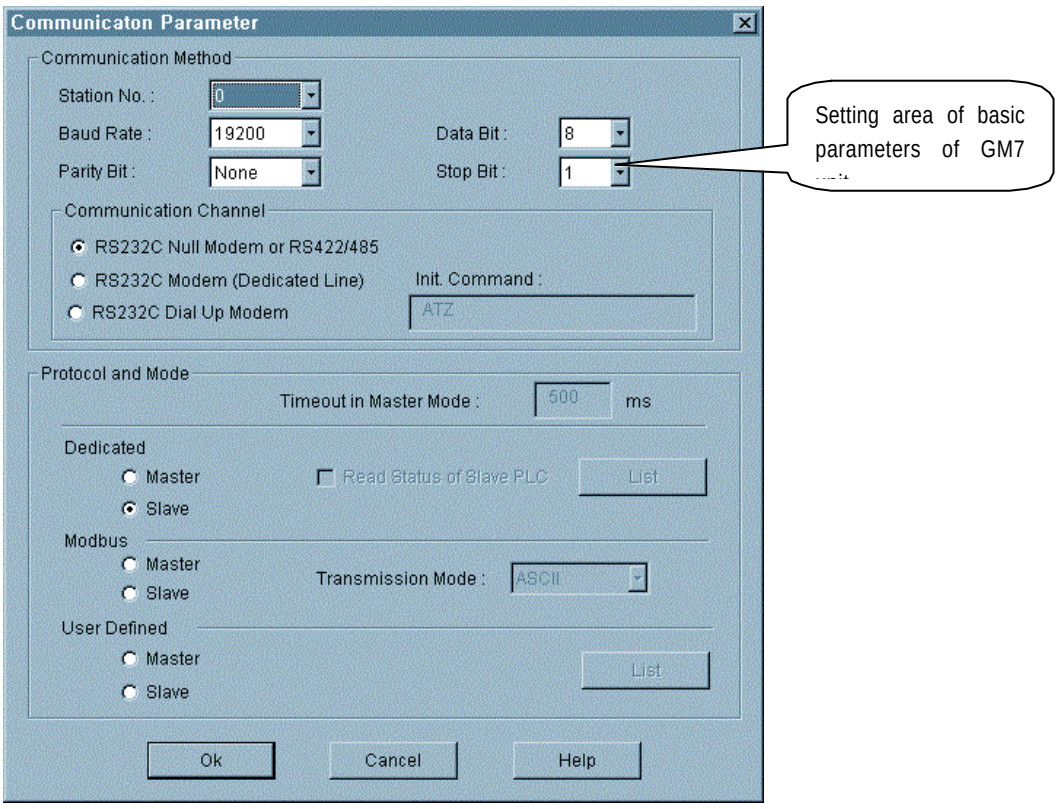
4.3.4 Transmission specification setting of GM7 series

Transmission specification of GM7 series is composed as set inside the communication parameter of GMWIN without Frame Editor.

1) Select and execute the communication parameter after GMWIN is started.

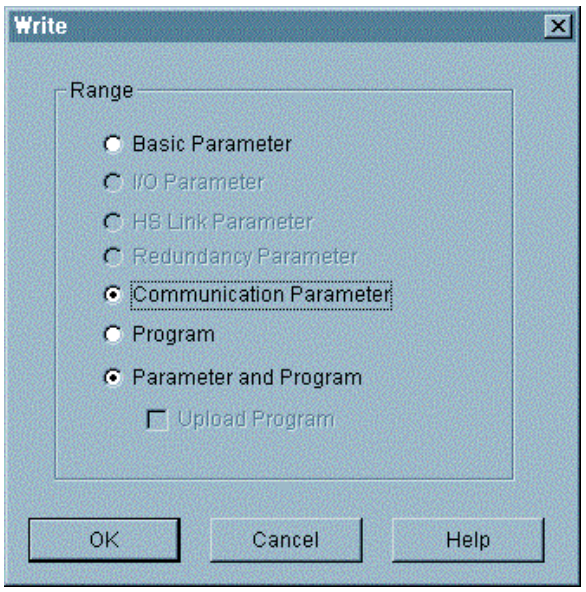


2) Select communication type of the communication parameter in accordance with the contents to set.



3) Select self-station number, communication speed, parity bit, data bit, stop bit and communication channel of Cnet I/F module to communicate among items in communication type.

4) If parameter setting of communication type is completed, enter protocol and transmission mode below and then select writing of communication parameter for program.



5) Start and execute the correspondent program after writing is performed.

4.4 How to connect to modem

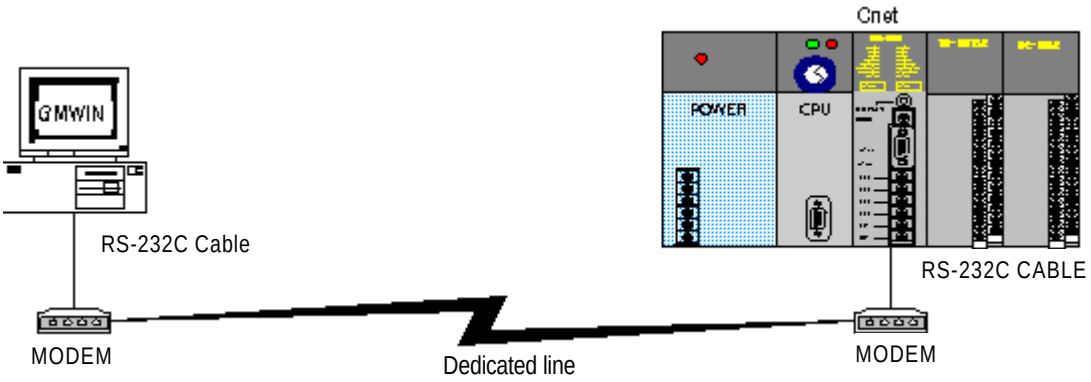
Cnet I/F module has a function for long-distance communication via RS-232C channel using public line. How to connect to public line using Cnet I/F module is as follows

1) Dedicated modem communication via dedicated line

2) Dial-up modem communication via normal telephone line

Since these two types of communication differ from each other according to characteristics of the line, they shall be used with modem connection as set differently by Frame Editor. [Figure4.10] shows long-distance communication using dedicated modem.

`[Figure 4.10] Example of dedicated modem communication



Connection sequence of this module to the modem is as below.

Set the basic parameter of Cnet I/F module as agreed with modem.

↓

Set the initial value of dedicated modem or dial-up modem.

↓

Connect modem to Cnet I/F module with modem connection cable.

↓

Power on Cnet I/F module and modem, and check if LED on.

If abnormal → Refer to chapter 4, for troubleshooting.

↓ If normal

Modem communication starts operation.

4.4.1 Connection to dedicated modem (RS-232C)

4.4.1.1 Modem selection

Performance of dedicated modem communication with Cnet I/F module depends on the condition and status of dedicated modem and dedicated line. Since low-performance modem or inferior line causes deterioration of communication, the modem as specified below is recommended for reliable communication.

Item	Specification
Communication speed	More than 2400 bps
Flow control	CTS/RTS Flow Control
Line control	Full-duplex/Half-duplex (2-line/4-line)
RTS-CTS delay	Within 500msec

4.4.1.2 How to connect dedicated modem with Cnet I/F module

Connect dedicated modem with Cnet I/F module via RS-232C channel using 9-pin cable as wired as below.

Cnet(9-PIN)		Connection No. and signal direction	Modem side(25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI		RI	22

4.4.1.3 Dedicated modem setting

Most dedicated modems are designed to set operation mode via dip switch or LED display window according to modem manufacturers. Operation type needs setting as agreed with communication type with Cnet I/F module referring to user's manual for modem. The following items related to communication with Cnet I/F module shall be set.

Item	Setting contents	Remark
Communication speed	Select according to modem speed and status of communication line	Same as Cnet I/F module
Data type	Asynchronous 10 bit[Note1]	Set to basic setting values of Cnet
RTS-CTS delay	0msec	Set to the smallest value
DTR control	ON compulsorily	
Communication mode	Set according to 4-line/2-line	

Remark

[Note1] Data type needs setting agreed with communication type of Cnet I/F module as in asynchronous type as supported only by Cnet I/F module. The number of bits shall be calculated according to setting values of data bit/stop bit/parity bit of basic parameters in Cnet I/F module. Start bit of Cnet I/F module is always set to 1 and parity bit possesses 1 bit regardless of Even/Odd. The table below shows an example of setting the number of bits according to basic parameters set in Cnet.

Start	Data	Stop	Parity	Number of bits	Ex. of Data-Bit calculation
1 always	8	1	None	10 bits	1 + 8 + 1 + 0 = 10 bits
1 always	7	0	Even	9 bits	1 + 7 + 0 + 1 = 9 bits

4.4.1.4 How to set

Cnet I/F module shall be set to stand-alone channel for dedicated modem communication and is, regardless of operation mode available to communicate distantly via dedicated modem in all the modes of user defined, dedicated communication and GMWIN modes. [Table4.3] shows operation modes where modem connection is available. As in Table, modem connection is not available in interlocking mode but only in stand-alone mode. If connecting with modem after interlocking mode is set, beware of modem communication which isn't available due to null modem operation.

Remark

[Note1] This module can be connected with dedicated modem/dial-up modem only via RS-232C channel.

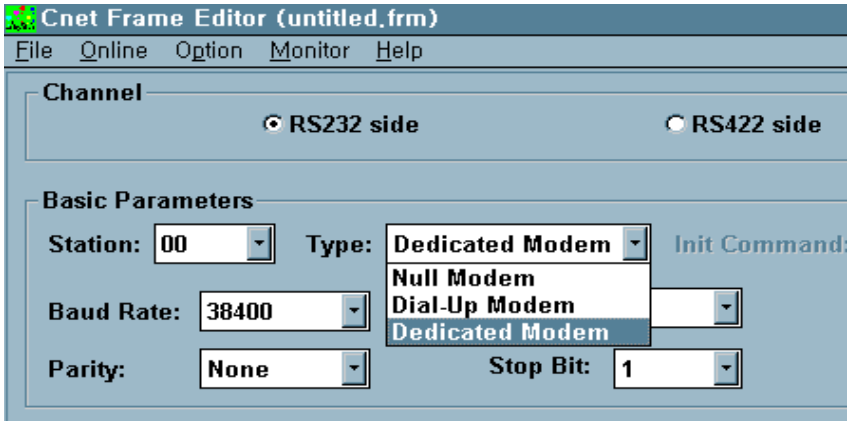
[Note2] For such modems as optical modem and wireless modem supporting RS-422 communication, communication via RS-422 channel is available without additional setting in Cnet I/F module.

[Table4.5] Switches available to connect with modem

Switch value	Module type			
	G3L-CUEA	G4L-CUEA	G6L-CUEB	G6L-CUEC
0	Unavailable	Unavailable	Available	Unavailable
1	Unavailable	Unavailable	Available	Unavailable
2	Available	Available	Available	Unavailable
3	Available	Available	Unavailable	Unavailable
4	Available	Available	Not used	Not used
5	Available	Available	Not used	Not used
6	Available	Available	Not used	Not used
7	Available	Available	Not used	Not used
8	Unavailable	Unavailable	Unavailable	Unavailable
9	Available if set to stand-alone channel in Ver. 2.0 Ver.2.0		G6L-CUEB module only available in Ver. 2.0 Ver.2.0	

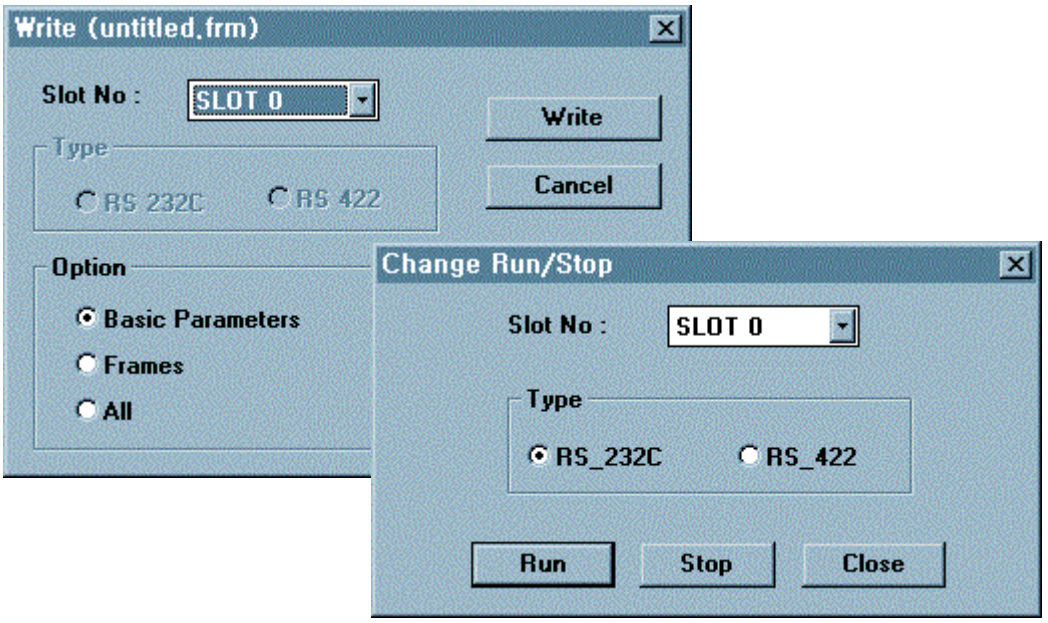
Basic setting sequence of Cnet I/F module with Frame Editor is as follows.

1) Run Frame Editor program in Windows.
2) Select RS-232C of communication channel in basic parameter items of Frame Editor and set such transmission specifications of communication speed, data, stop bit, etc. as in transmission type set in dedicated modem.



3) Set communication type to dedicated modem in basic parameter setting in Figure above. (Basic value is set to null modem)

4) Write basic parameters and change communication in [Online] connection of Frame Editor to switch RS-232C channel over to communication run.

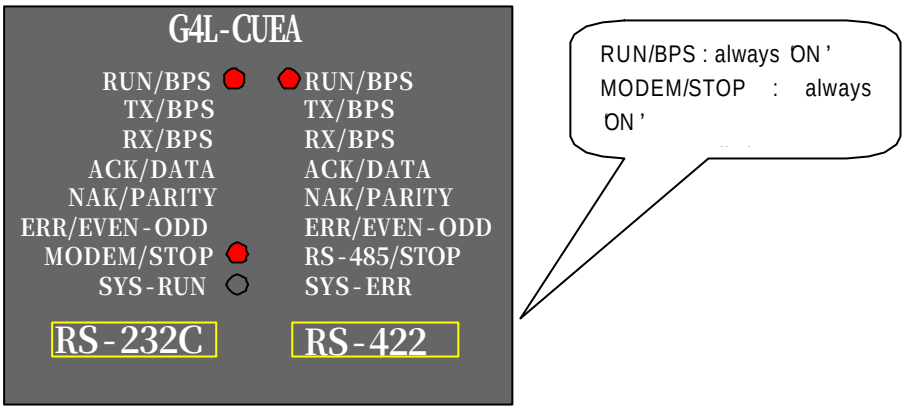


5) If switched to communication run, operation setting of Cnet I/F module is completed and the setting contents are saved in flash memory of the module as reserved even if powered off.

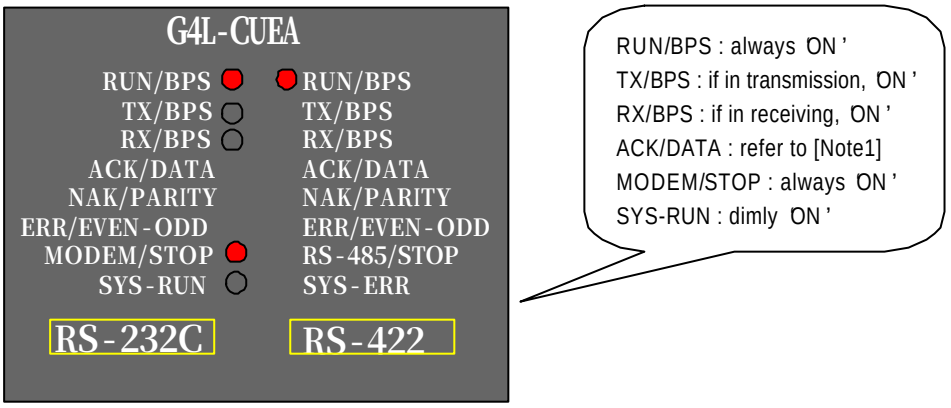
4.4.1.5 Troubleshooting for dedicated modem

If basic setting of Cnet I/F module and dedicated modem is completed, connect Cnet I/F module with dedicated modem using modem connection cable and start normal communication with power on. At this moment communication can be checked if normal or not through LED display of Cnet I/F module and dedicated modem. Only LED of RS-232C channel in Cnet I/F module is related with modem operation. In dedicated modem, user's manual for dedicated modem shall be referred to according to makers due to different specification of LED display.

1) Module's LED status before communication starts



2) Module's LED status during normal communication



Remark

[Note1] ACK and NAK are turned ON if normal response is transmitted when communicating in dedicated mode. Refer to Chapter 7 for details of dedicated mode in this user's manual.

3) Troubleshooting for module: If module's LED status is abnormal differently as above, refer to checklist in [Table4.4] to shoot the trouble.

[Table4.6] Checklist for module's LED

LED type	If normal	If abnormal	Action to take
RUN	ON	OFF	1) Run RS-232C channel operation using Frame Editor
TX	Flash if in transmission	No flash	1) Check cable connection between module and dedicated modem 2) Check setting of mode program and station number based on module operation mode
RX	Flash if in receiving	No flash	1) Check connection of dedicated line 2) Check status of dedicated line 3) Check cable connection between module and dedicated modem 4) Check if data is transmitted from the other station's dedicated modem
ERROR	OFF	Flash	1) Check if communication speeds of dedicated modem and module are identical 2) Check if data bit setting of dedicated modem is identical with calculated basic-setting values of module 3) Check connection of cable
MODEM	ON	OFF	1) Download communication type of RS-232C channel as set to dedicated modem via Frame Editor 2) Let channel operation mode set to stand-alone mode

4) LED display & Troubleshooting for dedicated modem: Since LED specification for dedicated modem differs according to makers, user's manual for modem shall be referred to. [Table4.5] describes how to troubleshoot in dedicated modem based on common specification of LED display.

[Table4.7] Checklist for dedicated module's LED

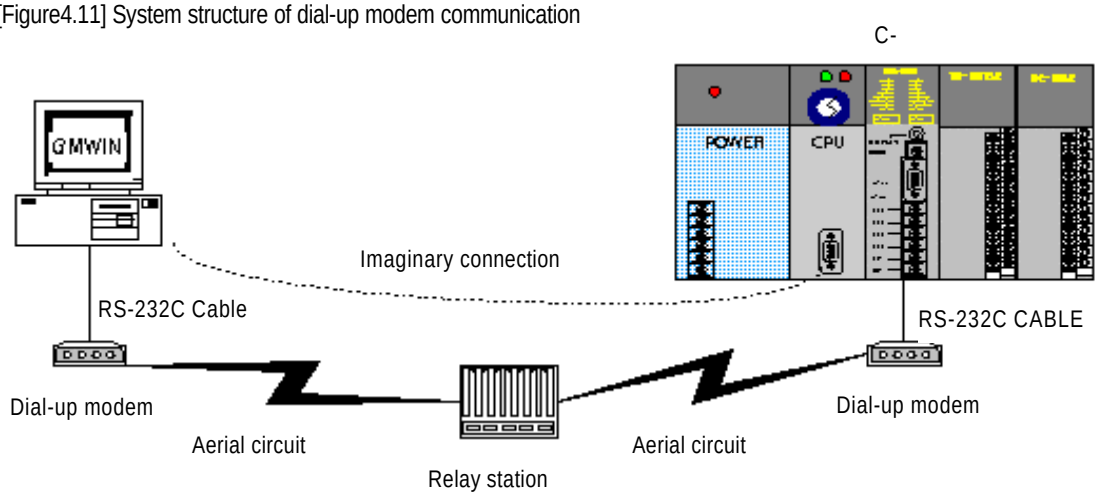
LED type	If normal	If abnormal	Action to take
TXD	Flash	OFF	1) If module's TX LED doesn't flash, follow LED Checklist to troubleshoot 2) If module's TX LED flashes, check cable connection between module and dedicated modem

LED type	If normal	If abnormal	Action to take
RXD	Flash	OFF	1) Check if data is transmitted from the other station's dedicated modem 2) Check status of dedicated line 3) Check connection status of dedicated line
RTS	1) Flash if in transmission 2) ON always	OFF	1) If TXD LED doesn't flash either, follow the action for TXD LED to troubleshoot 2) Check cable connection between module and dedicated modem 3) If RTS control is set to ON compulsorily, always 'ON' operated normally 4) If RTS control is set to EIA control, it shall flash along with TXD LED to be normal
CTS	1) Flash if in transmission 2) ON always	OFF	1) Check if RTS LED flashes (CTS will flash only if RTS flashes) 2) Shoot the trouble of RTS LED to let RTS flash 3) Check cable connection between module and dedicated modem 4) If RTS control is set to ON compulsorily, always 'ON' operated normally 5) If RTS control is set to EIA control, it shall flash along with TXD LED to be normal
DTR	ON always	OFF	1) Check if module is set to dedicated modem mode 2) Check status of cable connection between module and dedicated modem
DSR	ON always	OFF	1) Check if module is set to dedicated modem mode 2) Check status of cable connection between module and dedicated modem
DCD	ON always	OFF	1) Check status of dedicated line 2) Check connection status of dedicated line

4.4.2 Connection to dial-up modem (RS-232C)

Cnet I/F module has a function for long-distance communication using public line. This function allows the long-distance communication by connecting external modem to module in PC or remote devices equipped with telephoning function via public line. In connection of dial-up modem and Cnet I/F module not equipped with telephoning function, connection shall be performed by telephoning via external modem linked with this module in PC or external devices. [Figure4.11] shows an example of system structure using dial-up modem and public line.

[Figure4.11] System structure of dial-up modem communication



4.4.2.1 Dial-up modem selection

In communication with modem, line may not be connected depending on performance of modem and status of public line, and line connection may be released while exchanging data even after once connected, due to great influences on quality of data communication caused by quality of public line, status of relay station and performance of dial-up modem. Therefore, selection of such a reliable modem as specified and recommended in the table below is most important.

Item	Specification
Communication speed	More than 14400 BPS
Flow control	CTS/RTS Flow Control
Command	Hayes complied, AT Command supported
Error correction	Error correction function in data transmission
Carrier wave control	Control function of carrier wave transmission

4.4.2.2 How to connect the modem with this module

Dial-up modem and Cnet I/F module are connected with 9-pin cable via RS-232C channel as wired as below.

Cnet (9-PIN)		Connection No. and Signal direction[Note1]	Mode side (25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI		RI	22

Remark

[Note1] Dial-up modem if purchased is usually provided with DTE connection cable built-in as an accessory, however this cable for connection between PC and modem can be connected to Cnet I/F module. Since most external modems are provided with DTE connection cable to connect to PC along with 9-pin female connector on DTE as reversed in connection, the built-in cable is not allowed to use. The connection cable is to be manufactured separately according to the wiring above.

4.4.2.3 Initial setting of module

Follow the sequence below via Cnet I/F module after modem is selected and connection cable is wired, to initialize dial-up modem and set to connection stand-by mode.

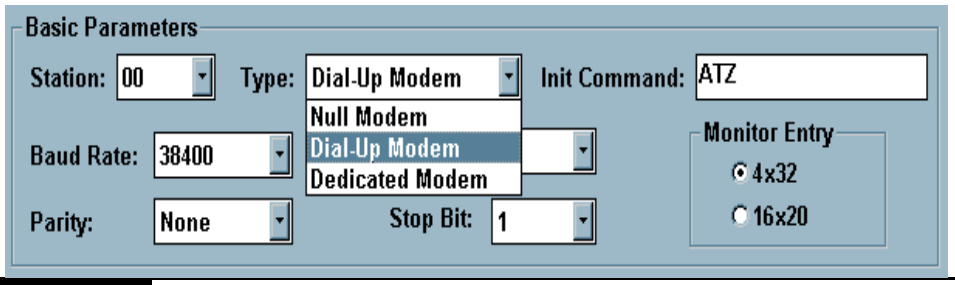
1) Operation mode setting : Set mode switch value of module correctly to desired position. Operation mode can be set only in the range shown in [Table4.3] (Modem connection is unavailable in interlocking mode)

Connect interface cable linked as specified in 4.4.2.2 for pin connection, to RS-232C port of this module and DTE connection terminal of the modem.

A) Connect the phone line to line terminal of modem.

B) Let modem and PLC powered on.

C) Run Frame Editor to set communication type of RS-232C channel to modem and input initializing command.[Note1]



Remark

[Note1] Each maker provides modem with various functions while communication control mode is to be set by user. Mode setting of modem operation shall be set by initializing command of modem like this, and the operation modes between 2 modems to use shall be set surely identical. The basic value of initializing command is 'ATZ'. And since the initializing command differs according to modems, AT command specified in user's manual for modem shall be input.

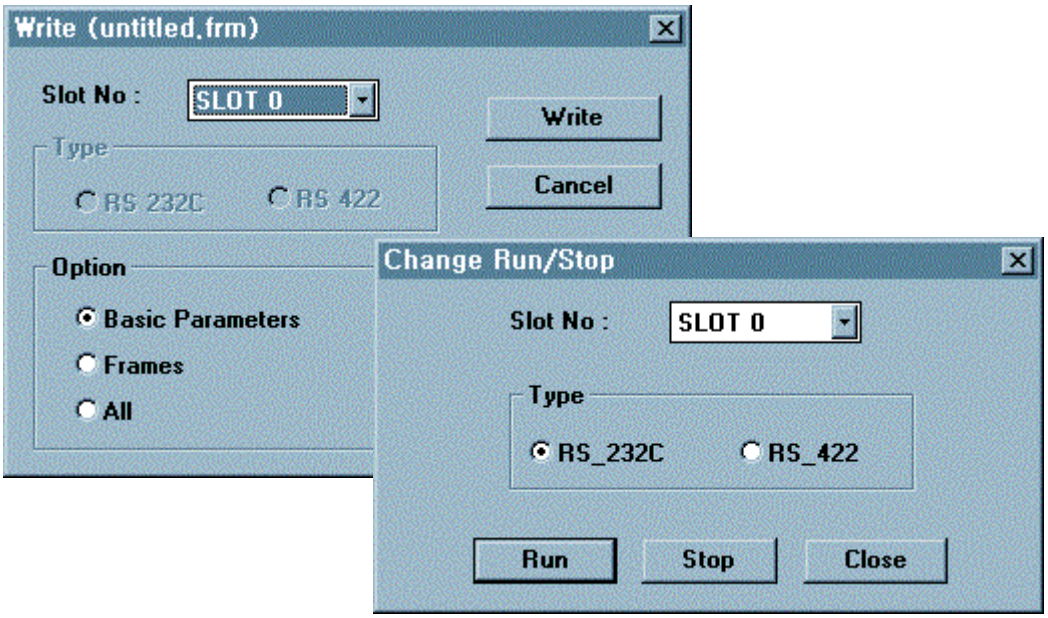
2) Set transmission specification of communication speed, data and stop bit in basic parameter items.[Note1]

Remark

[Note1] Beware of the following items when setting basic parameters.

1) Communication speed and setting values of data and stop bit in setting items of basic parameters are the transmission specification not between modem and modem but between DTE(Cnet I/F module) and DCE(modem).
2) Set basic parameters to basic values and communication speed to max. speed of modem
3) If modem is used supporting communication speed of more than 56kbps, set communication speed of Cnet I/F module to 38400bps as of max. speed.

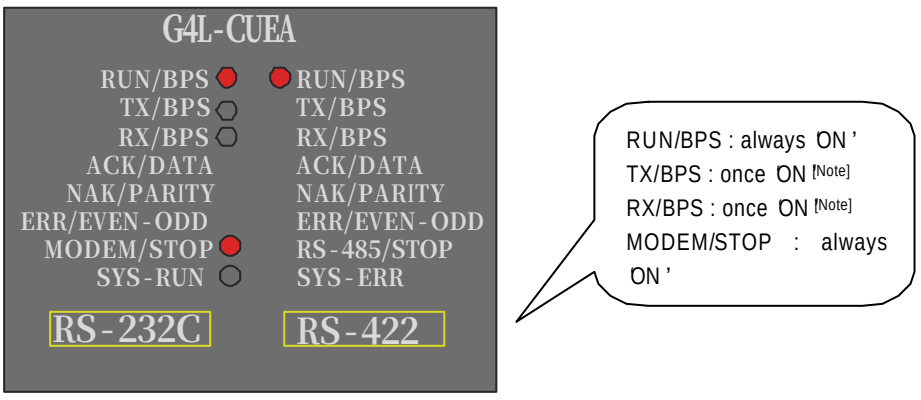
3) Write basic parameters and change communication in [Online] connection of Frame Editor to switch RS-232C channel over to communication run.



4) If switched to communication run, operation setting of Cnet I/F module is completed and the setting contents are saved in flash memory of the module as reserved even if powered off.

5) If setting of the module is completed with all the items above input, initialize modem by powering PLC and dial-up modem 'OFF' and then 'ON' again. If modem is initialized normally, initial LED status is as below.

LED status of modem initialized



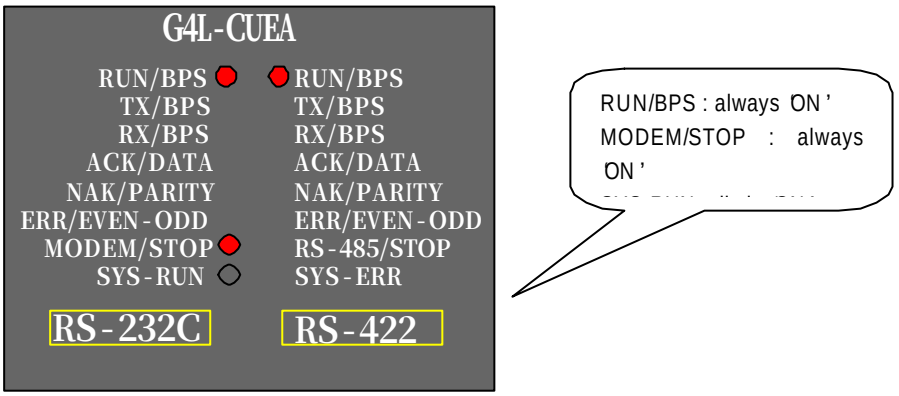
Remark

[Note1] TX LED of module flashes in a cycle of 1 second until modem is completely initialized.

If modem is initialized normally, TX LED and RX LED flash almost simultaneously indicating that normal response of modem to initializing request of modem is performed. In this case, TX/RX LEDs are no more flashing.

6) The case in which the initializing described in (9) is completed normally indicates that modem and Cnet I/F module are normally standing by with the following LED status kept until communication starts via telephoning from the other PC or communication devices.

LED status in stand-by mode



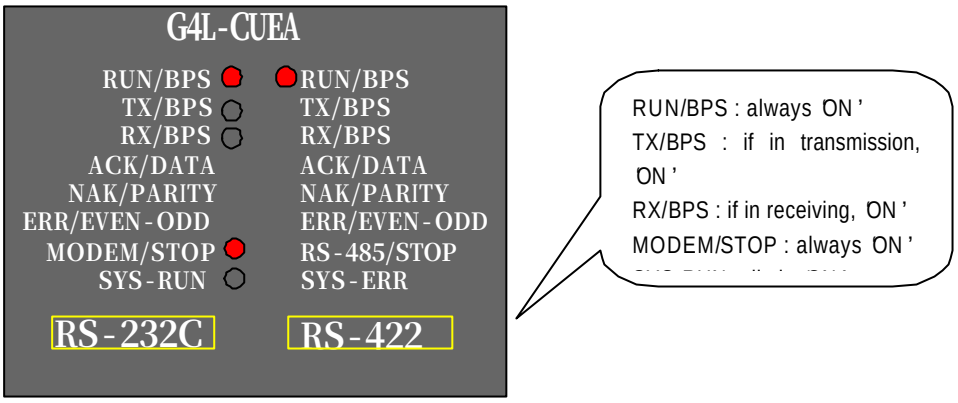
7) After modem is initialized normally, modem and Cnet I/F module in stand-by status wait for RING signal until received from the other modem.

8) If telephoned by the other modem prior to modem initializing, the module doesn't respond out of normal communication.

4.4.2.4 Answering to telephone and modem communication

If modem in local connection is initialized normally, communication with PLC is available by telephoning via the other modem. However, this module supports not telephoning via Cnet but only answering function to telephone. If in the state of on-line connection by telephoning, data communication in long distance is allowed via modem and the on-line state is maintained as it is until the telephone is hung up by the other station compulsorily or by communication error. LED display of Cnet I/F module in normal communication status is described as follows.

LED status during normal communication



4.4.2.5 Troubleshooting for dial-up modem communication

1) Modem communication of module can be checked if operated normally through LED display. Refer to Checklist in [Table4.6] to shoot the trouble.

[Table4.8] Checklist for module's LED

LED type	If normal	If abnormal	Action to take
RUN	ON	OFF	1) Run RS-232C channel operation using Frame Editor
TX	Flash once initially	Flash continuously in a cycle of 1 second	1) Check cable connection between module and modem 2) Reset modem initializing command referring to modem manual 3) Tx/Rx LEDs shall initially flash once to be normal
	Flash if in Transmission	No flash	1) Check cable connection between module and modem 2) If in user mode, check setting of PLC program and frame 3) If in dedicated mode, check setting of station No.
RX	Flash if in receiving	No flash	1) Check if phone line is connected to line terminal of modem 2) Check status of public line 3) Check if data is transmitted from the other station's modem 4) Check cable connection between module and modem if RX LED of modem flashes while LED of module doesn't flash.

LED type	If normal	If abnormal	Action to take
ERROR	OFF	Flash	1) Check cable connection 2) Check if modem is deficient
MODEM	ON	OFF	1) Download communication type of RS-232C channel as set to modem via Frame Editor 2) Check if channel operation mode is set to stand-alone mode

2) LED display & Troubleshooting for dial-up modem : Since LED specification for dial-up modem differs according to makers, user's manual for modem shall be referred to. [Table4.7] describes how to troubleshoot in dial-up modem based on common specification of LED display.

[Table4.9] Checklist for dial-up module's LED

LED type	If normal	If abnormal	Action to take
TXD	Flash	OFF	1) If module's TX LED doesn't flash, follow LED Checklist to troubleshoot 2) If module's TX LED flashes, check cable connection between Cnet and modem
RXD	Flash	OFF	1) Check if phone line is connected to line terminal 2) Check if data is transmitted from the other station's modem 3) Check public line
RTS	Flash if in transmission	OFF	1) If TXD LED doesn't flash either, follow the action for TXD LED to troubleshoot 2) Check cable connection between module and modem
CTS	Flash if in transmission	OFF	1) Check if RTS LED flashes (CTS will flash only if RTS flashes) 2) Shoot the trouble of RTS LED to let RTS flash 3) Check cable connection between module and modem
DTR	ON always	OFF	1) Check if module is set to modem mode 2) Check cable connection between module and modem
DSR	ON always	OFF	1) Check if module is set to modem mode 2) Check cable connection between module and modem
CD	ON after telephoned	OFF	1) Check status of public line 2) Check connection status of phone line to line terminal