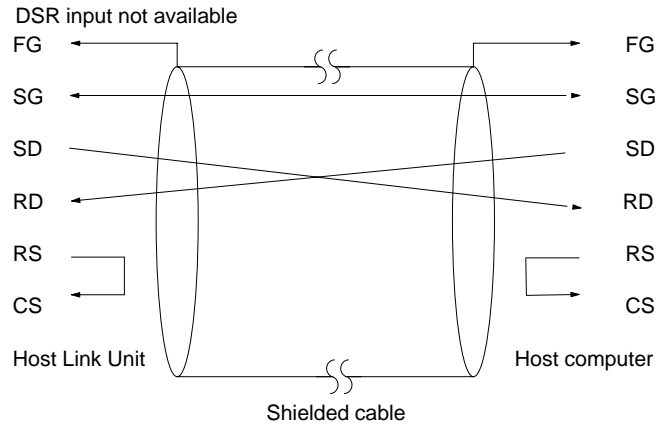


1-5-2 RS-232C Interface

(For all but C500-LK203 and insulated types.) When using an optical fiber cable or RS-422 cable, several Host Link Units can be connected to one host computer. When RS-232C cables are used, however, the connection must be made on a one-to-one basis, or a Link Adapter must be used to convert to RS-422 cable or optical fiber cable as shown in *Examples 1 and 2* in *1-2-2 System Examples* (see also *Link Adapters Installation Guide*). The table below gives the proper connections for a RS-232C interface.

Signal*	Symbol	Pin No.
Frame ground	FG	1
Signal ground	SG	7
Send data	SD	2
Receive data	RD	3
Request to send	RS	4
Clear to send	CS	5
Equipment Ready	ER	20
Send signal element timing 1***	ST1	24
Send signal element timing 2***	ST2	15
Receive timing***	RT	17
5-V power supply**	5V	14



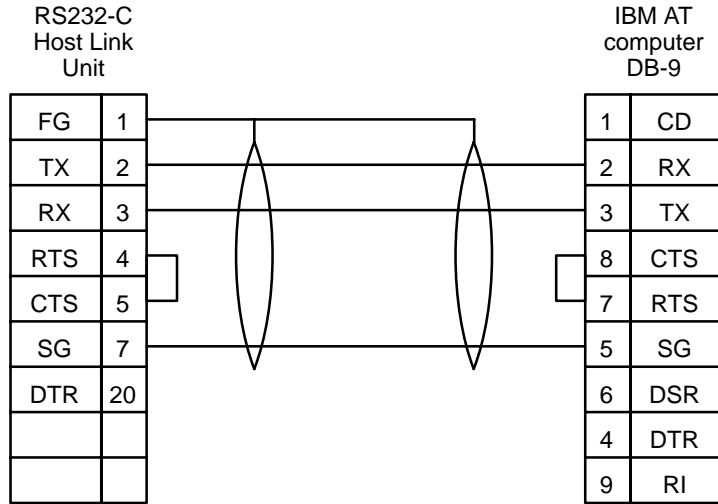
* Viewed from the Host Link Unit.

** For Optical Interfaces used with the C500-LK203 Host Link Unit.

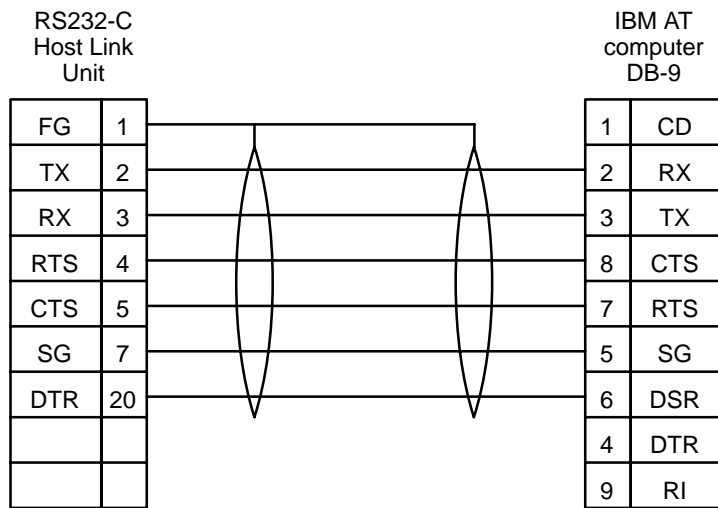
***For synchronous timing (not available with C200H-LK201-V1Host Link Unit).

The maximum cable length is 15 m. Ground the FG terminals of both the PC and the host computer at a point that has a resistance of less than 100 Ω.

Interfacing to IBM AT via AL004 Link Adapter

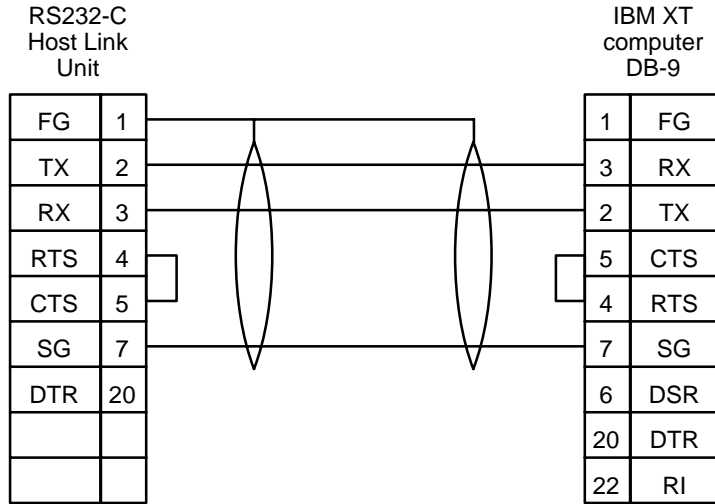


Two-wire system, no handshaking.

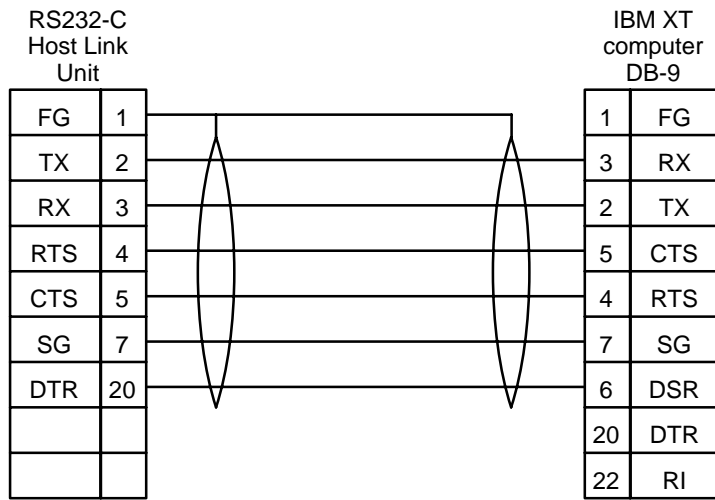


Full handshake configuration.

Interfacing to IBM XT via AL004 Link Adapter



Two-wire system, no handshaking.



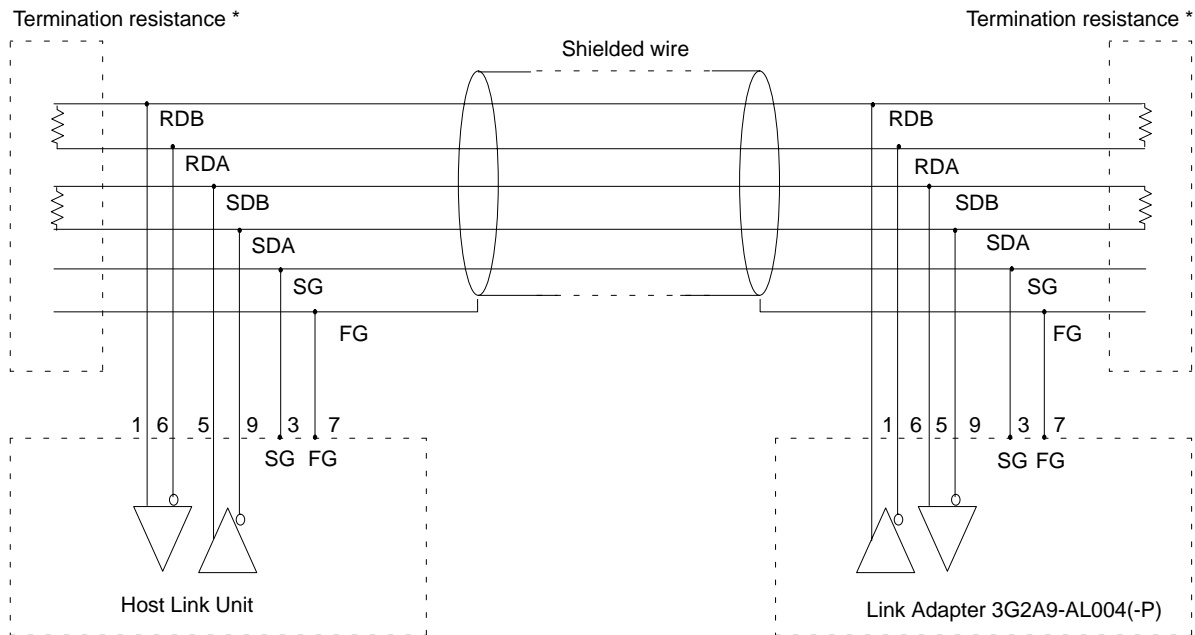
Full handshake configuration.

1-5-3 RS-422 Interface

(For all but C500-LK203 and insulated types) The following table details the pin connections for a RS-422 interface.

Signal*	Symbol	Pin No.
Send data A	SDA	9
Send data B	SDB	5
Receive data A	RDA	6
Receive data B	RDB	1
Signal ground	SG	3
Frame ground	FG	7

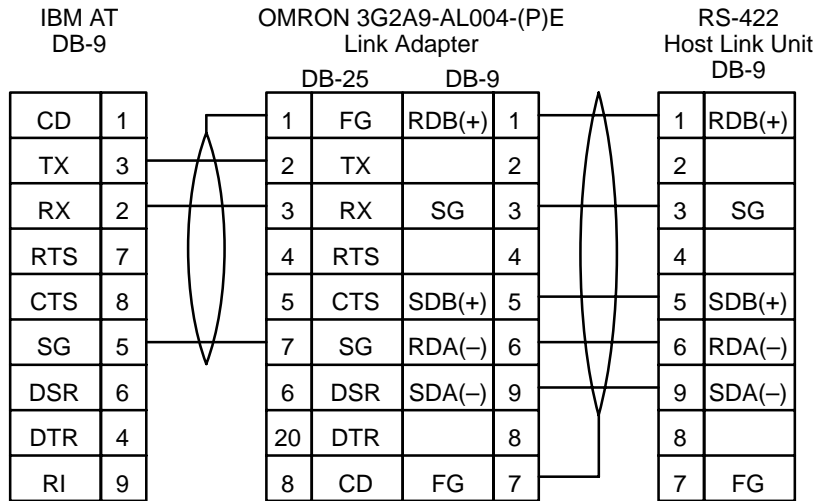
* Viewed from the Host Link Unit.



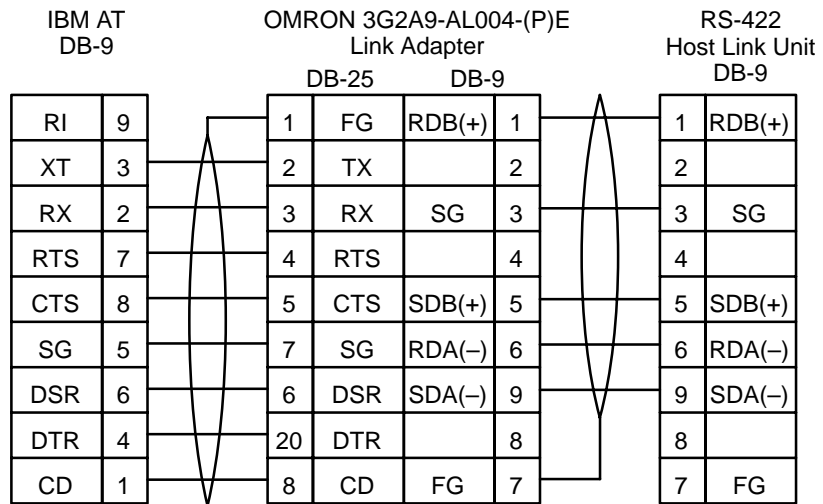
* The total termination resistance must be $100\ \Omega$ min.
The built-in resistance is $220\ \Omega$.

The maximum cable length is 500 m. Ground the FG terminals on both the PC and the host computer to a point where the resistance is less than $100\ \Omega$. For more information, refer to the PC or host computer manuals.

Interfacing to IBM AT via AL004 Link Adapter

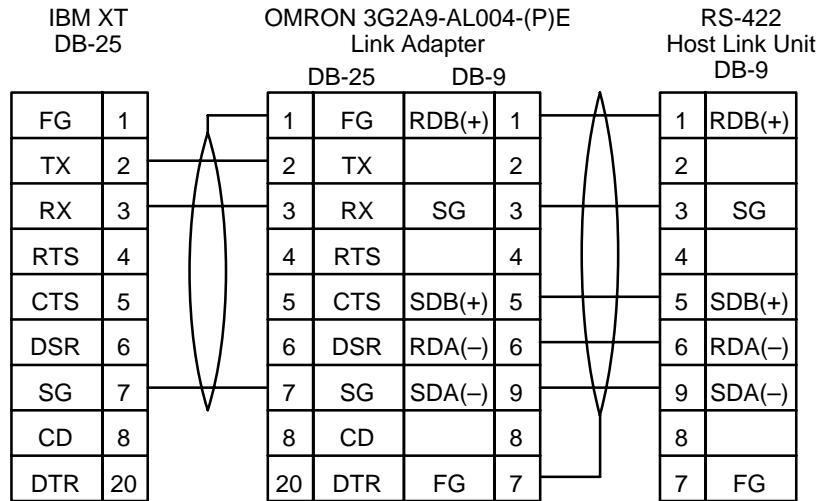


Two-wire system, no hand-shaking.

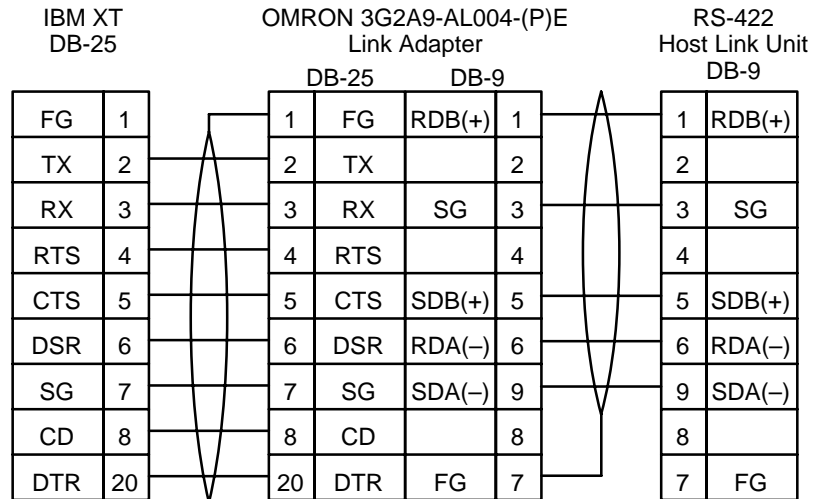


Full handshake configuration.

Interfacing to IBM XT via AL004 Link Adapter



Two-wire system, no hand-shaking.



Full handshake configuration.

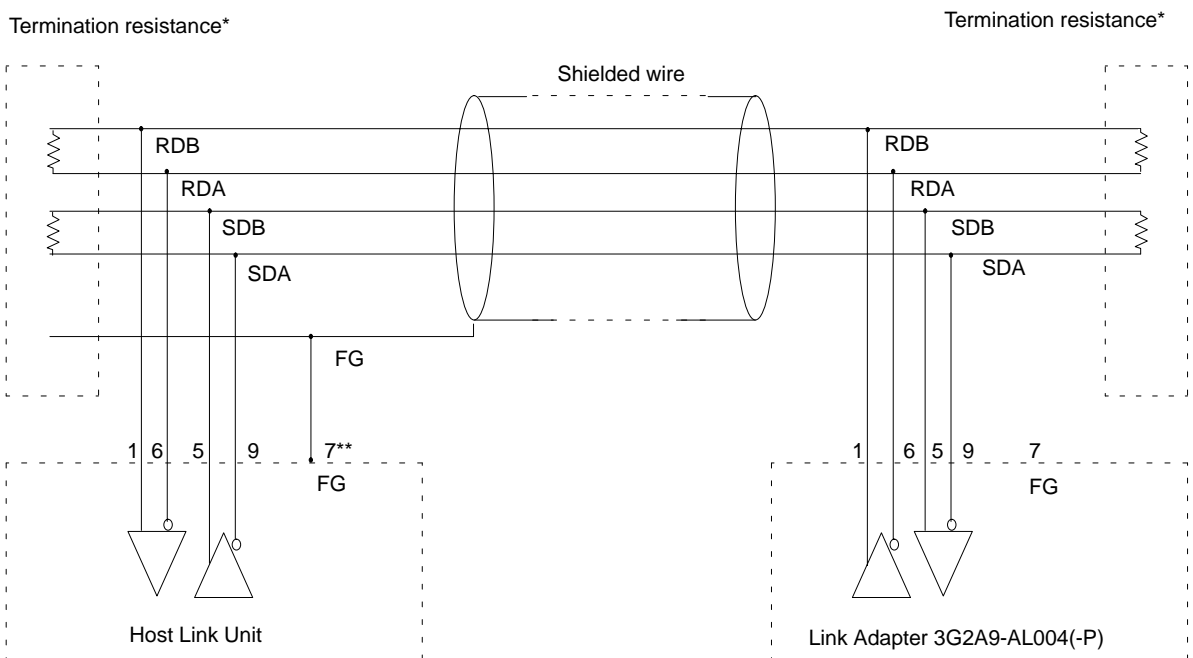
RS-422 Interface (For Insulated C500-LK203)

The table below lists the connections for interfacing a RS-422 cable to an insulated C500-LK203 Host Link Unit.

Signal*	Symbol	Pin No.
Send data A	SDA	9
Send data B	SDB	5
Receive data A	RDA	6
Receive data B	RDB	1
Frame ground	FG	7
Frame ground**	FG	Hood fitting

* Viewed from the Host Link Unit.

** In order to prevent current flow in the shield wire, make a connection to only one end of it. Either pin 7 or the hood fitting can be used to connect the shield wire to the frame ground.



* The total termination resistance must be 100Ω min.
The built-in resistance is 220Ω .

** In order to prevent current flow in the shield wire, make a connection to only one end of it. Either pin 7 or the hood fitting can be used to connect the shield wire to the frame ground.

The maximum cable length is 500 m. Ground the FG terminals of both the PC and the host computer to a point with a resistance of less than 100Ω . For details, refer to the PC or host computer manuals.

C500-LK203 Noise Tolerance The RS-422 interface on the C500-LK203 Host Link Unit is insulated to improve its tolerance to electrical noise. Although the increased tolerance provides better performance under normal operating conditions, the operation can be affected in very noisy environments. For this reason the optical C500-LK103(-P) is recommended in situations where noise might be a problem.

FG Connections for Insulated C500-LK203 Host Link Units

In systems which use only the insulated C500-LK203 Host Link Units, connect the frame ground to the shield wire at the connections to the Host Link Units and at either end of the connections between Link Adapters. In systems using the insulated C500-LK203 with other types of Host Link Units, connect the frame ground to the shield wire at connections to the C500-LK203 Host Link Units and at both ends of all connections between Link Adapters and between the other Host Link Units and Link Adapters.

Multiple-link Connections

When connecting a multiple-link system with RS-422 cable, use shielded twisted pair cables for the Host Link Unit. The total cable length of the entire system must not exceed 500 m. The length of each branch line should be kept to less than 10 m.

The optical Host Link Units can be used to achieve greater distances in the overall system (see *Example 2* in *1-2 System Configuration*). If they are connected in series, however, signals are not transmitted to any Unit that is not supplied with power, or any other Units beyond it. To avoid any problems with this, signals can also be distributed through Link Adapter 3G2A9-AL002-PE. To connect the Host Link Units to the host computer, Link Adapter 3G2A9-AL004-(P)E is necessary to be able to interface the optical fiber cables and the RS-232C and RS-422 cables.

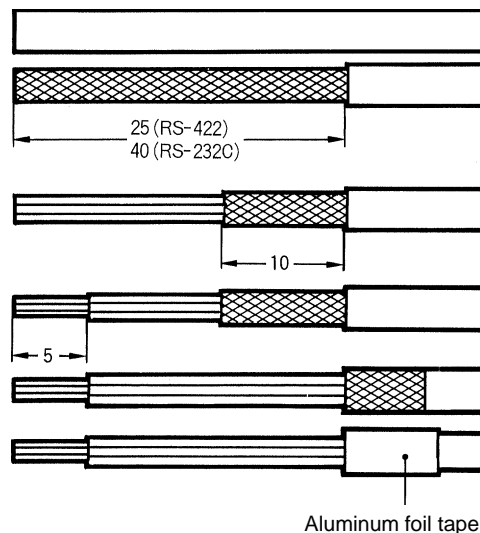
1-6 Wiring RS-232C and RS-422 Cable Connectors

The following procedures should be followed when wiring RS-232C and RS-422 connectors.

1-6-1 Preparation for Connecting Shielded Cable to FG

The procedures listed below correspond to the following diagrams.

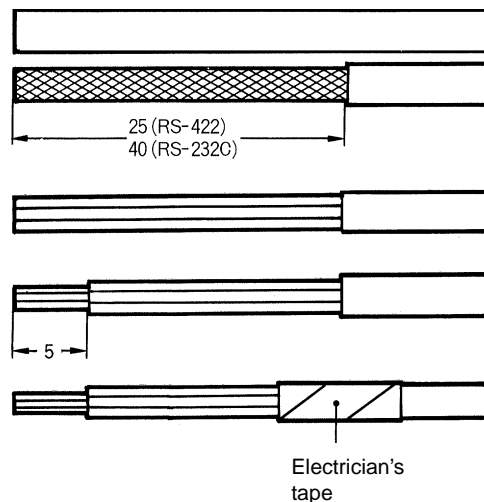
- 1, 2, 3...
1. Cut the cable to the required length.
 2. Use a razor blade to cut away the sheath (being careful not to damage the braiding underneath): 25 mm for RS-422 cable; 40 mm for RS-232C cable.
 3. Use scissors to cut away all but 10 mm of the exposed braiding.
 4. Use wire strippers to remove the insulation from the last 5 mm of each wire.
 5. Move the boot to cut the edge of the sheath and fold the braiding back over the end of it.
 6. Wrap aluminum foil tape over the top of the braiding on top of the boot for one and a half turns.



1-6-2 Preparation for Connecting Unshielded Cable to FG

The procedures outlined in the list below correspond to the following diagrams.

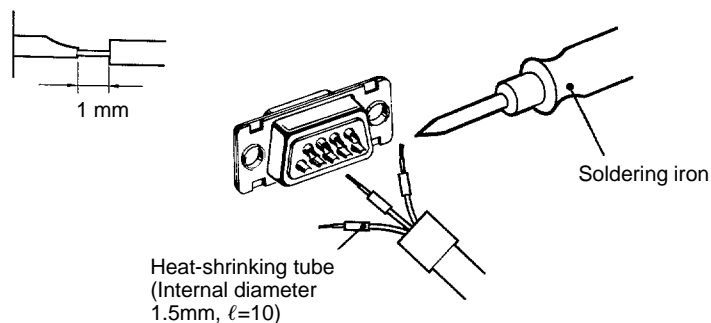
- 1, 2, 3...
1. Cut the cable to the required length.
 2. Use a razor blade to cut away the sheath: 25 mm for RS-422 cable; 40 mm for RS-232C cable.
 3. Use scissors to cut away the exposed braiding.
 4. Use wire strippers to remove the insulation from the last 5 mm of all wires.
 5. Wrap insulating tape over the top and end of the the cut sheath.



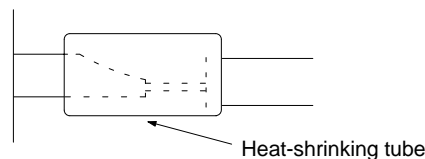
Soldering

Observe the following when soldering the prepared wires onto the connectors.

- 1, 2, 3...
1. Place heat-shrinking tubes over all wires, far enough away from the end so as not to interfere with the soldering.
 2. Pre-solder all wires and connector terminals.
 3. Solder wires, inserting 4 mm of the exposed 5 mm of wire into the connector terminal.

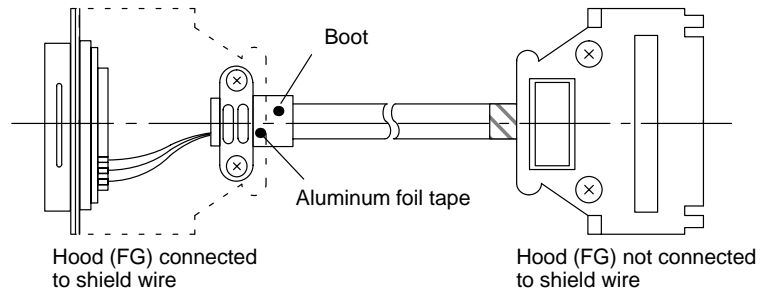


4. Move the heat-shrinking tubes onto the soldered area and shrink them into place.



Hood Assembly

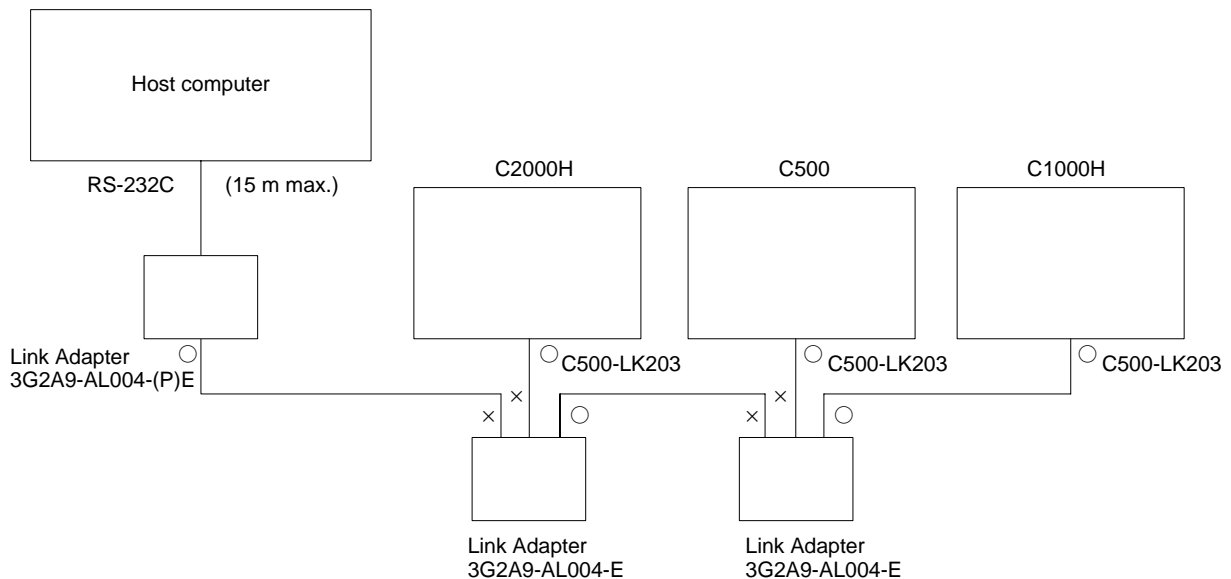
Assemble the hood as shown in the following diagram.



1-6-3 FG Connection to the Cable's Shield Wire (RS-422 Interface)

Connection of C500-LK203 Host Link Units

When connecting a Host Link Unit and a Link Adapter, connect the cable's shield wire to the Host Link Unit's FG. Do not connect the shield wire to the Link Adapter's FG.
 When connecting two Link Adapters, connect the cable's shield wire to either Link Adapter's FG.



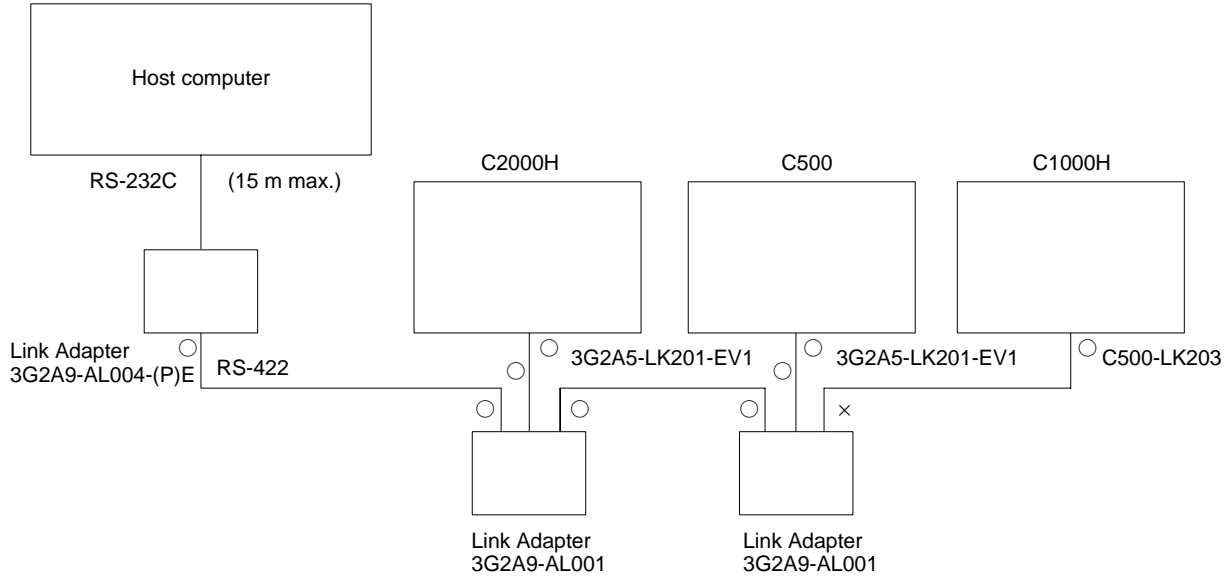
Note Just one end of the shield wire is connected to FG to prevent current from flowing in the shield wire.

- : Connect the shield wire to FG.
- ×: Do not connect the shield wire to FG.

Connection of C500-LK203 with other Host Link Units

When connecting a C500-LK203 and a Link Adapter, connect the cable's shield wire to the C500-LK203 Host Link Unit's FG. Do not connect the shield wire to the Link Adapter's FG.

When connecting a Host Link Unit (other than a C500-LK203) and a Link Adapter, connect the both ends of the cable's shield wire to the FGs. Also connect both ends to the FG's when connecting two Link Adapters.



Note Just one end of the shield wire is connected to FG to prevent current from flowing in the shield wire.

○: Connect the shield wire to FG.

x: Do not connect the shield wire to FG.

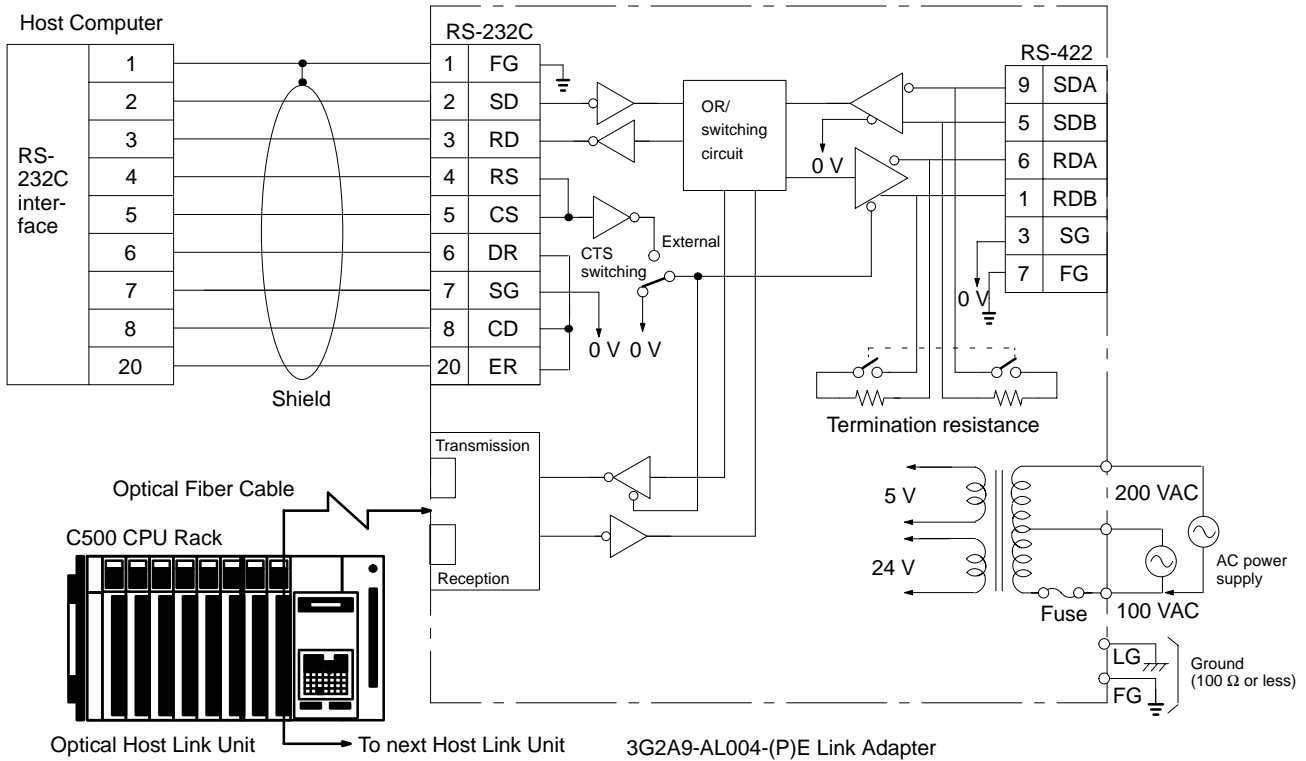
1-6-4 Wiring

Connection of Optical Host Link Units

Optical Host Link Units (C200H-LK101-PV1, 3G2A5-LK101-(P)EV1, C500-LK103(-P), and 3G2A6-LK101-(P)EV1) are connected sequentially with Optical Fiber Cable. Consequently, Units cannot transmit if they follow a Unit that is turned off. Branches can be made in the Optical Fiber Cable with a 3G2A9-AL002-(P)E Link Adapter.

When connecting a host computer, a 3G2A9-AL004-(P)E Link Adapter is required to convert Optical Fiber Cable to RS-232C or RS-422.

Wiring Example



Be sure to use a wire of at least 1.25 mm² in thickness.

Use M4 screws for tightening crimp terminals.

Use ring crimp terminals for wiring. Do not connect bare stranded wires directly to terminal blocks.



Caution

Tighten the screws on the terminal block of the AC Power Supply Unit to a torque of 1.2 N·m. The loose screws may result in burning or malfunction.

Switch Settings

CTS (CS) Switching (Link Adapter Settings)

Set to “0 V” when the CTS (Clear-To-Send) signal will usually be ON. Set to “External” when the signal is received externally. This switch is normally set to “0 V.”

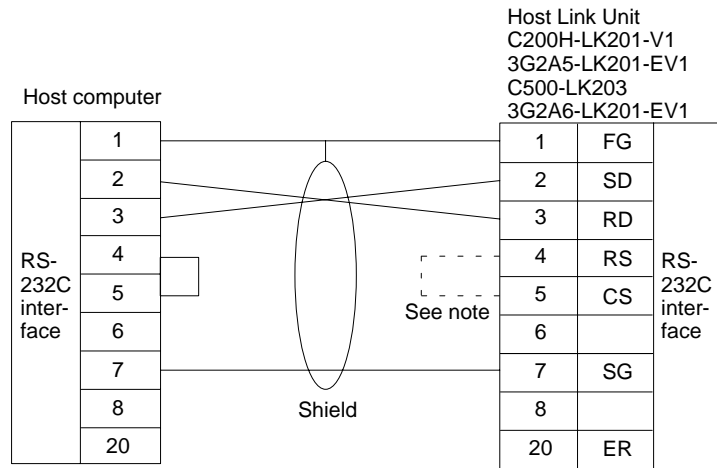
Note

Always cap unused Optical Connectors. If the connectors are not capped, ambient light interference can enter the Optical Connectors and cause transmission errors.

1:1 Connection of Host Computer and Host Link Unit

The following diagram shows a 1:1 connection of a host computer and a Host Link Unit (C200H-LK202-V1, 3G2A5-LK201-EV1, C500-LK203, or 3G2A6-LK202-EV1).

Wiring Example

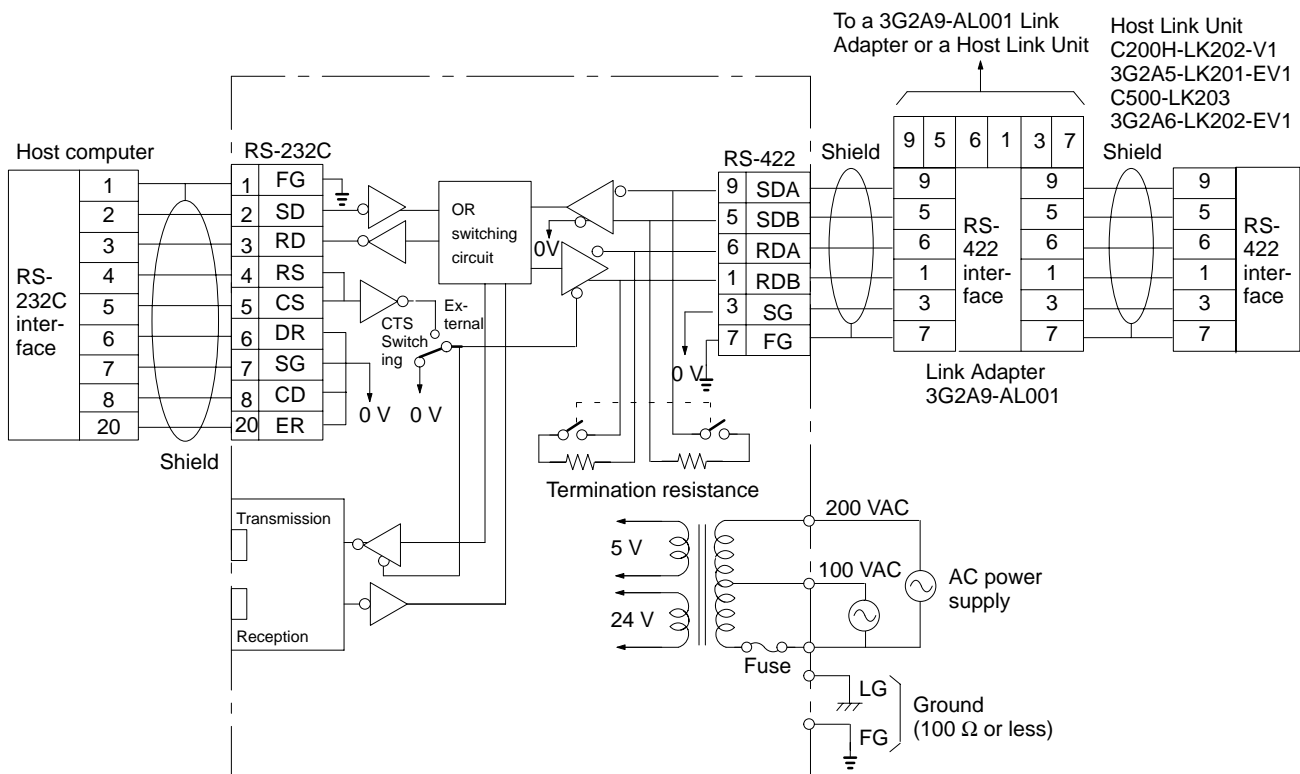


Note It is not necessary to connect the RS and CS signals if the CTS switch on the back of the Host Link Unit is set to 0 V. Set the I/O port switch on the back of 3G2A5-LK201-EV1/C500-LK203 Host Link Units to "RS-232C."

1:N Connection of Host Computer and Host Link Unit

Set to 0 V when the CTS (Clear-To-Send) signal will usually be ON. Set to External when the signal is received externally. This switch is normally set to 0 V.

Wiring Example




Note Set the I/O port switch on the back of 3G2A5-LK201-EV1/C500-LK203 Host Link Units to “RS-422.”

Be sure to use a wire of at least 1.25 mm² in thickness.

Use M4 screws for tightening crimp terminals.

Use ring crimp terminals for wiring. Do not connect bare stranded wires directly to terminal blocks.

 **Caution** Tighten the screws on the terminal block of the AC Power Supply Unit to a torque of 1.2 N·m. The loose screws may result in burning or malfunction.

SECTION 2

Host Link Unit Characteristics

This section provides the switch location and setting details for each group of Host Link Units. The Units are grouped according to the operating characteristics. C200H Units are dealt with first, followed by C500 and 3G2A5 models, and 3G2A6 models are included at the end of the section.

For each grouping, labelled pictures of the different models show the positions and names of the switches and connections. The functions of the switches are then explained. The effects of the Host Link Units and other peripheral devices on the operating mode of the PC System are discussed, followed by a section on the I/O Response Times.

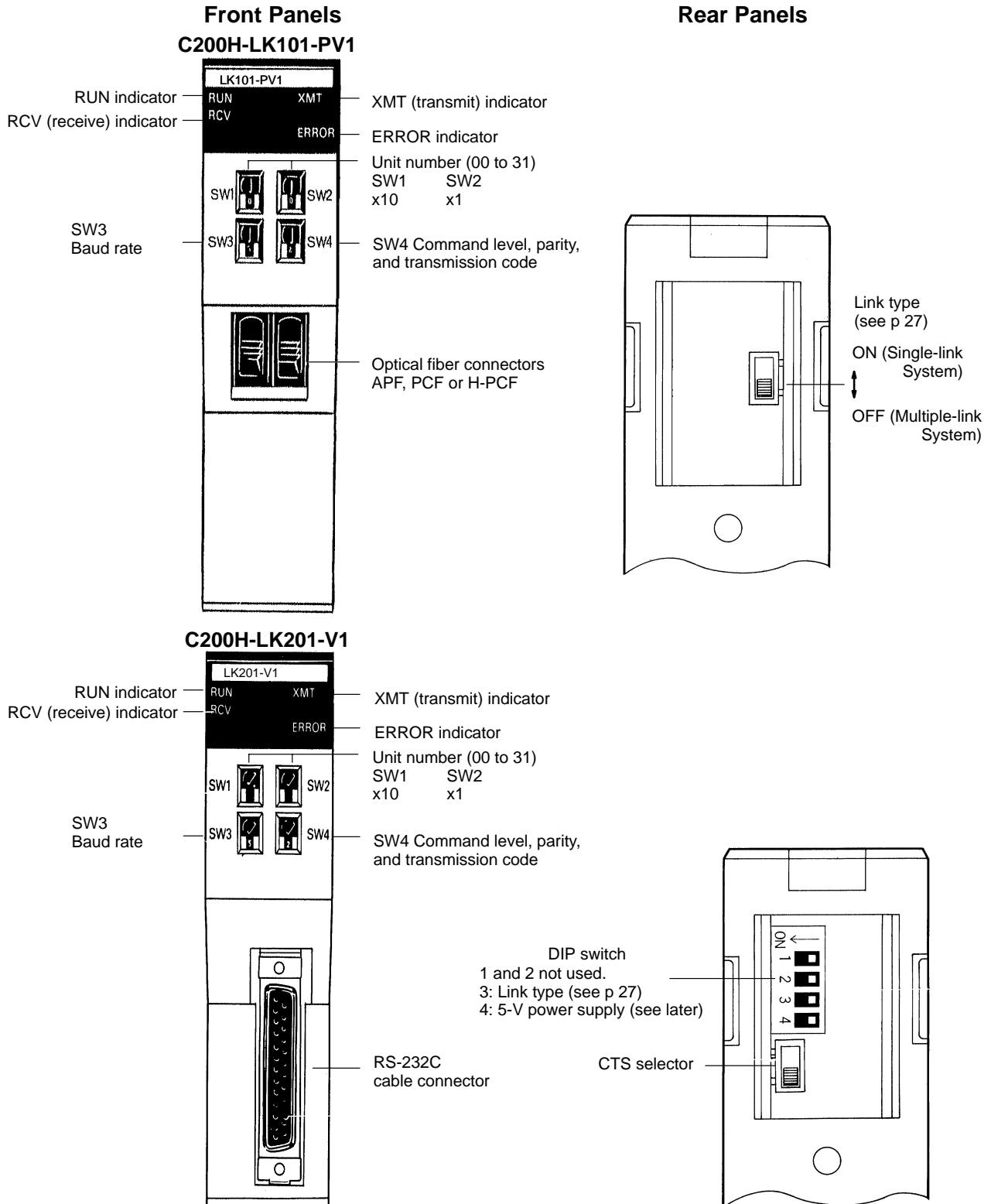
The systems and PCs that apply to each Host Link Unit are given in the table at the beginning of *Section 1*.

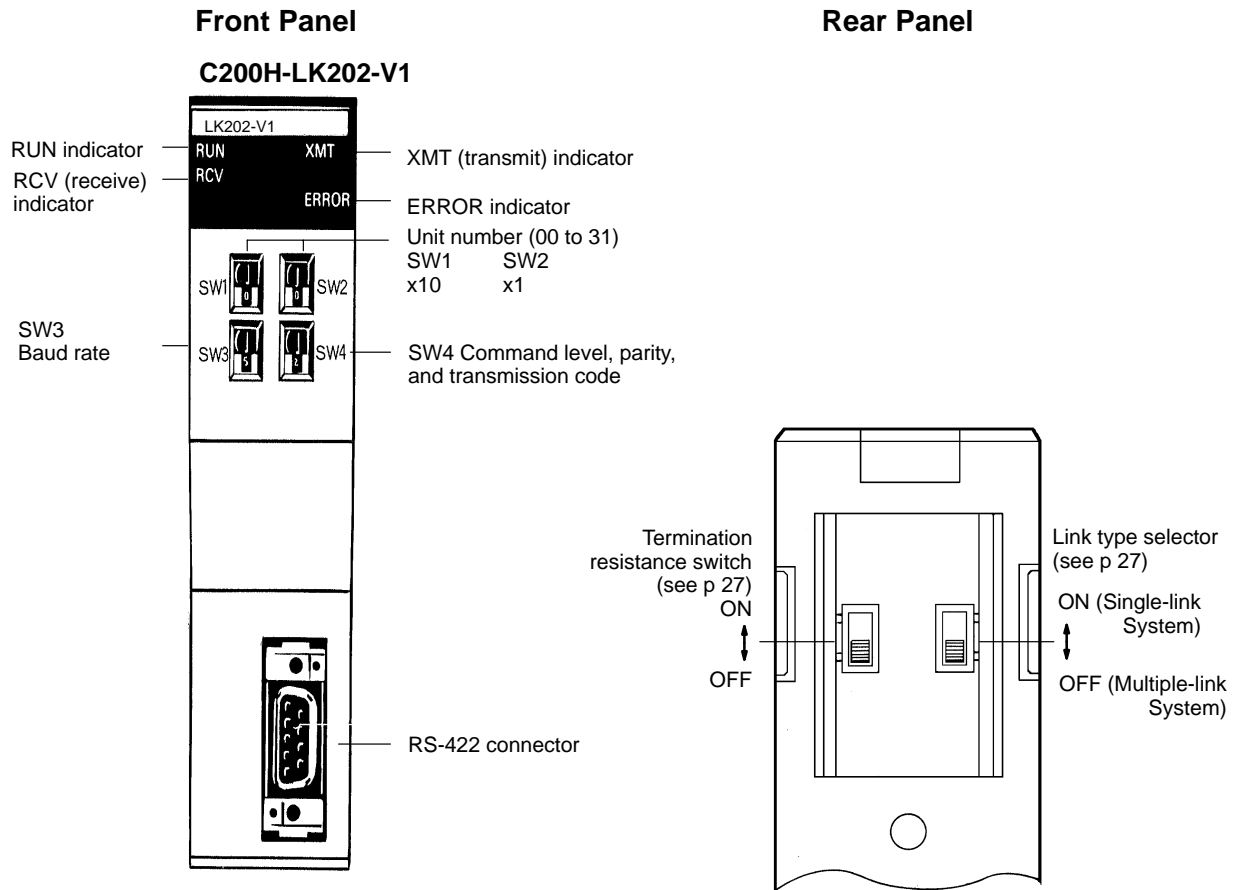
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2-1 C200H Host Link Units

2-1-1 Nomenclature and External Appearance

The following figures give details of switch types, selectors, and connectors for your Host Link Unit. It will be necessary to refer to these diagrams from time to time as you read further in the manual, particularly when reading the section on 2-1-2 *Switch Settings*.





2-1-2 Switch Settings

The following information provides details on correct settings for the range of Host Link Units covered by this manual. Pay particular attention to the RUN/STOP and MONITOR/NORMAL switches on the C1000H-style cards.

SW1 and SW2

These switches are used to set the Unit number. The same unit number must not be specified for more than one Unit.

SW3: Baud Rate

The baud rate of the Host Link Unit, as determined by the following switch settings, must match that of the host computer.

SW3	Baud rate
0	300 bps
1	600 bps
2	1,200 bps
3	2,400 bps
4	4,800 bps
5	9,600 bps
6	19,200 bps
7	
8	Do not set
9	

SW4: Command Level, Parity and Transmission Code

SW4	Command Level*	Parity	Transmission Code
0	1	Even	ASCII 7 bit, 2 stop bits
1	1,2		
2	1,2,3**		
3	Do not set		
4	1	Odd	
5	1,2		
6	1,2,3		
7	Do not set		
8	1	Even	JIS 8 bit, 1 stop bit
9	1,2		
A	1,2,3		
B	Do not set		
C	1	Odd	
D	1,2		
E	1,2,3		
F	Do not set		

* See descriptions of Command Levels at the end of this sub-section.

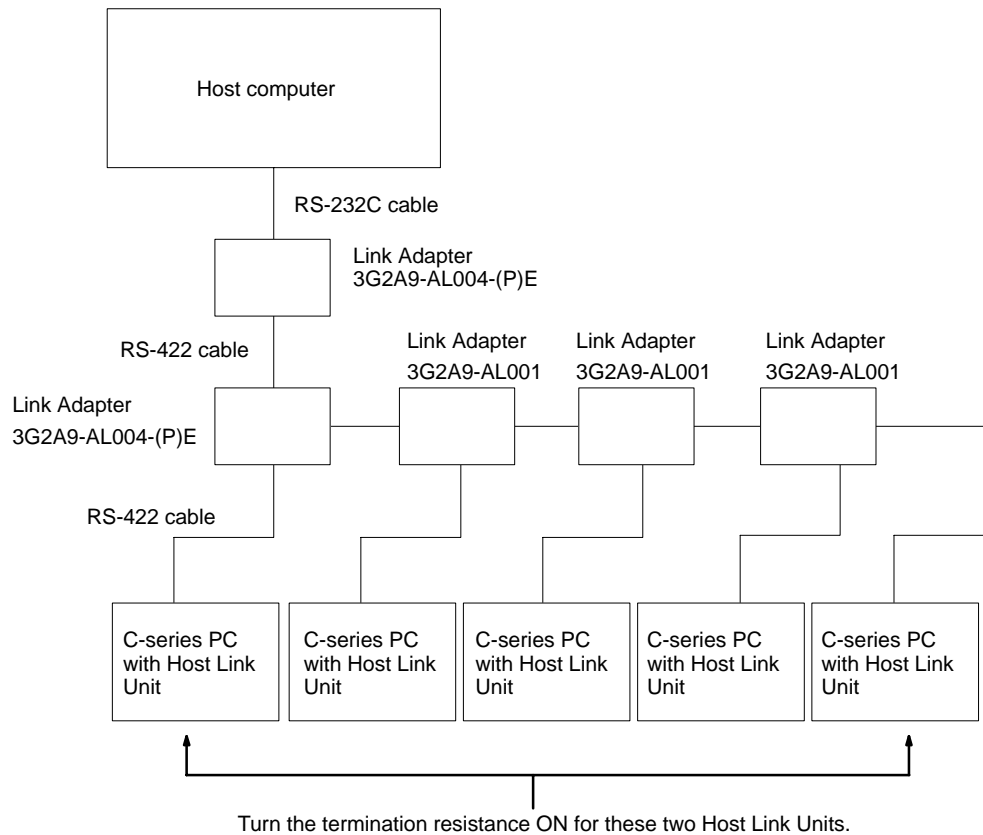
** Use this setting when using LSS (Ladder Support Software)

Mode Selection

C200H Units are automatically set to HOST mode. See 2-1-4 *PC Operating Mode* for further details.

Termination Resistance

When using a RS-422 cable (C200H-LK202-V1 Host Link Units) throughout a system, the Host Link Unit at each end of the cable system (as detailed in the following diagram) must have the termination resistances connected by turning ON the switch on the back of the panel. When this switch is set to ON, a built-in termination resistance of 220 Ω is connected. When set to OFF, the termination resistance is disconnected.



CTS Selector

For RS-232C models (C200H-LK201-V1), the selector is set to 0 V, the clear-to-send (CTS) signal is continuously ON. When the selector is set to external, the Unit will respond to externally generated CTS signals. This is normally set to CTS always ON, i.e., the switch is set to ON.

5-V Power Supply Switch

When using a Z3RN-A-5 Optical Interface with an RS-232C Host Link Unit, the 5 V power supply switch should be set to ON; otherwise it should be set to OFF. On the C200H-LK201-V1, pin 4 on the back-panel DIP switch functions as the 5 V power supply switch.

Link Type Selector

Pin 3 on the back-panel DIP switch of the C200H-LK201-V1 (RS-232C connection), and the Link Type Selector on the rear of the C200H-LK101-PV1 (optical fiber connection) provide the same functions as described below.

OFF (Single-link):

If set to OFF, the Host Link Unit is connected to the host computer on a one-to-one basis (see *Example 3* and *Example 5* under *1-2 System Configuration*). The Unit number and Frame Checksum (FCS) settings are not required. The normal setting is ON (see below).

ON (Multiple-link):

If set to ON, up to 32 Host Link Units can be connected to one host computer. The unit number and FCS must be specified, even if only one Host Link Unit is connected to the host computer. When using Ladder Support Software, LSS, the switch must be set to ON.

Command Levels

- 1, 2, 3...
1. Enables data areas to be read and, when the CPU has been correctly set via the SC (Status Write) command, data can also be written.
 2. Enables program transfers and reading or writing of I/O tables.
 3. I/O READs can be performed and I/O tables can be registered. The Command Level should be set to "1, 2, 3" for running LSS software, program transfers, etc. Other levels may be used for Systems Control Software, monitoring, Data Acquisition Software, etc.

Note Commands valid for each level are listed in 3-1 *Command Levels*.

2-1-3 Indicators

Indicator	Function
RUN	ON when the Unit is operating. Depending on the settings of switches 1 to 4, this indicator will blink when an error occurs. (See notes.)
RCV	ON when the Host Link Unit is receiving data.
XMT	ON when the Host Link Unit is transmitting data.
ERROR	Goes ON when a transfer error is detected (See note 1.); goes OFF when a new command is received normally. Goes ON when an error is detected in communications with the CPU. The RUN indicator will blink in this case. (See note 2.)

- Note**
1. Transfer errors include parity, framing, overrun, and FCS errors.
 2. Operation of the Unit is stopped when the RUN indicator is OFF or blinking. Restart the Unit after setting switches 1 to 4 correctly.
 3. Refer to 5-4 *Troubleshooting* for details on correcting the following problems.
 - The RUN indicator does not light.
 - The Host Link Unit's RCV indicator does not light when data is transmitted from the host computer.
 - The RCV indicator lights, but the XMT indicator does not.
 - The ERROR indicator lights.
 - The XMT indicator lights, but the host computer does not receive the data.

2-1-4 PC Operating Modes

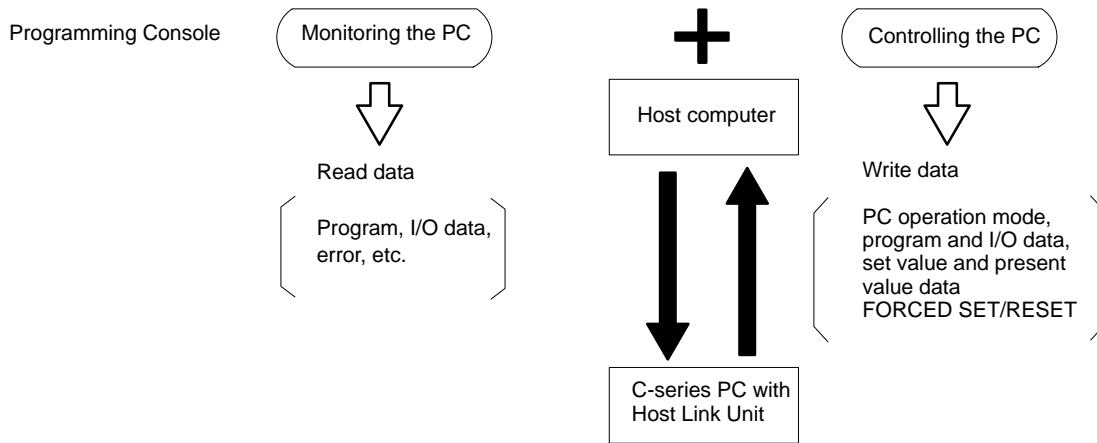
The operating mode of the PC depends on the Memory Unit's Initial Mode setting, the RUN/STOP on the any CPU-mounted Host Link Unit, and the status of any peripheral device connected to the PC. Refer to the following table for details.

PC Mode on Applying Power with the Host Link Unit Mounted

System configuration and Host Link Unit setting		Memory Unit Initial Mode setting	
		Normal (OFF)	Run (ON)
With no CPU-mounted device		RUN	RUN
With CPU-mounting Host Link Unit	RUN	RUN	
	STOP	PROGRAM	
With CPU-mounting peripheral device		PROGRAM	
With Programming Console		The mode is determined by the mode selector on the Console, i.e., RUN, MONITOR or PROGRAM.	

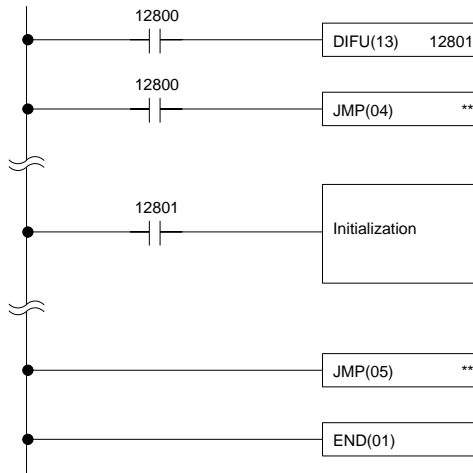
Data Flow

The diagram below shows the flow of data between the system using C200H Host Link Units, and a Programming Console. As can be seen, the Programming Console can be used for monitoring, or for writing to the PC System.



Controlling PC Start-up

PROGRAM mode cannot be achieved manually when C200H Rack-mounting Host Link Units are used without a Programming Console or other peripheral device. Programming can be implemented, however, to prevent the PC from automatically starting when the power is applied. This allows greater control and the Unit can be started later with a command from the host computer. The following is an example of a programmed start-up for a C1000H PC.

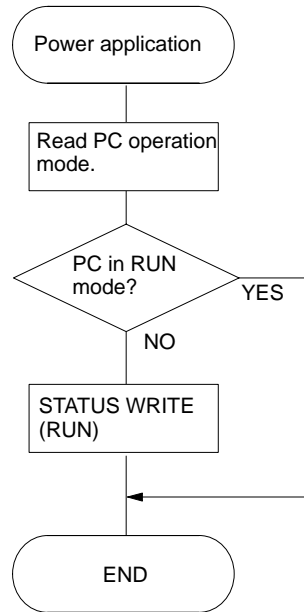


Appropriate initialization codes must be programmed between JMP(04) and JME(05). IR area bit 12800 can then be turned on to start PC operation from the host computer. The PC must be set in MONITOR mode for this to be possible. To initialize the PC when starting operation, use DIFU with the Always ON Flag; the Reset Flag cannot be used. Refer to your PC's operation manual for specific bits. The PC's operating mode can then be changed from the host computer after operation has begun. When programming in this fashion, note the following conditions:

- 1, 2, 3... 1. Before turning on the IR area bit 12800, set the C200H Host Link Units to MONITOR mode using the host computer.
2. JMP command numbers must be between 01 and 99 for C200H/HS, C1000H, and C2000H PCs.

Sending a RUN Start Command to the PC

The following flowchart shows the computer decision making processes for ensuring that the PC is in RUN mode after start-up.



2-1-5 Restart Bits and Error Flags

Host Link Units use some of the Special Relay (SR) area and Auxiliary Relay (AR) area bits of the PC to restart the communications control program of the Host Link Unit and to indicate the occurrence of communications errors between the Unit and the computer. The word (Wd) addresses and bit numbers of these bits are as follows:

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SR Wd 252			RM* #0 connection error flag					CM* restart bit	CM* error flag	RM* #1 connection error flag	RM* #1 HC** error flag					
SR Wd 253					RM* #0 HC** error flag											
AR Wd 00			RM* #0 CPU** error flag	RM* #1 CPU** error flag												
AR Wd 24	CM* restart bit	RM* #0 connection error flag	RM* #1 connection error flag													
AR Wd 267			RM* #1 Transmission ready (C200HS/HX/HG/HE only)								RM* #0 Transmission ready (C200HS/HX/HG/HE only)					

* RM: Rack-mounting Host Link Unit
 CM: CPU-mounting Host Link Unit
 ** HC: Error between the Host Link Unit and the host computer
 CPU: Error between the Host Link Unit and the CPU of the PC

Host Link Unit Restart Bit

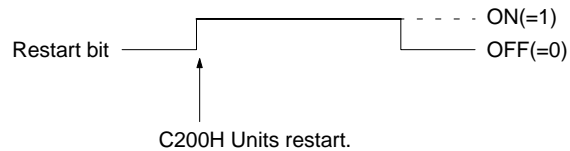
When this bit is turned ON, the Host Link Unit is reset to its initial conditions, as if the power had just been applied.

Caution Do not turn this bit ON in the user program; doing so could cause the memory to be lost.

Host Link Unit Error Flag

This flag turns ON if a transmission error occurs between the PC and the Host Link Unit. It turns ON the error indicator on the front of the Unit.

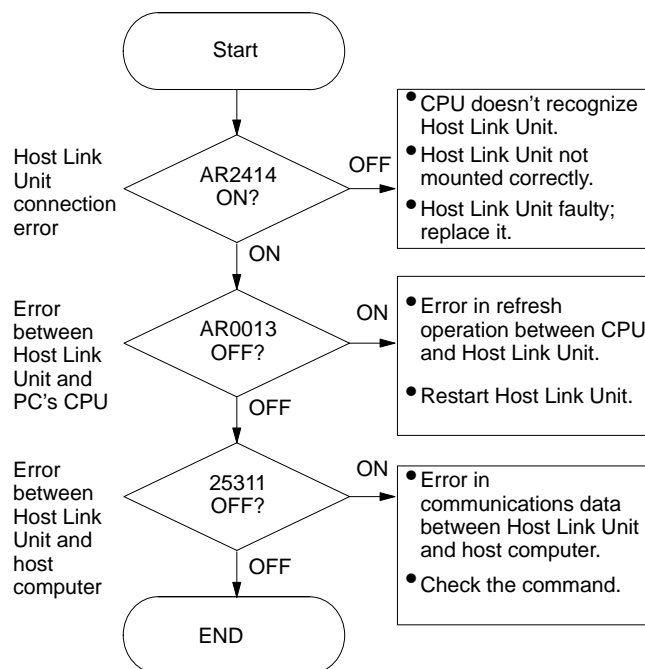
- Note**
1. When the Host Link Unit Restart bit is turned ON, the Host Link Unit Error Flag is turned OFF.
 2. Set the Host Link Unit to LOCAL mode before force setting or force resetting an error flag.
 3. With all but C200H Rack-mounting Host Link Units, communications between the Host Link Unit and the host computer will not be resumed until the Restart bit is turned OFF. The initialization process is repeated as long as the Restart bit is ON.



4. If the error condition does not clear, disconnect and then reconnect the power to the PC.

Error Location

The following example for a Rack-mounting Host Link Unit with an assigned operating level 0, indicates the process flow used in locating errors.



2-1-6 I/O Response Time

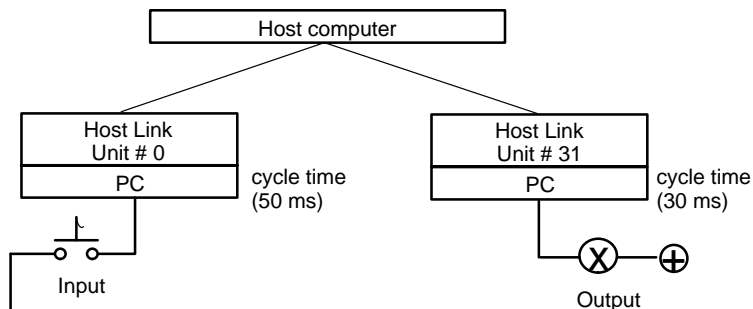
The processing that determines and the methods for calculating the minimum and maximum times required from an input on one PC with a Host Link Unit to an output on another PC with a Host Link Unit are described below. The transfer between the PCs is handled through a host computer connected to both these PCs.

Processing and calculations are described by PC model in the first subsection and for Systems combining C200H/HS/HX/HG/HE and C1000H PC models in the last subsection. Although more precise equations may be written if required, those used in the following calculations do not consider fractions of a cycle.

The calculations used in this section assume that all host computer commands and PC responses require no more than one host link servicing period to complete transmission. To compute response times for situations involving a longer command and/or response, the number of host link servicing periods (i.e., the number of cycles) required to complete the command or response would have to be incorporated into the equations.

In considering response times, it is important to remember the sequence of processing that occurs during the PC cycle. The main factor that affects the response time is the timing of inputs and outputs and of host computer processing in relation to this sequence.

The following diagram illustrates the setup used in response time calculations



The following equations can be used as required to calculate the minimum and maximum response times with the C200H. The maximum response time is an approximation.

Minimum response time = Input ON delay + Command transmission time + (cycle time of PC for Unit #0 x 3) + Response transmission time + Host computer processing time + Command transmission time + (cycle time of PC for Unit #31 x 3) + Output ON delay

Maximum response time = Input ON delay + Command transmission time + (cycle time of PC for Unit #0 x 10) + Response transmission time + Host computer processing time + Command transmission time + (cycle time of PC for Unit #31 x 10) + Output ON delay

Combined Systems

When transferring data from one model of PC through a host computer and then out to a different model of PC, all that is necessary is to combine the first half of the minimum/maximum equation for the origin PC with the second half of that for the destination PC. For example, the following equation can be used for the minimum response time when transferring from a C200H/HS/HX/HG/HE to a C1000H.

Minimum response time = Input ON delay + Command transmission time + (cycle time of PC for Unit #0 x 3) + Response transmission time + Host computer processing time + Command transmission time + Output ON delay

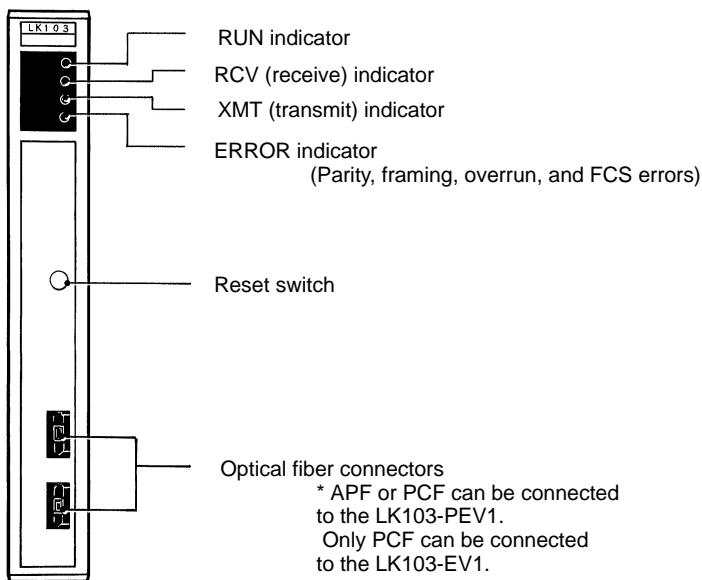
2-2 C500 (3G2A5) Host Link Units

2-2-1 Nomenclature and External Appearance

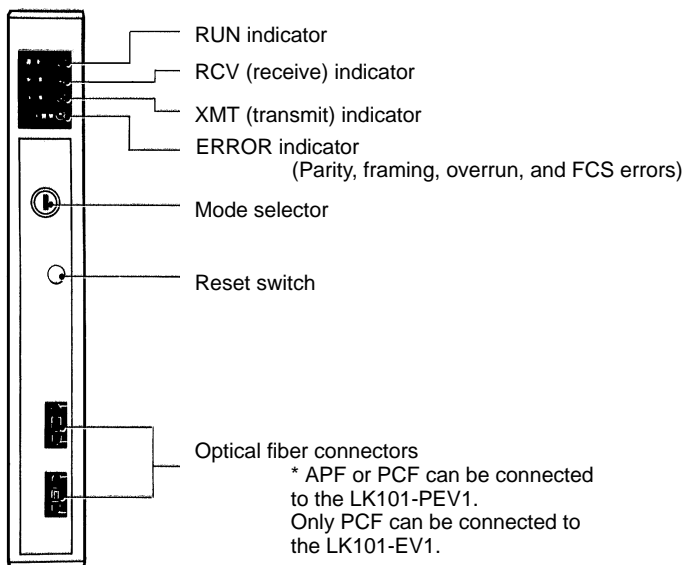
The following figures give details of switch types, selectors, and connectors for your Host Link Unit. It will be necessary to refer to these diagrams from time to time as you read further in the manual, particularly when reading the section on 2-2-2 *Switch Settings*. These Units are suitable for use with C500, C1000H, and C2000H PCs.

Front Panels

C500-LK103(-P)

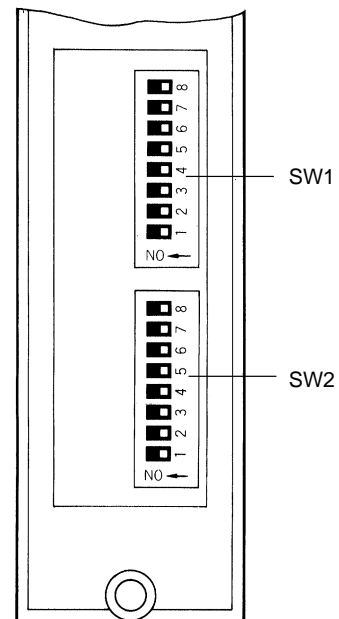


3G2A5-LK101(-P)EV1



Rear Panels

3G2A5-LK101(-P)EV1 C500-LK103(-P)

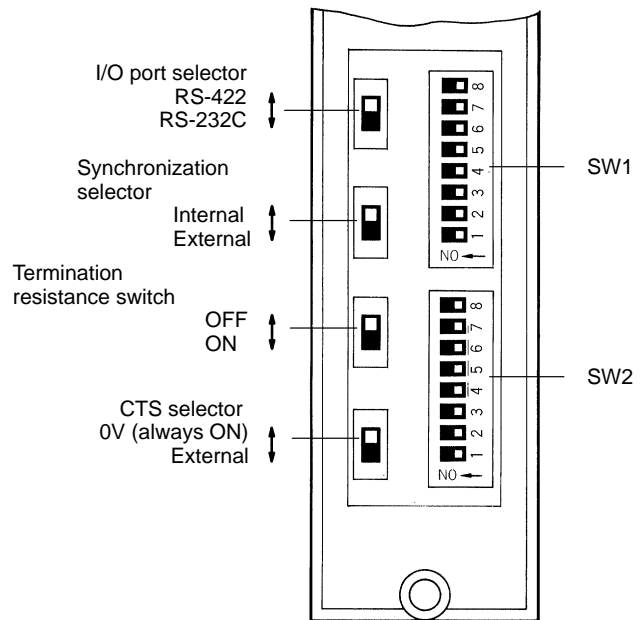
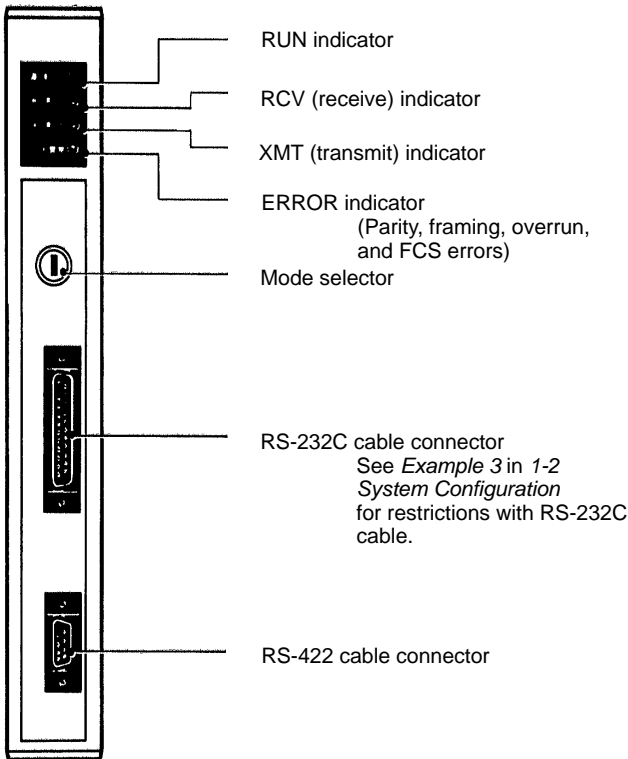


Front Panels

Rear Panels

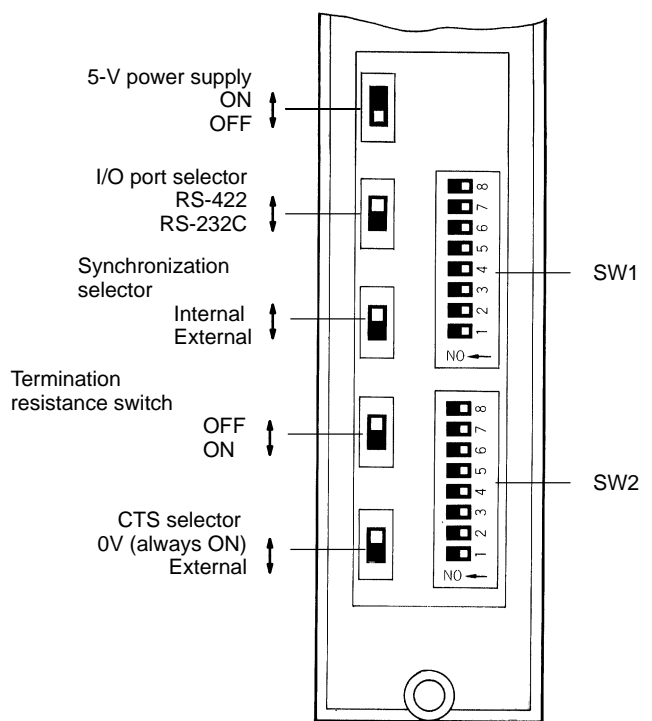
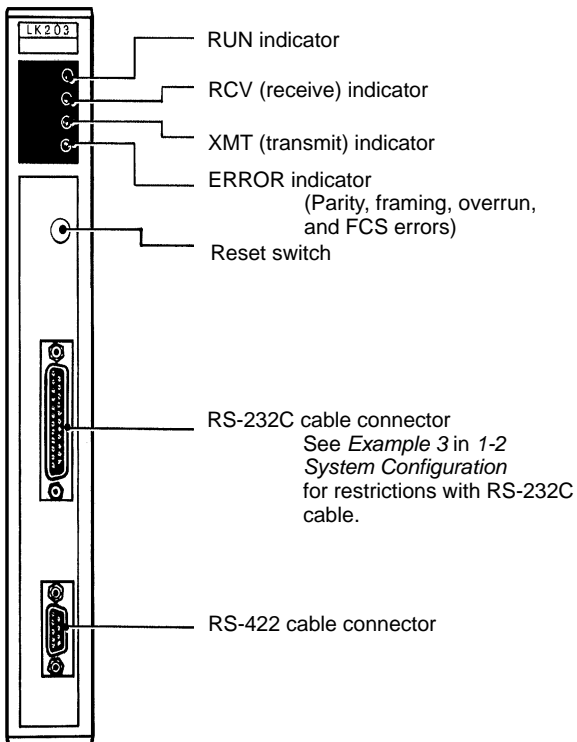
3G2A5-LK201-EV1

3G2A5-LK201-EV1



C500-LK203

C500-LK203



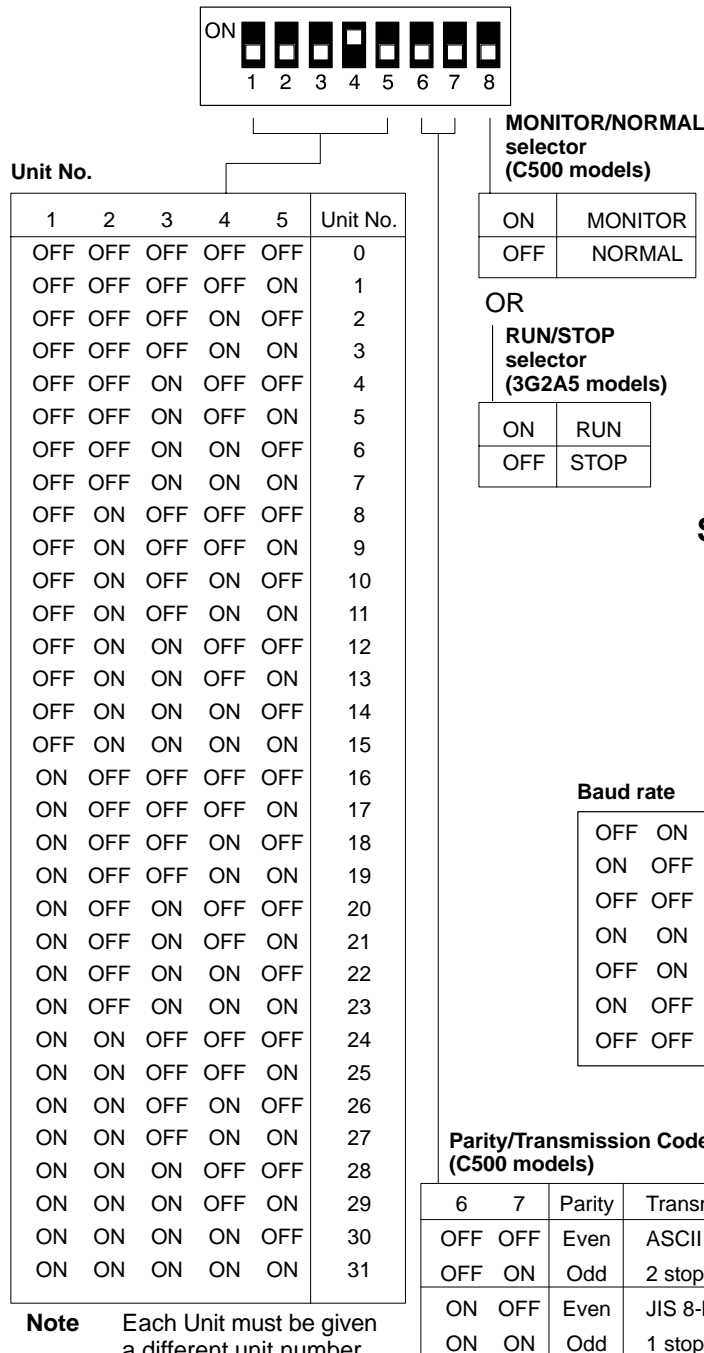
2-2-2 Switch Settings

The following information provides details on correct settings for the range of Host Link Units covered by this manual. Pay particular attention to the RUN/STOP and MONITOR/NORMAL switches on the C1000H-style cards.

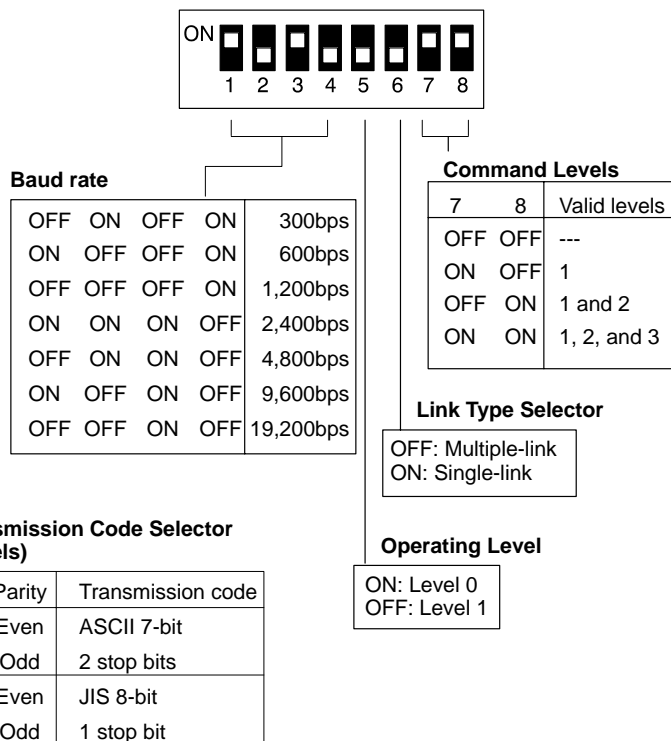
SW1

SW1 will perform one of two different functions depending on the Unit. In both instances, the first five pins are used to set the Unit number as shown below. Details about SW1 and SW2 settings are included following the diagram.

SW1 C500-LK103(-P)/-LK203 and 3G2A5-LK101(-P)EV1/-LK201-EV1 Host Link Units



SW2 C500-LK103(-P))/-LK203 and 3G2A5-LK101(-P)EV1/-LK201-EV1 Host Link Units



Note Each Unit must be given a different unit number.

**RUN/STOP Selector
(3G2A5-LK101/-LK201)**

When pin 8 is set to RUN (ON), the CPU will start in RUN mode upon power application. When set to STOP (OFF), the CPU will start operation in PROGRAM mode. (Refer to to the 2-2-4 PC Operation Mode for further details.)

**MONITOR/NORMAL
Selector (C500-LK103(-P),
C500-LK203)**

When pin 8 is set to MONITOR (ON), the PC will operate in MONITOR mode upon the application of power. When the pin is set to NORMAL (OFF), the PC is no longer controlled by the Host Link Unit (i.e., the mode of operation will be determined by other system conditions). Refer to the 2-2-4 PC Operating Mode for details.

SW2**Operating Level**

Set pin 5 of SW2 to OFF (operating level 1) when using a C500 PC and ON (operating level 0) when using the Host Link Unit together with a SYSMAC NET Link Unit. When using two Rack-mounting Host Link Units, set this pin to ON for one of the Units, and to OFF for the other.

**Caution**

Failure to set pin 5 correctly may damage components or prevent operation.

Link Type Selector**ON (Single-link)**

If pin 6 is set to ON, the Host Link Unit is connected to the host computer on a one-to-one basis (see *Example 3* under 1-2 System Configuration). The Unit number and Frame Checksum (FCS) settings are not required. The normal setting is OFF (see below).

OFF (Multiple-link)

If pin 6 is set to OFF, up to 32 Host Link Units can be connected to one host computer. The unit number and FCS must be specified, even if only one Host Link Unit is connected to the host computer. When using Ladder Support Software, LSS, pin 6 must be set to OFF.

Command Levels

1. Enables data areas to be read and, when the CPU has been correctly set via the SC (Status Write) command, data can also be written.
- 2: Enables program transfers and reading or writing of I/O tables.
- 3: I/O reads can be performed and I/O tables can be registered. The Command Level should be set to 1, 2, and 3 for running LSS software, program transfers, etc. Other levels may be used for Systems Control Software, monitoring, Data Acquisition Software, etc.

Note Commands valid for each level are listed in 3-1 Command Levels.

Mode Selector

The Mode Selector (3G2A5-LK101/201) sets the Host Link Unit in to HOST or LOCAL mode. In HOST mode, the host computer can set the operating mode of the PC or write data to its memory. In LOCAL mode, the operating mode is specified by a programming device connected to the PC; such as a Programming Console. This switch is locked by removing the key with the HOST mode selected. See 2-2-4 PC Operating Mode for further details.

Reset Switch

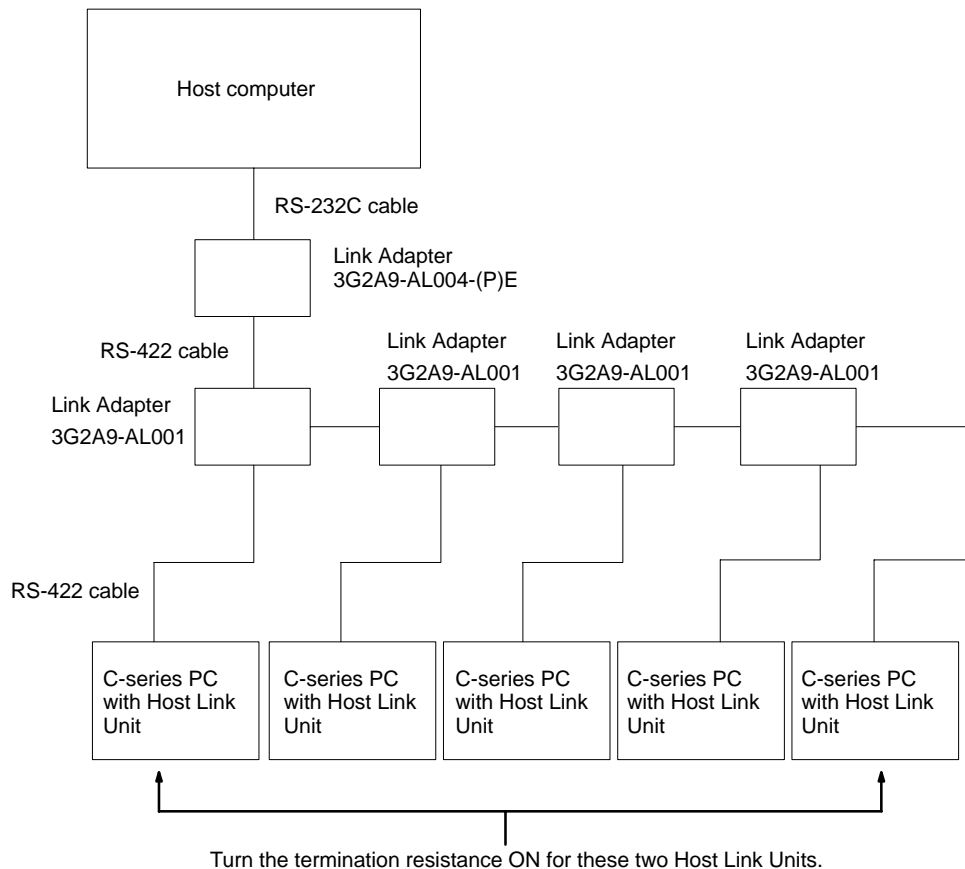
By pressing the Reset Switch the Host Link Unit is forced to the initial status.

Synchronization Selector

Sets the Host Link Unit to either an internal or external clock. Normally, an internal clock is employed. But, when a synchronization modem with a baud rate of 2,400 bps or higher is used, the external clock setting must be selected.

Termination Resistance

When this switch is set to ON, a built-in termination resistance of 220 Ω is connected. When set to OFF, the termination resistance is disconnected. When using a RS-422 cable throughout a system, the Host Link Unit at each end of the cable system must have the termination resistances connected by turning ON the switch as detailed in the following diagram. RS-232C systems provide point-to-point connections and do not require a termination resistance.



CTS Selector

When the selector is set to 0 V, the clear-to-send (CTS) signal is continuously ON. When the selector is set to external, the Unit will respond to externally generated CTS signals. This is normally set to CTS always ON, i.e., the switch is set to ON.

5-V Power Supply Switch

When using a Z3RN-A-5 Optical Interface, the 5 V power supply switch should be set to ON; otherwise it should be set to OFF.

I/O Port Selector

Sets the Host Link Unit (3G2A5-LK201-EV1 or C500-LK203) to either the RS-232C or the RS-422 interface.

2-2-3 Indicators

Indicator	Function
RUN	ON when the Unit is operating.
RCV	ON when the Host Link Unit is receiving data.
XMT	ON when the Host Link Unit is transmitting data.
ERROR	Goes ON when a transfer error is detected (See note 1.); goes OFF when a new command is received normally.

- Note**
- Transfer errors include parity, framing, overrun, and FCS errors.
 - Refer to 5-4 *Troubleshooting* for details on correcting the following problems.
 - The RUN indicator does not light.
 - The Host Link Unit's RCV indicator does not light when data is transmitted from the host computer.
 - The RCV indicator lights, but the XMT indicator does not.
 - The ERROR indicator lights.
 - The XMT indicator lights, but the host computer does not receive the data.

2-2-4 PC Operating Modes

The operating mode of the PC depends on the setting of the mode selector on the Host Link Unit, the RUN/STOP or MONITOR/NORMAL selector on the Host Link Unit, and the status of any peripheral device connected to the PC. Refer to the following tables for details.

Host Link Units in C500, C1000H, or C2000H Systems (Except C500-LK103(-P) and C500-LK203 Host Link Units)

For Rack-mounting Host Link Units set to Host mode, the PC mode on initial application of power is as set on the Host Link Unit, i.e., RUN if the setting is RUN, and PROGRAM if the setting is STOP. (RUN/STOP setting is selected via pin 8 of DIP switch 1 for all models.) If the Host Link Unit is set to LOCAL, start-up mode will be as shown below.

System configuration and Host Link Unit setting*		Rack-mounting Host Link Unit in LOCAL mode
No CPU-mounting device		RUN
With CPU-mounting Host Link Unit	RUN	RUN
	STOP	PROGRAM
With CPU-mounting peripheral device		PROGRAM
With Programming Console**		The mode is determined by the mode selector on the Console, i.e., RUN, MONITOR or PROGRAM.

* If there is no Rack-mounting Host Link Unit mounted, the data for the Rack-mounting Host Link Unit LOCAL mode applies.

** With the Host Link Unit mode set to HOST, a MODE SET ERR alarm occurs if the Programming Console is set to MONTR or PROG and RUN is selected on the DIP switch, or if the Programming Console is set to RUN or MONTR with STOP selected.

The operating mode can be set from a host computer as long as the Host Link Unit is set to HOST mode. If the Host Link Unit is set to LOCAL mode, the operating mode cannot be set from the host computer and must be set from the host computer and must be set from a Peripheral Device, such as the Programming Console.

C500-LK103(-P) and C500-LK203 Host Link Units

System configuration and Host Link Unit setting		Host Link Unit mode	
		MONITOR	NORMAL
No other mounted device		MONITOR	RUN
Programming Console		The mode is determined by the mode selector on the Console., i.e., RUN, MONITOR, or PROGRAM.	
CPU-mounting Host Link Unit	RUN	*	RUN
	STOP	MONITOR	PROGRAM
Host Link Unit	MONITOR	MONITOR**	MONITOR**
	NORMAL	MONITOR**	RUN**
CPU-mounted peripheral device		MONITOR	PROGRAM

- * A CPU-mounting Host Link Unit must be set to STOP mode when used together with a Rack-mounting Host Link Unit that is set to MONITOR mode.
- ** If a Programming Console is also mounted, the mode selector on the Programming Console determines the PC operating mode.

If a peripheral device other than a CPU-mounting Host Link Unit is attached to the CPU, the PC's operating mode is determined by the peripheral device when the Host Link Unit's mode selector is set for LOCAL. With the mode selector set for HOST, the PC's operating mode is determined by the RUN/STOP selector on the Host Link Unit.

Unless programming is implemented to prevent starting, if the PC is in RUN mode, it will begin operation immediately the power is applied. Refer to *Controlling PC Start-up* at the end of this subsection for details on programming methods. These methods do not apply when using a 3G2A5-LK101-(P)EV1 or 3G2A5-LK201-EV1 Host Link Unit.

PC Mode When Mounting a CPU-mounting Host Link Unit with the Power ON

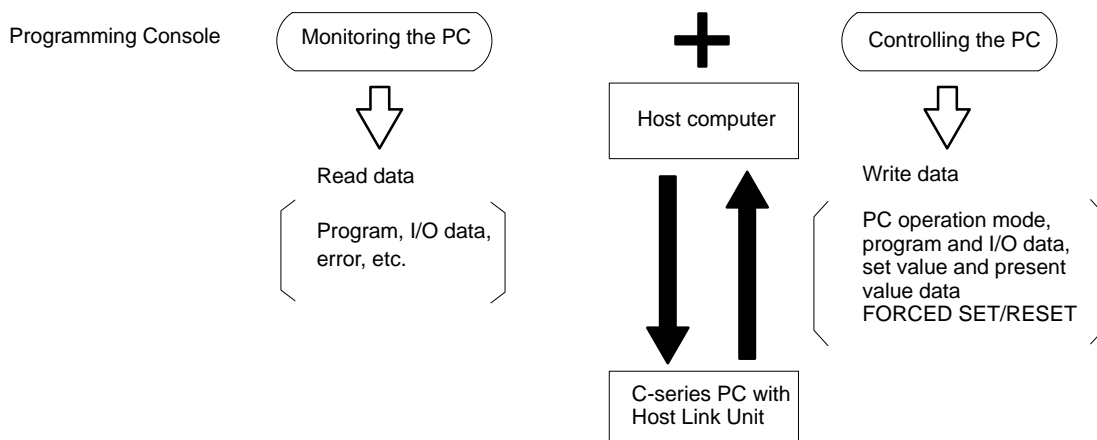
System configuration			Rack-mounting Host Link Unit*	
			LOCAL	HOST
V1 PCs**			Operating mode unchanged	Operating mode unchanged
Other PCs	Mounting for the first time	RUN	RUN	
		STOP	PROGRAM	
	Remounting (the Host Link Unit has been mounted before)			

* If there is no Rack-mounting Host Link Unit mounted, data for the Rack-mounting Host Link Unit LOCAL mode applies.
 ** V1 PCs are the C200H/HS/HX/HG/HE, C1000H, C2000H, and any other building-block PC with the suffix "V1" in the model number.

Data Flow

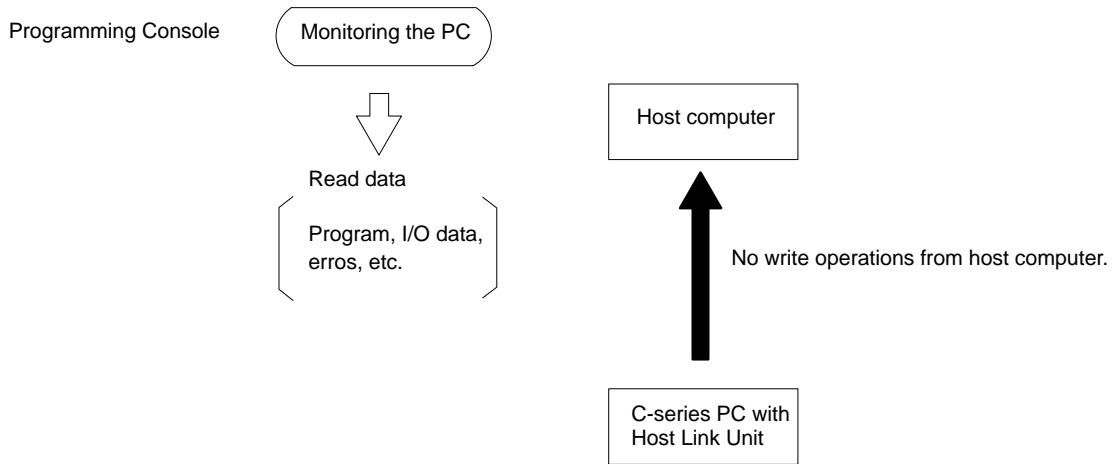
HOST Mode

The following figures show the flow of data between the system and a Programming Console with the Host Link Unit set in HOST mode. As can be seen, the Programming Console can be used for monitoring or writing in this mode.



LOCAL Mode

The following diagram shows the flow of data while the Host Link Unit is in LOCAL mode. Note that in this mode the Programming Console can be used for monitoring only.



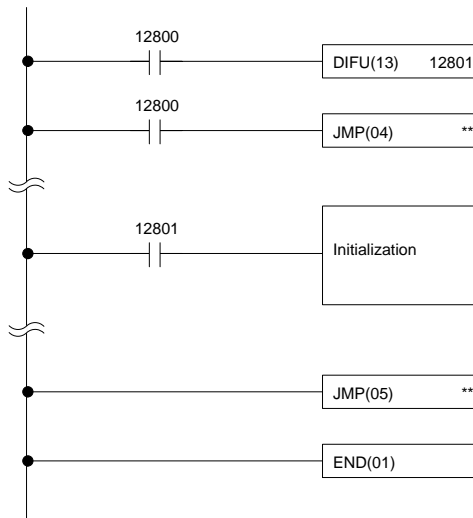
C500-LK103(-P) and C500-LK203 Host Link Unit Modes

These Units do not have mode selectors, i.e., PC operating modes can be set, data can be written, and similar operations can be performed without regard to HOST/LOCAL mode settings. Data flow is the same as that for HOST mode, shown above.

Controlling PC Start-up

C500-LK103(-P) and C500-LK203 Host Link Units

PROGRAM mode cannot be achieved manually when these Rack-mounting Host Link Units are used without a Programming Console or other peripheral device. Programming can be implemented, however, to prevent the PC from automatically starting when the power is applied. This allows greater control and the Unit can be started later with a command from the host computer. The following is an example of a programmed start-up of a C1000H PC.



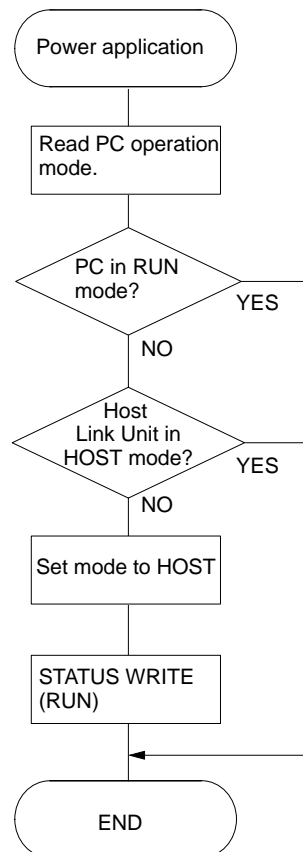
Appropriate initialization codes must be programmed between JMP(04) and JME(05). IR area bit 12800 can then be turned on to start PC operation from the host computer. The PC must be set in MONITOR mode for this to be possible. To initialize the PC when starting operation, use DIFU with the Always ON Flag; the Reset Flag cannot be used. Refer to your PC's operation manual for specific bits. The PC's operating mode can then be changed from the host computer after operation has begun. When programming in this fashion, note the following conditions:

- 1, 2, 3... 1. Pin 8 of SW1 on C500-LK103(-P) or C500-LK203 Units should be set to MONITOR. If it is not, use the host computer to change it to the MONITOR mode before turning on IR area bit 12800.
2. JMP command numbers must be between 01 and 99 for C200H/HS, C1000H and C2000H PCs.
3. This programming example cannot be applied to C500 PCs, which do not support direct jumps. In this case, use a 3G2A5-LK101-(P)EV1 or 3G2A5-LK201-EV1 Host Link Unit so that the mode can be set manually.

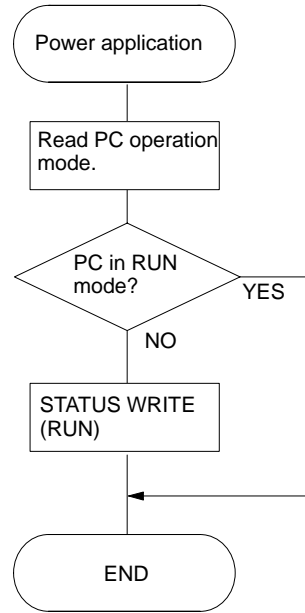
Sending a RUN Start Command to the PC

The following flowcharts show the computer decision making processes for ensuring that the PC is in RUN mode after start-up.

3G2A5-LK101-(P)EV1 and 3G2A5-LK201-EV1 Host Link Units



C500-LK103(-P) and C500-LK203 Host Link Units



2-2-5 Restart Bits and Error Flags

Host Link Units use some of the Special Relay (SR) area and Auxiliary Relay (AR) area bits of the PC to restart the communications control program of the Host Link Unit and to indicate the occurrence of communications errors between the Unit and the computer. The word (Wd) addresses and bit numbers of these bits are as follows:

C500

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SR Wd 60			RM* re-start bit				CM* restart bit	CM* error flag								
SR Wd 61				RM* error flag												

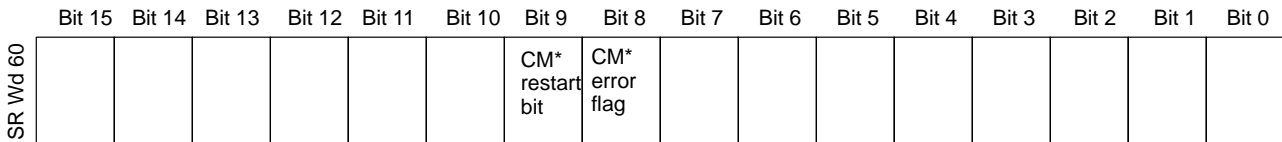
* RM: Rack-mounting Host Link Unit
 CM: CPU-mounting Host Link Unit

C1000H and C2000H

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SR Wd 252			RM* re-start bit				CM* restart bit	CM* error flag		RM* #1 error flag						
SR Wd 253				RM* #0 error flag												

* RM: Rack-mounting Host Link Unit
 CM: CPU-mounting Host Link Unit

C120



* CM: CPU-mounting Host Link Unit

Host Link Unit Restart Bit

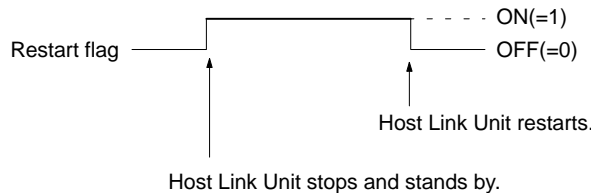
When this bit is turned ON, the Host Link Unit is reset to its initial conditions, as if the power had just been applied.

Caution Do not turn this bit ON in the user program; doing so could cause the memory to be lost.

Host Link Unit Error Flag

This flag turns ON if a transmission error occurs between the PC and the Host Link Unit. It turns ON the error indicator on the front of the Unit.

- Note**
1. When the Host Link Unit Restart bit is turned ON, the Host Link Unit Error Flag is turned OFF.
 2. Set the Host Link Unit to LOCAL mode before force setting or force resetting an error flag.
 3. Communications between the Host Link Unit and the host computer will not be resumed until the Restart bit is turned OFF. The initialization process is repeated as long as the Restart bit is ON.



4. If a reset switch is provided, pressing it should reset the Host Link Unit and clear the error state.
5. If the Unit still won't reset, disconnect and then reconnect the power to the PC.

2-2-6 I/O Response Time

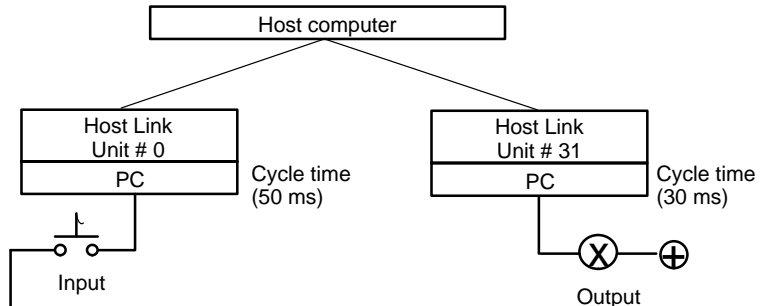
The processing that determines and the methods for calculating the minimum and maximum times required from an input on one PC with a Host Link Unit to an output on another PC with a Host Link Unit are described below. The transfer between the PCs is handled through a host computer connected to both these PCs.

Processing and calculations are described by PC model in the first subsection. An example combining a C200H/HS/HX/HG/HE PC with a C1000H PC is included in the C200H section. Although more precise equations may be written if required, those used in the following calculations do not consider fractions of a cycle.

The calculations used in this section assume that all host computer commands and PC responses require no more than one host link servicing period to complete transmission. To compute response times for situations involving a longer command and/or response, the number of host link servicing periods (i.e., the number of cycles) required to complete the command or response would have to be incorporated into the equations.

In considering response times, it is important to remember the sequence of processing that occurs during the PC cycle. The main factor that affects the response time is the timing of inputs and outputs and of host computer processing in relation to this sequence.

The following diagram illustrates the setup used in response time calculations

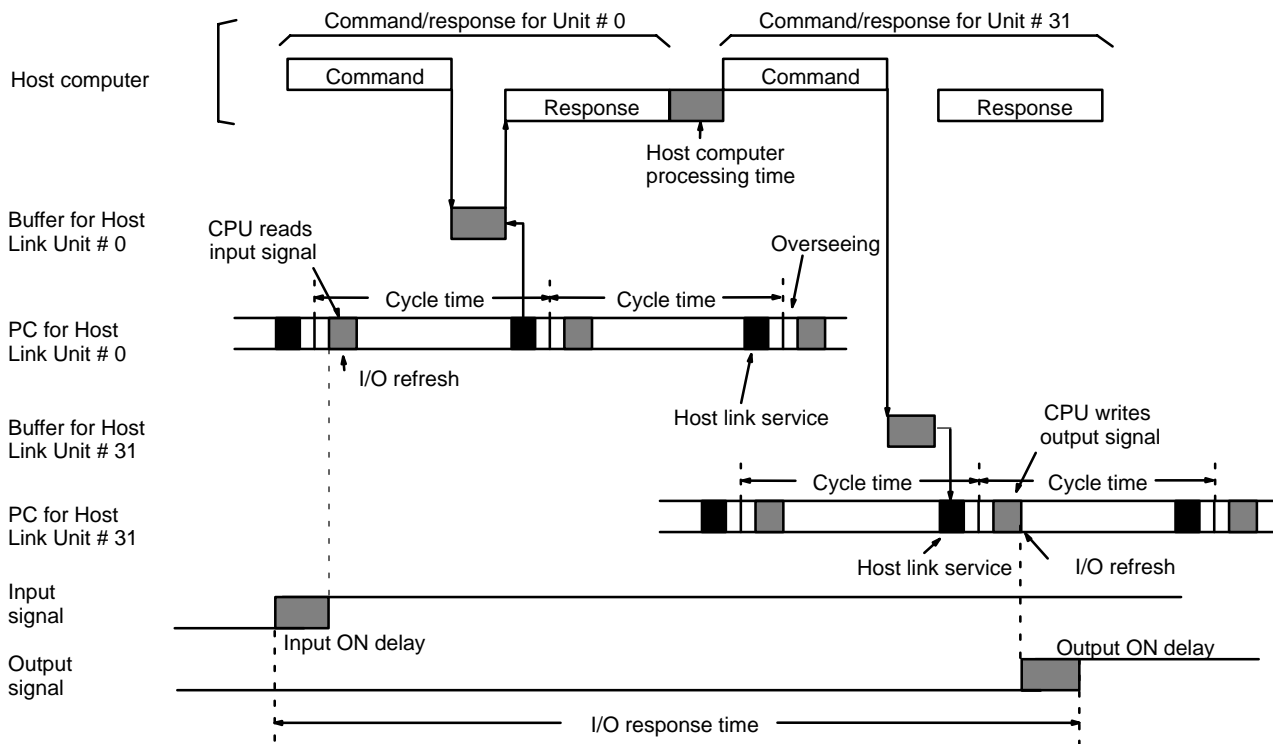


C120 and C500

Although the C120 and C500 equations for the minimum and maximum response times are the same as those for the C1000H and C2000H, the breakdown of the CPU's cycle differs. These groups are thus treated in different sections.

Minimum Response Time

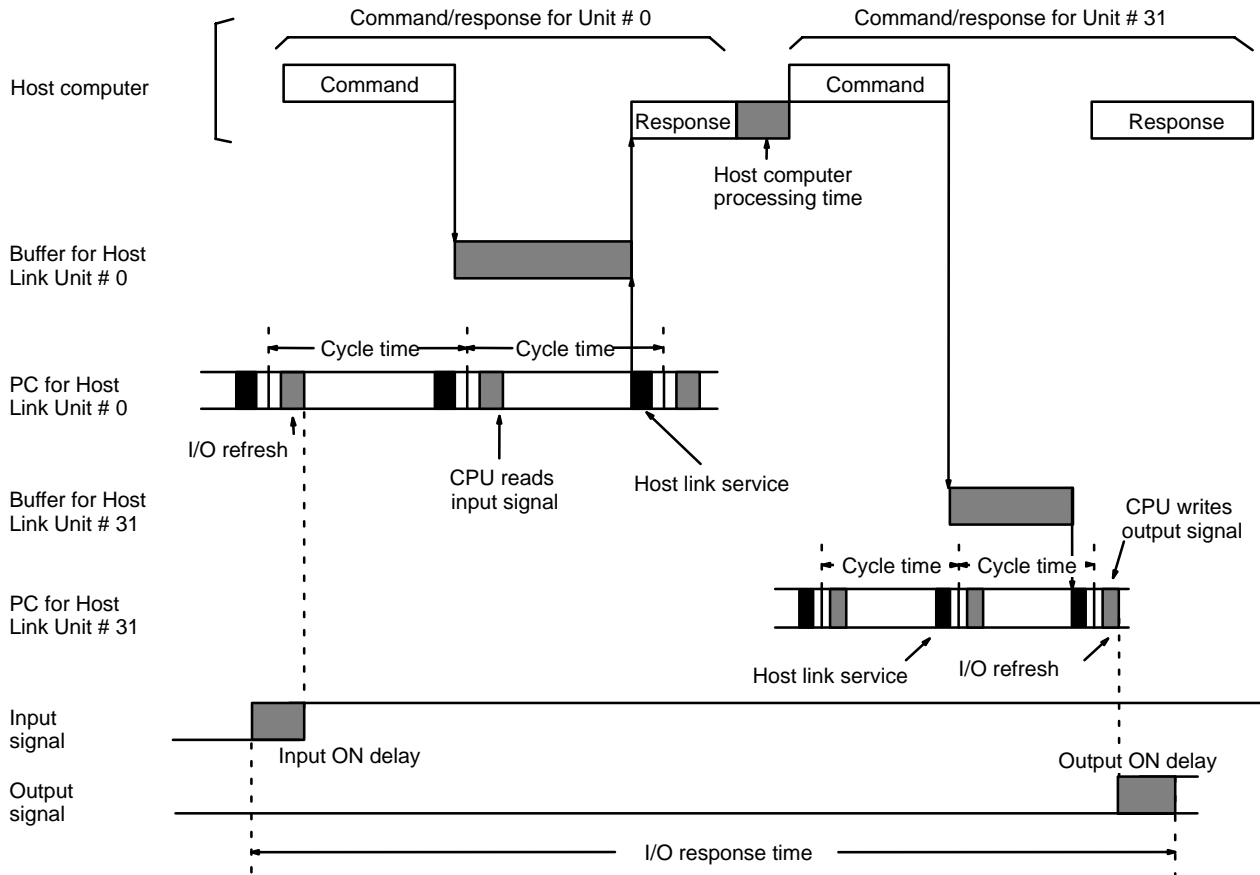
The data flow that will produce the minimum response time is shown below. This flow assumes that all signals and data transmissions are processed as soon as they occur. The equation for the minimum response time is given below the diagram.



Minimum response time = Input ON delay + Command transmission time + Cycle time of PC for Unit #0 + Response transmission time + Host computer processing time + Command transmission time + Output ON delay

Maximum Response Time

The data flow that will produce the maximum response time is shown below. Delays over the minimum response time occur because the input to be transferred through the host computer is received immediately following the I/O refresh period (requiring a wait to the next cycle) and because the command from the host computer to write the bit to be output from PC for Unit #31 is received immediately following host link servicing (again requiring a wait to the next cycle). The equation for the maximum response time is given below the diagram.



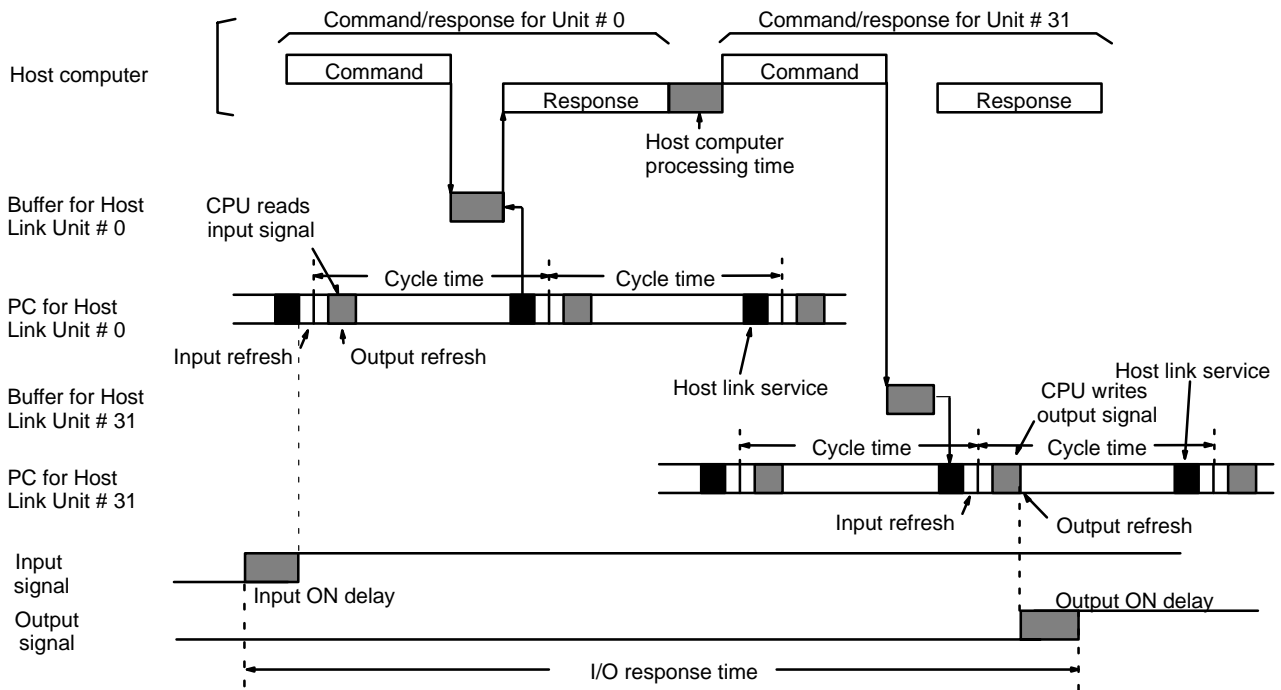
Maximum response time = Input ON delay + Command transmission time + (Cycle time of PC for Unit #0 x 2) + Response transmission time + Host computer processing time + Command transmission time + Cycle time of PC for Unit #31 + Output ON delay

C1000H and C2000H

Although the C1000H and C2000H equations for the minimum and maximum response times are the same as those for the 3G2A6 and C500, the breakdown of the CPU's cycle differs. These groups are thus treated in different sections.

Minimum Response Time

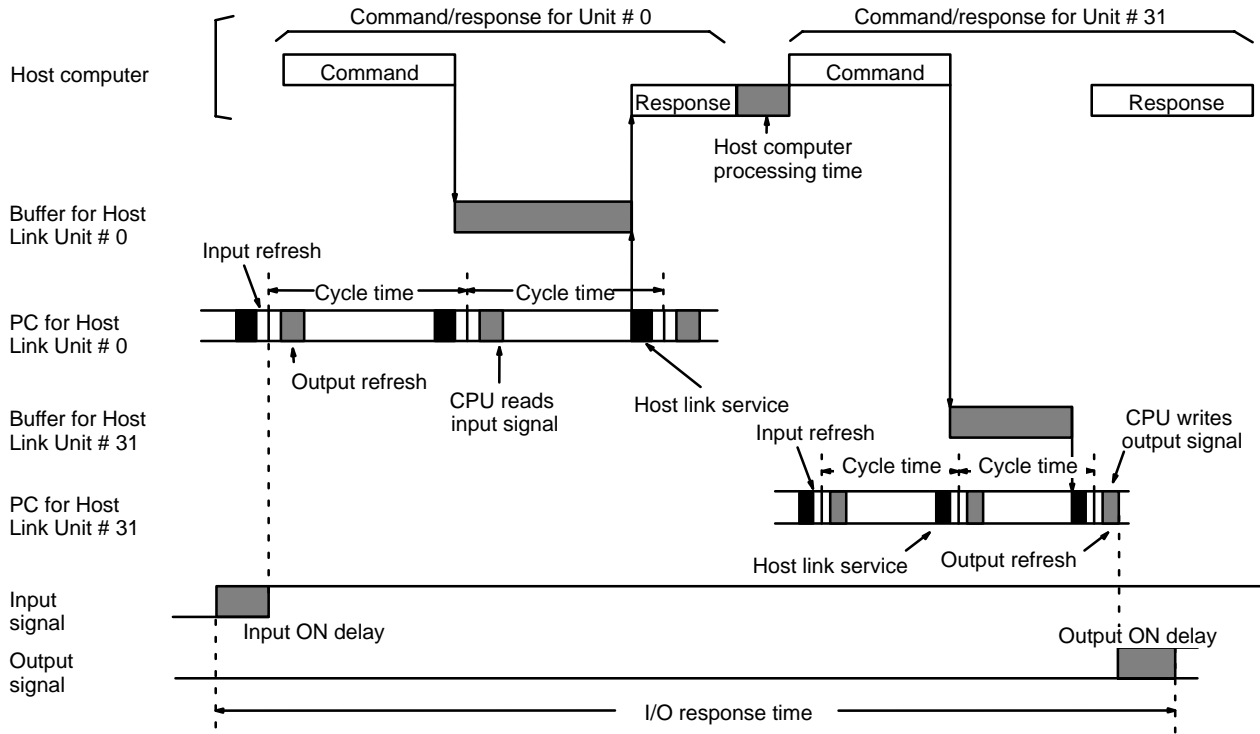
The data flow that will produce the minimum response time is shown below. This flow assumes that all signals and data transmissions are processed as soon as they occur. The equation for the minimum response time is given below the diagram.



Minimum response time = Input ON delay + Command transmission time + Cycle time of PC for Unit #0 + Response transmission time + Host computer processing time + Command transmission time + Output ON delay

Maximum Response Time

The data flow that will produce the maximum response time is shown below. Delays over the minimum response time occur because the input to be transferred through the host computer is received immediately following the I/O refresh period (requiring a wait to the next cycle) and because the command from the host computer to write the bit to be output from PC for Unit #31 is received immediately following host link servicing (again requiring a wait to the next cycle). The equation for the maximum response time is given below the diagram.



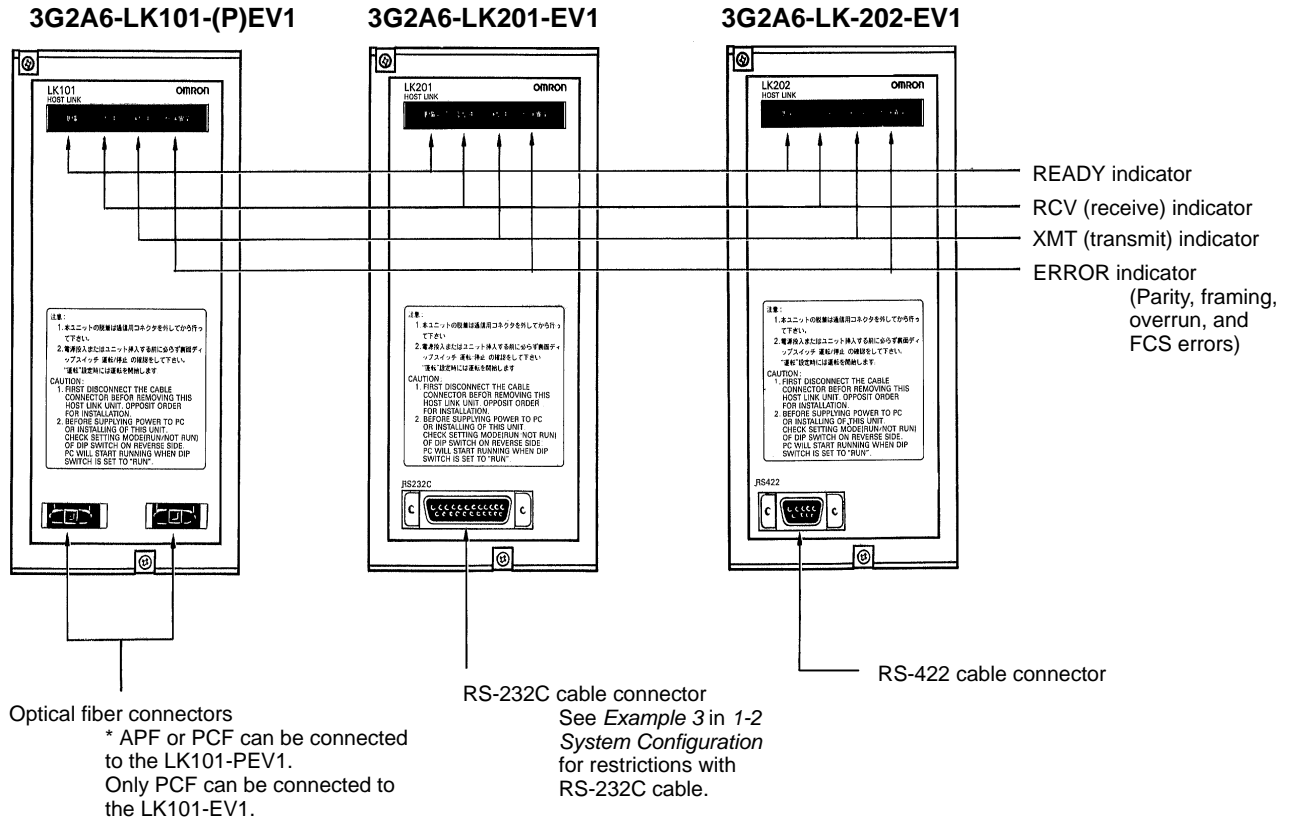
Maximum response time = Input ON delay + Command transmission time + (Cycle time of PC for Unit #0 x 2) + Response transmission time + Host computer processing time + Command transmission time + Cycle time of PC for Unit #31 + Output ON delay

2-3 C120 (3G2A6) Host Link Units

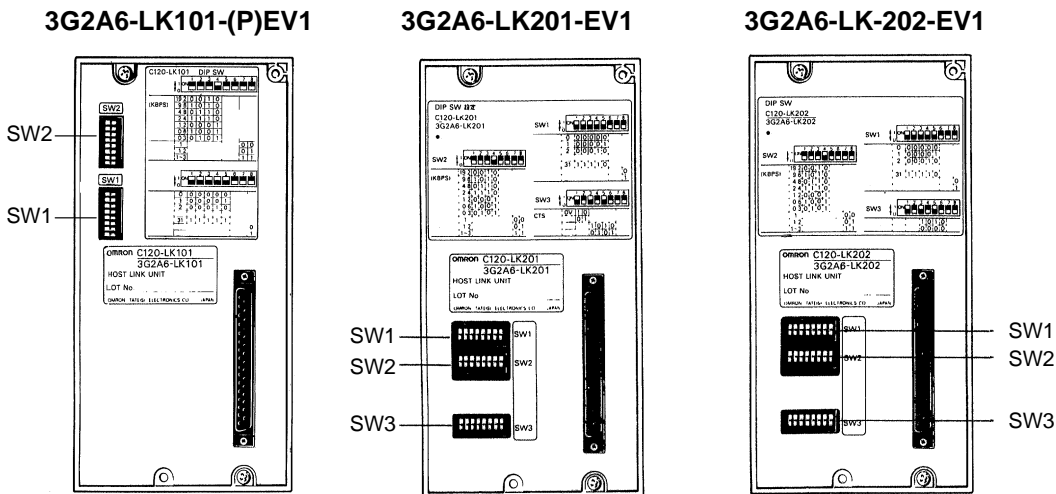
2-3-1 Nomenclature and External Appearance

The following figures give details of switch types, selectors, and connectors for your Host Link Unit. It will be necessary to refer to these diagrams from time to time as you read further in the manual, particularly when reading the section on 2-3-2 *Switch Settings*. These Units can be used with all of the C-series Rack-mounting PCs. (C120 Host Link Units are sometimes referred to as 3G2A6 Host Link Units.)

Front Panels



Rear Panels

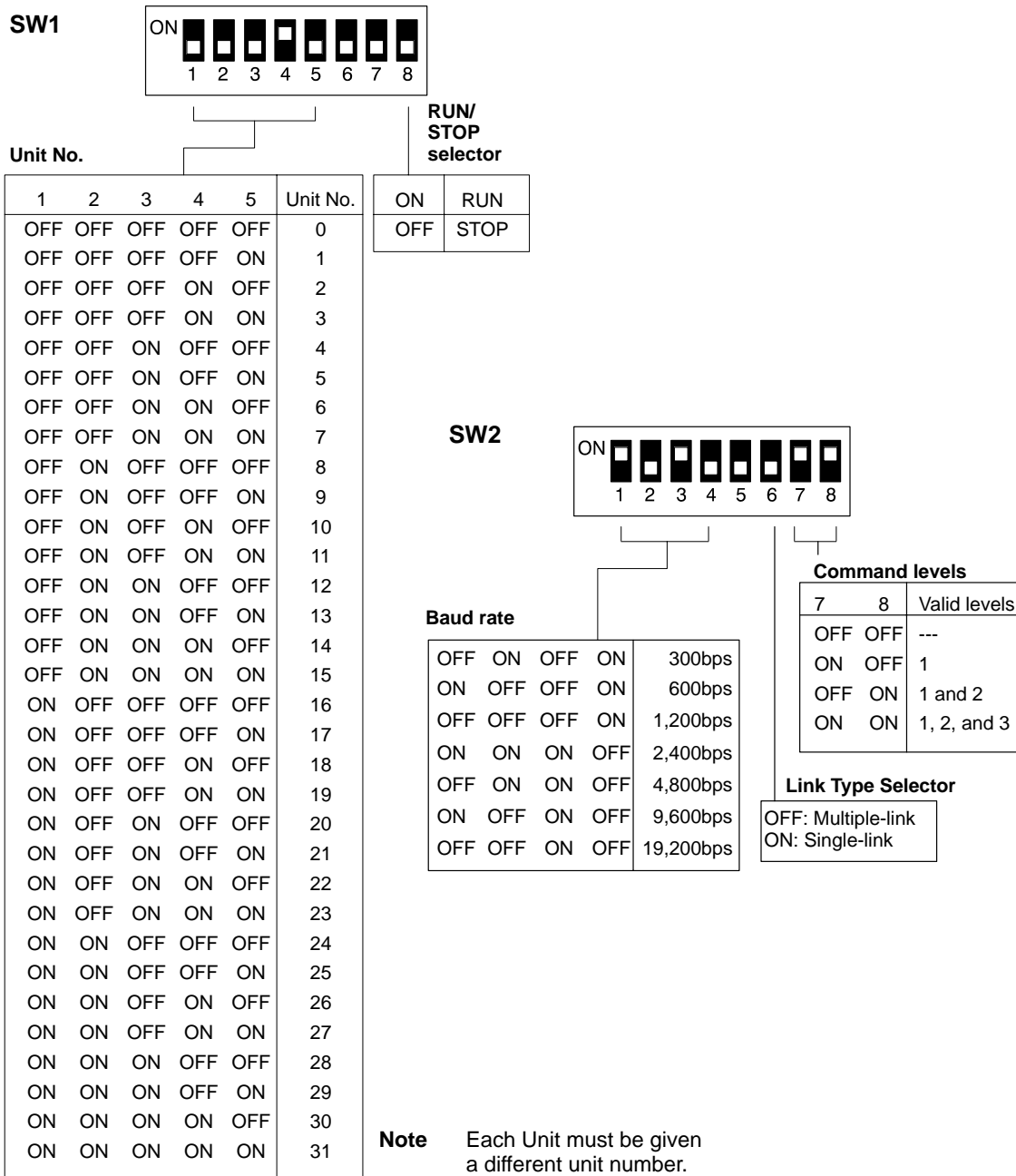


2-3-2 Switch Settings

The following information provides details on correct settings for the range of 3G2A6 Host Link Units covered by this manual.

SW1

For SW1, the first five pins are used to set the Unit number as shown below. Details about SW2 settings are given following the diagram.



SW2

Operating Levels

Set pin 5 of SW2 to OFF (operating level 1) when using a C500(F) PC and ON (operating level 0) when using the Host Link Unit together with a SYSMAC NET Link Unit. When using two Rack-mounting Host Link Units, set this pin to ON for one of the Units, and to OFF for the other.

Caution Failure to set pin 5 correctly may damage components or prevent operation.

MONITOR/NORMAL Selector

When this switch is set to MONITOR, the PC will operate in MONITOR mode upon the application of power. When the pin is set to NORMAL, the PC is no longer controlled by the Host Link Unit (i.e., the mode of operation will be determined by other system conditions). Refer to 2-3-4 PC Operating Mode for details.

Link Type Selector

ON (Single-link) If pin 6 is set to ON, the Host Link Unit is connected to the host computer on a one-to-one basis (see Example 3 and Example 5 under 1-2 System Configuration. The Unit number and Frame Checksum (FCS) settings are not required. The normal setting is OFF (see below).

OFF (Multiple-link) If pin 6 is set to OFF, up to 32 Host Link Units can be connected to one host computer. The unit number and FCS must be specified, even if only one Host Link Unit is connected to the host computer. When using Ladder Support Software, LSS, pin 6 must be set to OFF.

Command Level

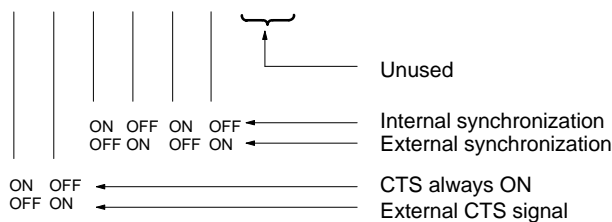
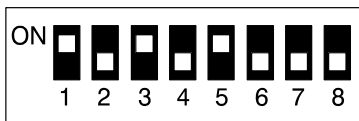
Pins 7 and 8 on SW2 control the operating command levels according to the following:

- 1: Enables data areas to be read and, when the CPU has been correctly set via the SC (Status Write) command, data can also be written.
- 2: Enables program transfers and reading or writing of I/O tables.
- 3: I/O reads can be performed and I/O tables can be registered. The Command Level should be set to 1, 2, and 3 for running LSS software, program transfers, etc. Other levels may be used for Systems Control Software, monitoring, Data Acquisition Software, etc.

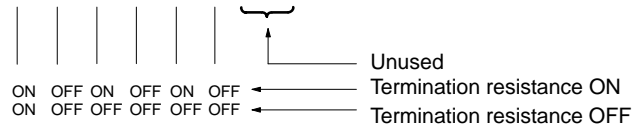
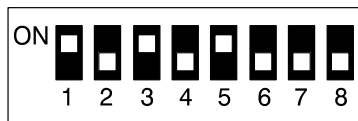
Note Commands valid for each level are listed in 3-1 Command Levels.

SW3

3G2A6-LK201-EV1



3G2A6-LK202-EV1



Synchronization Selector

Sets the Host Link Unit to either an internal or external clock. Normally, an internal clock is employed. But, when a synchronization modem with a baud rate of 2,400 bps or higher is used, the external clock setting must be selected.