

PREFACE

Thank you for purchasing the LT integrated development software, "LT Editor Ver. 2.0". Please read this manual carefully in order to use this software properly, and be sure to keep this manual handy for future reference.

NOTES

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Trademark / Trade Name	Right Holder
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Intel, Pentium	Intel Corporation, USA
Pro-face, Flex Network	Digital Electronics Corporation (in Japan and other countries)
Ethernet	Western Digital Electric Corporation, USA
IBM, VGA, PC/AT	International Business Machines Corporation (IBM), USA

The following terms differ from the above mentioned formal trade names and trademarks.






Term used in this manual	Formal Trade Name or Trademark
Windows 95	Microsoft® Windows® 95 Operating System
Windows 98	Microsoft® Windows® 98 Operating System
Windows Me	Microsoft® Windows® Me Operating System
Windows NT	Microsoft® Windows NT® Operating System
Windows 2000	Microsoft® Windows® 2000 Operating System
Windows XP	Microsoft® Windows® XP Operating System
MS-DOS	Microsoft® MS-DOS® Operating System

MANUAL SYMBOLS AND TERMINOLOGY

This manual uses the following symbols and terminology.



■ Safety Symbols and Terms

This manual uses the following symbols and terms to identify important information related to the correct and safe operation of this product.

Symbol	Description
	Indicates a potentially hazardous situation that could result in serious injury or death.
	Indicates a potentially hazardous situation that could result in minor injury or equipment damage.
	Indicates a potentially damaging action or dangerous situation that could result in abnormal equipment operation or data loss.
	Indicates instructions or procedures that must be performed to ensure correct product use.
	Indicates instructions or procedures that must not be performed.

■ General Information Symbols and Terms

This manual uses the following symbols and terms for general information.

Symbol	Description
	Provides hints on correct product use, or supplementary information.
	Indicates an item's related information (manual name, page number).
Device	Indicates a peripheral device (temperature controller, inverter, etc.). This does not include devices connected via the Flex Network or DIO.
LT	Generic name for the "LT Series" Graphic Logic Controller made by Digital Electronics Corporation.
LT Editor	Indicates LT Editor Version 2.0 (hereinafter referred as "this product"), LT integrated development ware made by Digital Electronics Corporation.

LT SERIES

The LT Editor supports the following LT models.

Series	Type	Model
LT Series	Type A1	GLC150-BG41-XY32SK-24V
	Type A2	GLC150-BG41-XY32SC-24V
	Type B	GLC150-BG41-FLEX-24V
	Type B+	GLC150-BG41-SY32KF-24V
	Type C	GLC150-BG41-RSFL-24V
	Type H1	GLC150-BG41-ADK-24V
		GLC150-BG41-ADPK-24V
		GLC150-BG41-ADTK-24V
	Type H2	GLC150-BG41-ADC-24V
		GLC150-BG41-ADPC-24V
		GLC150-BG41-ADTC-24V

HOW TO USE THIS MANUAL

■ Manual Structure

The "Device Connection Manual" is one in a series of manuals for this product and explains how to use the LT Editor. There are three other manuals in the series, as well as online help. Please refer to "Operation Manual - Screen Creation Guide Chapter 1 LT Editor Fundamentals" for an outline of this product.

▼Reference▲ *Operation Manual - Screen Creation Guide*
1.6 LT Editor Manuals and Help

In addition to these manuals, data files containing supplemental information on updated functions are also provided. To read these additional data files, click on the [Start] button in your Windows OS main screen and select the [Programs]-[Pro-face]-[LT Editor] menu. Then, click on the [Read Me] selection.

For detailed information on LT series products, please refer to "*LT Series User Manual*". (Optionally available)

Included on CD-ROM	Operation Manual -Screen Creation Guide	Describes the operating procedures for the LT Editor and all functions except for Logic Program development (provided as a PDF file).
	Operation Manual -Logic Programming Guide	Describes logic program development. This manual's "Programming" section uses a tutorial lesson to help users learn basic operation procedures, and a "Functions" section to explain the software settings required for the combination of the LT main unit and the LT Editor (provided as a PDF file).
	Parts List	Describes the LT Editor's pre-made Parts and symbols (provided as a PDF file).
	Device Connection Manual (this manual)	Describes the methods for connecting the LT to devices of various manufacturers (provided as a PDF file).
Available on LT Editor screen	Online Help	Describes the methods for setting the LT Editor's windows and dialog boxes, instructions and functions of logic programs, as well as how to set up individual drivers.



- Note:**
- Address settings described in these manuals are for explanatory purposes only. Appropriate addresses must be set according to your requirements.
 - If you have any questions about the contents of this manual, please contact your local LT distributor. LT distributors will answer to your technical inquiries and provide you with technical support.

▼Reference▲ *Operation Manual - Screen Creation Guide*
A-4 Software Trouble Report

If you have any question about your personal computer or Microsoft® Windows®, please contact your PC distributor or manufacturer.

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A 1 Maximum Number of consecutive Addresses

A.1.1 Maximum number of Consecutive Device Addresses Appendix1-1



1 Direct Access Communication

The *Direct Access* (Programless) format, which frees the Device from running protocol programs, performs communication between the LT (Only Type C) and an Device. This chapter describes the Direct Access method of Communication.



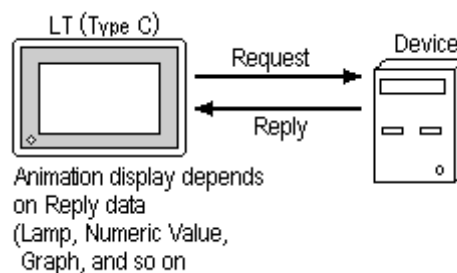
Note: When LT unit communicates with the equipment such as a personal computer or a one-board microcomputer which do not have their own protocols, the communication method will be Memory Link method. For Memory Link method, refer to this manual Chapter 6 Memory Link Communication.

1.1 Communication Method

Depending on the Parts used in your screen program, the LT can easily specify an Device. By doing so, the LT automatically requests the data required for operation (System Data) and the screen display from the Device. Then the LT, after receiving the External Device response, changes its screen display via its screen animation settings. Also, data can be sent to the Device using LT touch key input.

With Direct Access communication, the LT is always the master in the communication link.

In Direct Access Communication, data required by the LT's screen display is automatically sent and received from the LT. Therefore, an Device program for screen display operations is not required, thereby simplifying installation of the graphical control panel (LT).

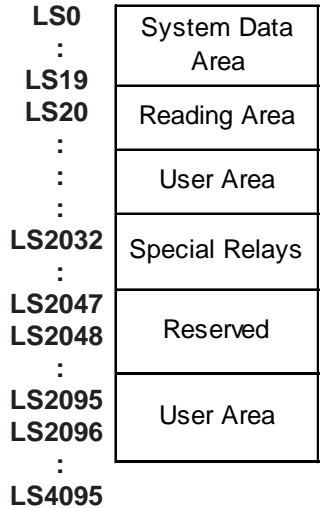


Caution

When an error occurs because data is read or written outside the Device's device range, the read/write operation continues retrying until the error is restored. For this reason, the LT display screen may seem to be not operating. To fix this problem, check to make sure the devices designated by the LT's Parts are within the Device's designated range.

1.1.1 LS Area Structure

The LS Area, located in LT memory, is the area used for the LT's operations. The LS Area structure is as follows.



System Data Area This is the data write area for LT screen control data or error information necessary for LT operation.

Reading Area Stores data common to all screens and performs LS Area Refresh. Up to 256 words can be designated here. Up to 16 words can be set in LS Area Refresh.

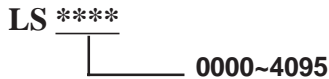
User Area The devices which are only for the LT's internal use, and cannot be allocated as Devices. This area is used to process Parts which can only be processed by the LT internally and cannot be controlled by as Device.

Special Relays This area is where the various status information is setup during LT communications.

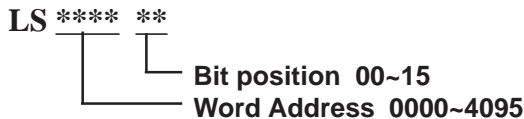


The following describes how to access the LS Area.

- Word Address access



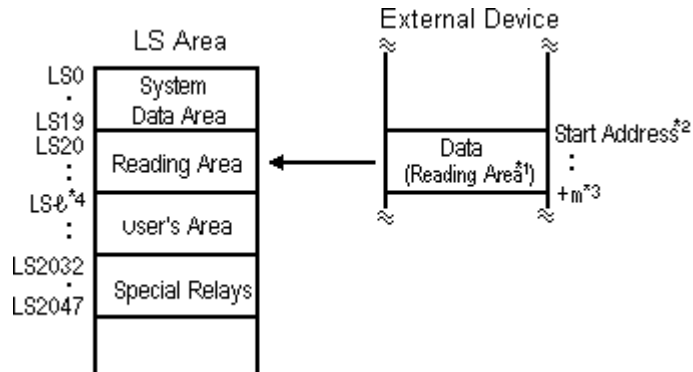
- Bit Address access



Reserved Please do not use this area. It is only for LT's internal use. If you use this area, the LT will not operate properly.

1.1.2 Address Settings

Up to 20 words can be set as the System Data Area and up to 256 words can be set as the Reading Area.*1 The size of these areas determines each area's number of available addresses.



- **Part addresses cannot be set so that they include the System Area and the Reading Area, or the Reading Area and the User. Area.**
- **When designating Parts that are inside the System Data Area's addresses, specify their data length as 16 bits.**

*1 If the device range of your Device is less than 256 words, the size of the Device's device range minus the size of System Data Area gives the maximum size for the Reading Area.

*2 The Start Address means the start address of System Data Area specified in the INITIALIZE menu.

Reference For more information, refer to "6.5 Device SETUP" in LT Series User Manual (sold separately)

*3 m = Reading Area Size

*4 ϕ = Reading Area Start Address (20) + Reading Area Size

1.1.3 Contents and Range of System Data Area

The following table describes the data write contents of the System Area for each address.

■ For a Device using 16-bit addressing



- **When you wish to turn off the LT's display, use the display's ON/OFF bit (word address +9). Do not use the Control area's Backlight OFF bit (word address +14).**
- **Depending on the Device, the device cannot be assigned to the System Data Area.**



- **The Word Address values assume that all the items have been selected for the System Data Area in the LT's INITIALIZE menu.**
- **Here, "item #" represents the item numbers shown in the System Environment Setup area's SYSTEM AREA SETUP; found in the LT OFFLINE mode's INITIALIZE area.**

	Item #	Word Addr	Contents	Bit	Detail
LT ↓ Device E x c l u s i v e W r i t i n g A r e a	1	+0	Display Screen Number	1 to 8999 (However, 1 to 1999 when using BCD input)	
	2	+1	Error Status Each bit changes to reflect the LT error status. When an error occurs, the bit is set ON. A bit that has turned ON remains ON until the power is turned OFF and back ON, or until RUN mode is re-entered from OFFLINE mode. For Error Status data and processing notes, refer to the end of this section.	0,1	Not used
				2	System ROM/RAM
				3	Memory Checksum
				4	SIO Framing ^{*1}
				5	SIO Parity ^{*1}
				6	SIO Over-run ^{*1}
				7,8	Not used
				9	Memory requires Initialization
				10	Timer Clock Error
	11	Device Error ^{*1}			
	12 to 15	Not used			
	3	+2 +3 +4 +5	Current YEAR, BCD 2 digits Current MONTH, BCD 2 digits Current DAY, BCD 2 digits Current TIME, BCD 4 digits	Last two digits	
				01 to 12 (month)	
				01 to 31 (date)	
				00 to 23 hr, 00 to 59 min	
	4	+6	Status ^{*3}	0 to 2	Reserved
				3	Writes a set value ^{*2}
				4 to 8	Reserved
				9	Display 0: OFF, 1: ON ^{*4}
10				Backlight Alarm ^{*5}	
11 to 15				Reserved	
5	+7	Reserved			

	Item #	Word Addr	Contents	Bit	Detail
Device ↓	6	+8	Change Screen Number	0 to 14	Change Screen No. 1 to 8999 (However, 1 to 1999 when using BCD input)
				15	Compulsion Change Screen 0:Normal, 1:Compulsion Change Screen
LT E x c l u s i v e R e a d i n g A r e a	8	+10	Clock's YEAR set value, BCD 2 digits (+flag)	FFFFh: Screen clears almost immediately. 0h: Screen turns ON. All other bits are reserved.	
		+11	Clock's MONTH set value, BCD 2 digits	Last 2 digits (bit #15 is the clock's data write change flag *6)	
		+12	Clock's DATE set value, BCD 2 digits	01 to 12	
		+13	Clock's TIME set value, BCD 4 digits	01 to 31	
9	+14	Control *10	0	Backlight OFF *7	
			1	Buzzer ON	
			2, 3	Reserved	
			4	Buzzer 0:Output, 1:Non-output *8	
			5 to 10	Reserved	
			11	Hard copy output 0: Enabled, 1: Disabled *11	
			12 to 15	Reserved	
A	+15	Reserved	Reserved		
B	+16	Reserved	Reserved		
C	+17	Reserved	Reserved		
D	+18	Reserved	Reserved		
	+19	Reserved	Reserved		

*1 Only LT Type C can be used.

*2 When an alarm is setup in the middle of Keypad Input Display, and a value outside the alarm range is entered, the bit turns ON. When you enter a value within the alarm range, or a screen change takes place, the bit turns OFF.

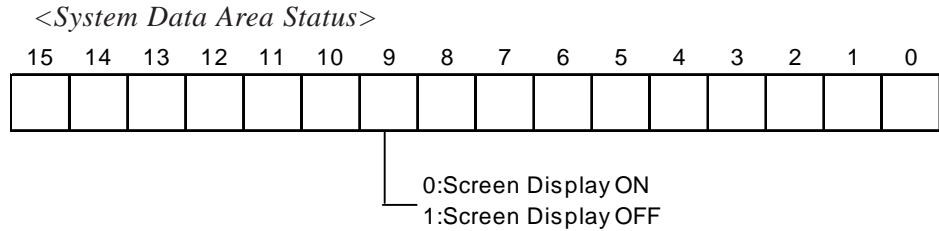
*3 Monitor, in bit units, only the necessary bits. Since reserved bits may be used for LT system maintenance, etc., their ON/OFF status is not defined.

*4 Adding the screen display ON/OFF status

Adding the screen display ON/OFF bit to the system data area status allows you to detect the screen display OFF status based on the stand-by time period, on the Device. Add the screen display ON/OFF status bit to the system data area's Bit 9. This bit will change in the following cases:

- (1) "FFFF" is written to the system data area's screen display ON/OFF bit (LS9 when using link type), to turn the screen display OFF. (Bit 9 = 1)
- (2) After the stand-by time has been elapsed, the screen display OFF bit is turned ON automatically. (Bit 9 = 1)
- (3) The screen display OFF status has been changed to the screen display ON status via screen switching, etc. (Bit 9 = 0)

(4)The screen display ON/OFF status bit will not change via turning ON/OFF the system data area backlight OFF bit (Bit 0).



*5 When the backlight burns out, the Status LED’s orange light turns ON, and the Status Data Area’s “Status”*3 bit 10 will turn ON.

*6 When the data write flag changes (OFF—>ON, or ON—>OFF), the clock data is rewritten.

Ex. October 16, 1995, 9:57 pm

The current data in word address +10 is 0000.

Month, Date, Time data is written as follows:

- In word address +11 0010
- In word address +12 0016
- In word address +13 2157

When the YEAR's 15th bit is turned on, the data is written.

- Inputting 8095 into word address +10 causes the clock data to be rewritten.

*7 When the Backlight OFF bit (word address +14) turns ON, only the backlight will turn OFF, however, the LCD display will remain ON and all touch switches set up on the display can still be used. Use the Screen display ON/OFF bit (word address +9) to actually turn the screen display OFF.

*8 Control Bit 1(Buzzer On) is output as shown below.

Buzzer output: When control bit 1 is ON, the LT internal buzzer is activated.

*9 After the screen display ON/OFF bit (word address +13) is set to OFF, simply touching the screen will turn the display ON again.

*10 Be sure to turn all reserved bits OFF since they may be used for LT system maintenance, etc.

*14 Turning ON bit 11(Hard Copy Output) in the Control Area (word address +14) cancels the current printing of the display’s hard copy.

- After printing is cancelled, bit 11, however, will not turn OFF automatically. Therefore, after checking the Status Area’s Now Printing bit, turn OFF the Control Area’s bit 11.
- When bit 11 in the Control Area is turned ON, hard copy cannot be created. If you cancel printing before it is completed, printing will stop after the last line of data on the panel’s current display has been output. Data already input in the printer buffer’s memory will not be deleted.



When writing data to the Control Area (Address +14) be sure to use bit units. Writing data in Word units can cause values to change.

■ Error Status Contents and Correction Process

Error	Origin	Solution
System ROM/VRAM	Problem with the hardware	Run Self-Diagnosis.
Memory Checksum	Because the screen file is corrupted, the screen memory data checksum does not match.	After powering up, check the screen where the error developed. (For details, refer to the LT Series User Manual, "Error Message" section.)
SIO Framing	Framing error	Check the SIO Setup. (For details, refer to the LT Series User Manual, "Would Not Communicate" section.)
SIO Parity	Parity error	
SIO Over-run	Over-run error	
Memory requires Initialization	Internal Memory has not been initialized.	Initialize internal memory.
Timer clock Error	The LT internal clock has been interrupted.	The LT internal battery may be drained. Contact your local LT distributor for service.
Device SIO Error (only for Direct Access type)	Either the SIO settings between the LT and Device do not match, or an error has developed on the Device side.	Check the SIO Setup. (For details, refer to the LT Series User Manual, "Would Not Communicate" section.)

1.1.4 Special Relays

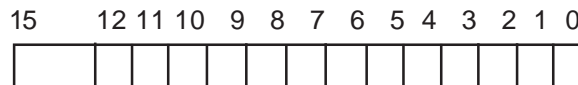
The structure of the LT's Special Relays is as follows.

◆ **Reserved**

The *Reserved* area value is indeterminate. Do not use this area.

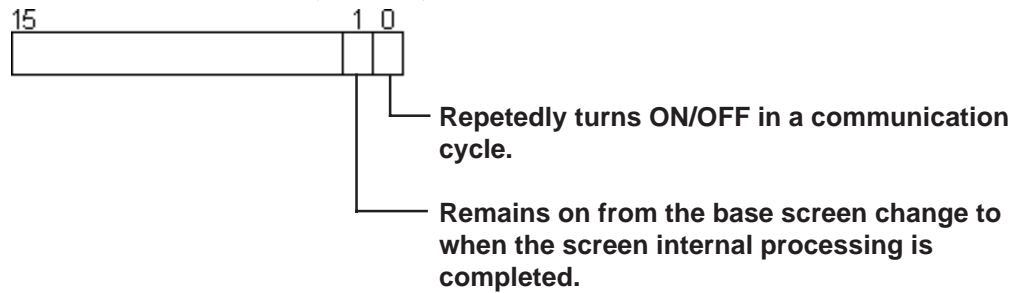
LS2032	Common Relay Information
LS2033	Base Screen Information
LS2034	Reserved
LS2035	1 Second Binary Counter
LS2036	Parts Scan Time
LS2037	SIO Cycle Time
LS2038	Parts Scan Counter
LS2039	SIO Error Code
:	Reserved
:	
LS2047	

◆ **Common Relay Information (LS2032)**



Bit	Contents
0	Repeatedly turns ON/OFF in a communication cycle.
1	Remains ON when a screen change (base, window) occurs until the screen internal processing is completed.
2	ON only in the middle of an SIO error developing.
3	ON when displaying the Initial screen after powering up.
4	Always ON
5	Always OFF
6	Turns ON when backup SRAM data has been deleted.
7	Turns ON if a BCD error occurs while D script is being used.
8	Turns ON if a zero division error occurs while D script is being used.
9	Filing data. Turns ON if the data is not transferred to Backup SRAM.
10	Filing data transfer is triggered by the Control Word Address. Turns ON if the data can not be transferred from Device to SRAM. Also data transfer between Devices is triggered by the Filing Data Display. Turns ON if the data is not transferred from Device to SRAM only when the transfer complete bit address is used.
11	Filing data. Via transfer data to and from SRAM to LS area, via Filing Data Display.
12	When using D-script, turns ON if a communication error occurs when the function memcpy () is used, or reading the data from designated Address Offset. Turns OFF when data read is normally completed.
13-15	Reserved

◆ Base Screen Information (LS2033)



◆ 1 Second Binary Counter (LS2035)

Begins counting in 1 second units, after powering up. The data is in binary format.

◆ Parts Scan Time (LS2036)

The time it takes to scan the setup screen display parts. The data is stored in binary *ms* units. The data renews at the point when the management of all the object parts is complete. The initial data value is **0**. The measured time may differ by $\pm 10\text{ms}$ with the actual time.

◆ SIO Cycle Time (LS2037)

The time it takes in 1 cycle, from the beginning to the end, to scan the SIO object (Device Internal System Area) and various devices. The data renews at the point when the management of the System Area and all the object devices is complete. The initial data value is **0**. The unit is 10ms .

◆ Parts Scan Counter (LS2038)

Begins counting in binary units, roughly when the scan of the parts setup on the display screen is complete.

◆ SIO Error Code (LS2039)

When an SIO error arises, the SIO error code displayed last is stored in binary data.



- *If a problem occurs which causes an SIO error for an extended period of time, such as the unit's data transmission cable becomes loose or disconnected, etc., it may ultimately create a System Error. When this occurs, reset the LT.*
- *When using the 1 Second Binary Counter and Parts Scan Counter value as D script's trigger bit, and the SIO error condition continues, it may develop into a System Error. When this occurs, reset the LT.*



Special Relays are not write protected. Be careful not to use a part to overwrite this data.



1.2 Efficient Data Communication

When using the Device Direct Access Type, the LT unit communicates based on the device addresses set on each screen. As a result, the more parts set on a screen, the more data is transferred, reducing the communication speed. For this reason, to speed up the response times, make data communication as efficient as possible.

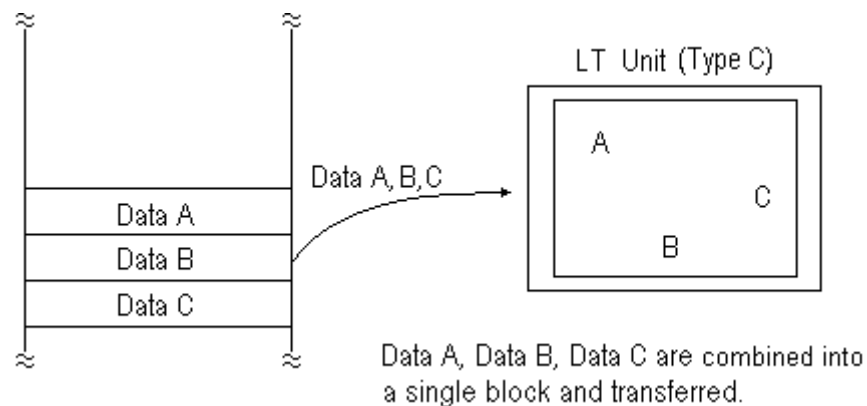
On the LT, in addition to the ordinary communication method, there are the *Block Transfer* and *LS Area Communication* methods, which upgrade data transfer efficiency.

1.2.1 Block Transfer

When displaying consecutive Device's devices on the LT, the LT automatically groups the transmission data into a block, which increases the communication speed.

The addresses in the designated data range*1 must be consecutive to use Data Block Transfer.

When parts are set up in consecutive addresses, the LT automatically reads the data as a single block. When you wish to transfer a block, design your part layout so that the addresses are consecutive.



*1 The maximum number of consecutive addresses is limited by the type of Device used. Refer to the Appendix, "Maximum Number of Consecutive Addresses".

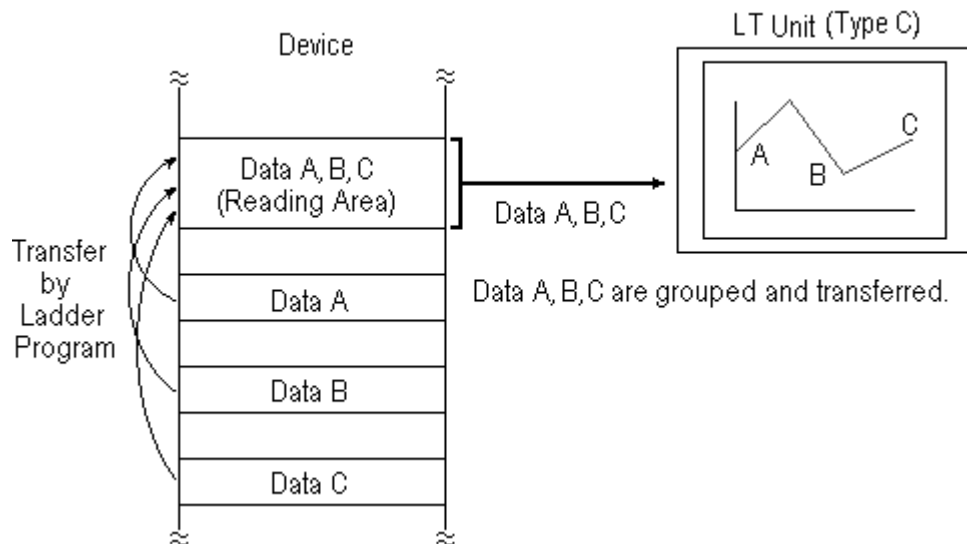
1.2.2 LS Area Communication

Use the LS area for communication in the following cases: when there is display data common to all screens, when there is Trend Graph block display data, or when a video window display is used.

To run LS Area communication, first set up the size of the Reading Area in LT's INITIALIZE setting. Then transfer the common display data or block display trend graph data to the Reading Area, allocated in the Device's internal memory. (Transfer the data via the Device ladder program.)

By doing so, the data transferred into the Reading Area *and* the System Data is sent to the LT unit at one time.

By using the LS Area Communication method, no matter what screen is displayed on the LT, the System Data is transmitted continually. Therefore, to change screens quicker, use LS Area Communication instead of Block Transfer.



Important

- **Use LS Area transmission only when there is data common to all screens or when performing LS Area refresh. Otherwise, communication will not be efficient**
- **Setting up a Reading Area that is too large can cause the display of Parts that do not use the Reading Area, or can slow data communication speed.**
- **When there are many Parts on an LT screen, set all the Parts so that they use consecutive addresses. Block data transfer can be utilized as a result, speeding up transmission.**

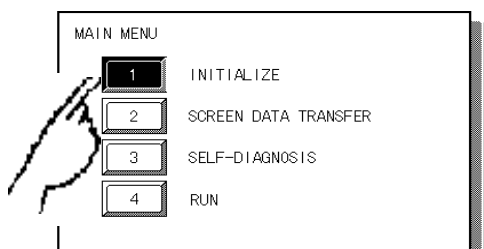
1.2.3 Reset GP on Data Write Error

If a Write error occurs, you can cancel the error from the error display. You will need to set up this feature beforehand via the LT OFFLINE mode's INITIALIZE area.

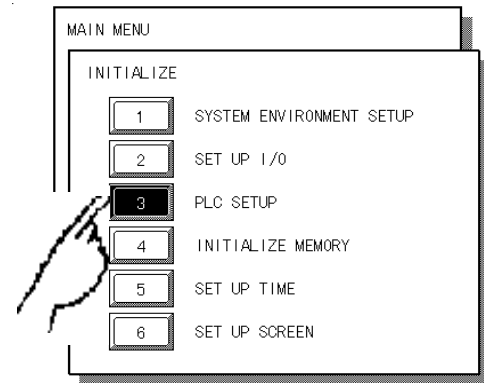
Reference Refer to *LT Series User Manual, Chapter 5 OFFLINE Mode*



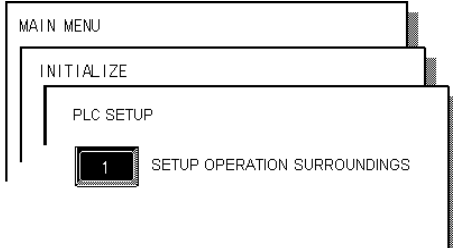
- The default setting is OFF.
- "Memory Link SIO" does not have this function.



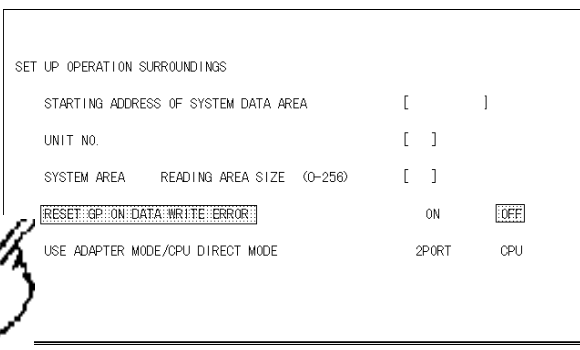
1) Touch item #1, INITIALIZE. The INITIALIZE menu will appear.



2) Touch item #3, PLC SETUP. The PLC SETUP menu appears.



3) Touch item #1, SET UP OPERATION SURROUNDINGS. The SET UP OPERATION SURROUNDINGS menu will appear.



4) Touch the "RESET GP ON DATA WRITE ERROR" selection. The selected item is then highlighted.

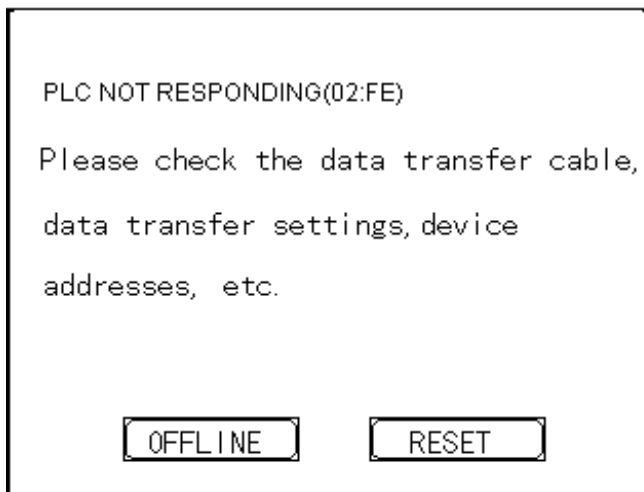


5) To prepare for when a DATA WRITE ERROR occurs, select ON to cancel the error.

■ When the LT is in RUN mode

When a DATA WRITE ERROR occurs, the screen shown here will be displayed.

*OFFLINE Mode **Reference**
 LT Series User Manual, Chapter 5
 OFFLINE Mode



- If you select "OFFLINE" : The LT unit's OFFLINE mode main menu will appear.
- If you select " RESET" : The LT will be reset, then change automatically to "OFFLINE" mode and a DATA WRITE ERROR will not occur.



Selecting [OFFLINE] or [RESET] will also cause the I/O to be reset.

2 Indicating Controllers

2.1 Connectable Controllers

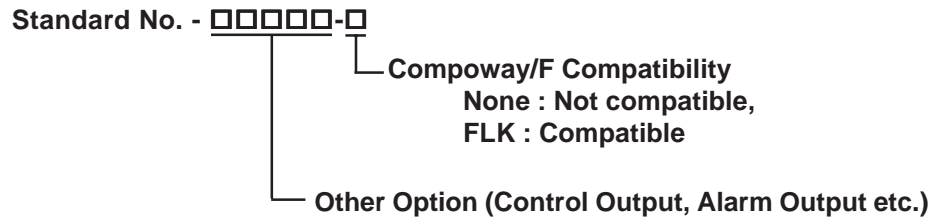
Company	Series	Controller ^{*1}	Note	Device name in LT Editor
Yokogawa M&C Corp.	UT100	UT130, UT150, UT152, UT155, UP150		YOKOGAWA FACTORY ACE 1:1 Comm. or YOKOGAWA FACTORY ACE 1:n Comm.
	UT2000	UT2400-□ UT2800-□		
	UT3000	UT3040-□□1 UT3080-□□1 UT3160-□□1		
	GREEN SERIES	UT320-□1 UT350-□1 UT420-□7 UT450-□1 UT450-□2		
Yamatate Corp.	SDC	SDC20, SDC21 SDC30, SDC31 SDC40A, SDC40B SDC40G		YAMATAKE SDC SERIES
	DMC	DMC10		
RKC INSTRUMENT INC. ^{*11}	CB	CB100 Z-1021 CB400 Z-1021 CB500 Z-1021 CB700 Z-1021 CB900 Z-1021	Applicable for Modbus protocol	RKC CB/SR-Mini Series (Modbus)
		CB100□□□□-□□*□□-5□/□ CB400□□□□-□□*□□-5□/□ CB500□□□□-□□*□□-5□/□ CB700□□□□-□□*□□-5□/□ CB900□□□□-□□*□□-5□/□	Applicable for RKC protocol	CB/REX-F/LE100 (RKC)
	SR-Mini	H-PCP-A Z-1021	Applicable for Modbus protocol	RKC CB/SR-Mini Series (Modbus)
	REX-F	F400□□□□-□□*□□-□□□-1□ F700□□□□-□□*□□-□□□-1□ F900□□□□-□□*□□-□□□-1□ F400□□□□-□□*□□-□□□-4□ F700□□□□-□□*□□-□□□-4□ F900□□□□-□□*□□-□□□-4□ F400□□□□-□□*□□-□□□-5□ F700□□□□-□□*□□-□□□-5□ F900□□□□-□□*□□-□□□-5□	Applicable for RKC protocol	CB/REX-F/LE100 (RKC)
		LE100	LE100-□□*□5□□-□□	
Omron Corporation	THERMAC NEO Electronic Temperature Controller	E5EN-□□□□□-FLK ^{*2} E5CN-□□□□□-FLK E5GN-□□□□□-FLK E5AN-□□□□□-FLK		OMRON THERMAC NEO
	In-Panel NEO Temperature Controller	E5ZN-□□□□□-FLK ^{*2}		

Company	Series	Controller ¹	Note	Device name in LT Editor
Sinko Technos Corp.	C	CPT-20A	Optional unit is required when using multiple channels. ³	SHINKO TECHNOS INDICATING
	FC	FCD-13A□□,C FCD-13A□□,C5 FCD-15A□□,C FCD-15A□□,C5 FCR-13A□□,C FCR-13A□□,C5 FCR-15A□□,C FCR-15A□□,C5	When using the Controller for the first time, select the serial communication option. (,C:RS-232C) (,C5:RS-485) ⁴	
	FIR	FIR-201-M□□,C FIR-201-M□□,C5		
	GC	GCS-300□□,C5		
	FCL	FCL-13A□□,C5		
	PC-900	PC-935□□,C PC-935□□,C5 PC-955□□,C PC-955□□,C5		
	Micro-Controller X (PXR)	PXR4□□□□-□□M00 ⁵ PXR4□□□□-□□V00		
TOHO ELECTRONICS INC. ⁶	TTM-004	TTM-004-□-A□□□		TOHO ELECTRONICS TTM SERIES
	TTM-X04	TTM-X04-□-□□□□		
	TTM-00B	TTM-00B-□-□□□□		
	TTM-10L	TTM-10L-□-□-□ ⁷		
	TTM-100B	TTM-100B4-□□-□□□□-□□□□ TTM-100B8-□□-□□□□-□□□□		
	TTM-110 Series	TTM-114-□-□ □-□□□□□□-□ TTM-115-□-□ □-□□□□□□-□ TTM-117-□-□ □-□□□□□□-□ TTM-119-□-□ □-□□□□□□-□		
	TTM-110B	TTM-110B-□-□ □-□□□□□□-□		
	TTM-120 Series	TTM-124-□-□ □-□□□□□□-□ TTM-125-□-□ □-□□□□□□-□ TTM-127-□-□ □-□□□□□□-□ TTM-129-□-□ □-□□□□□□-□		
	TTM-300 Series	TTM-304-□-□N-□□□□-□ TTM-305-□-□N-□□□□-□ TTM-309-□-□N-□□□□-□		
	TTM-300B	TTM-300B-□-□N-□□□□-□		

Company	Series	Controller *1	Note	Device name in LT Editor
TOHO ELECTRONICS INC. *6	TTM-1020 Series	TTM-1520-□□-□□-□□□□-□ TTM-1521-□□-□□-□□□□-□ TTM-1522-□□-□□-□□□□-□ TTM-1523-□□-□□-□□□□-□ TTM-1524-□□-□□-□□□□-□ TTM-1525-□□-□□-□□□□-□ TTM-1920-□□-□□-□□□□-□ TTM-1921-□□-□□-□□□□-□ TTM-1922-□□-□□-□□□□-□ TTM-1923-□□-□□-□□□□-□ TTM-1924-□□-□□-□□□□-□ TTM-1525-□□-□□-□□□□-□ TTM-1920-□□-□□-□□□□-□ TTM-1921-□□-□□-□□□□-□ TTM-1922-□□-□□-□□□□-□ TTM-1923-□□-□□-□□□□-□ TTM-1924-□□-□□-□□□□-□ TTM-1925-□□-□□-□□□□-□		TOHO ELECTRONICS TTM SERIES
Fenwal	AL series	AL24R-□□□-□□□□-□□□□ *8 *9		Fenwal AL series
Shimaden Co., Ltd. *10	SR253	SR253-□□-□-□□□□□□□□6□ SR253-□□-□-□□□□□□□□5□		Shimaden controller
	SR90	SR92-□□-□-□□-□□7□ SR93-□□-□-□□-□□7□ SR94-□□-□-□□-□□7□ SR91-□□-□□-□5□ SR92-□□-□-□□-□□5□ SR93-□□-□-□□-□□5□ SR94-□□-□-□□-□□5□		
	SR80	SR82-□□-□-□□-□□□□7□□ SR83-□□-□-□□-□□□□7□□ SR84-□□-□-□□-□□□□7□□ SR82-□□-□-□□-□□□□5□□ SR83-□□-□-□□-□□□□5□□ SR84-□□-□-□□-□□□□5□□		
	MR13	MR13-□□-□-□□-□□□□17□ MR13-□□-□-□□-□□□□15□		
	FP90	FP93-□□-□□-□□7□ FP93-□□-□□-□□5□		
	SD16	SD16-□□□-□□7□ SD16-□□□-□□5□		
	EM70	EM70-□□-□□□7□ EM70-□□-□□□5□		

*1 The Controller's model number "□" will vary depending on each controller's functionality specifications.

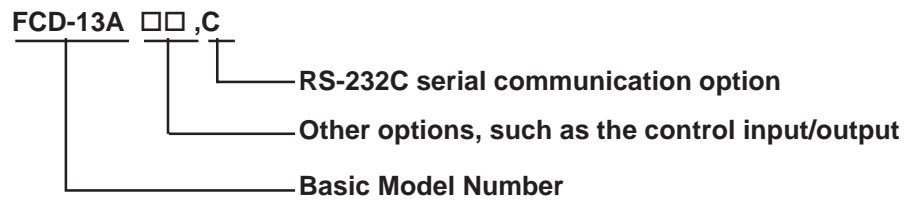
*2 Omron Controller’s model number consists of the following items.



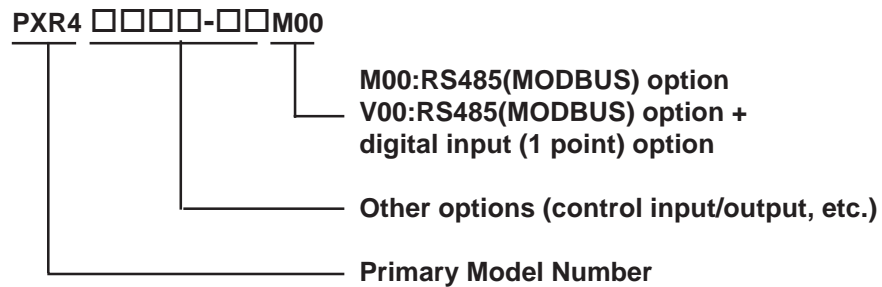
*3 When using multiple channels with a C Series unit, the 2 ch temperature control unit (CCT-235-2-□□) is required. For model number details “□□”, refer to the C Series catalog.

*4 Items with the serial communication option have a “,C” or “,C5” after the basic model number.

Ex.) When specifying the RS-232C serial communication option for the FC Series.



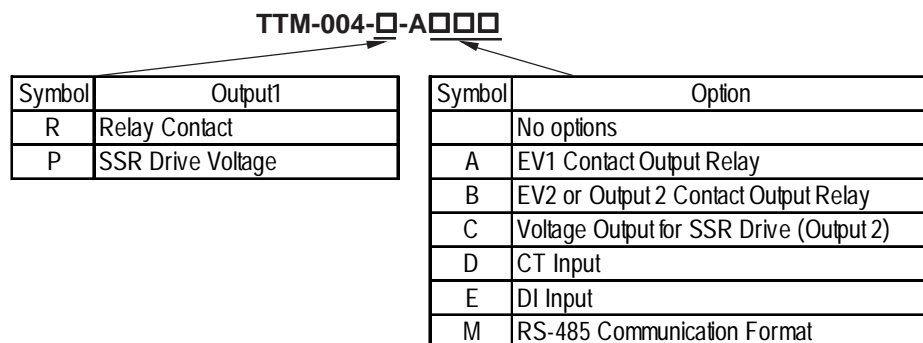
*5 When connecting the Controller to a LT, the RS485(MODBUS) option “M00” or “V00” is required.



*6 About TOHO Controller's Model Number

The Controller model number is used to designate if a Controller is equipped with communication features or not. To check whether your Controller has communication features, refer to your Controller's User Manual or Catalog.

For example, the Controller model number of the TTM-004 Controller is shown below. Only Controllers with the character "M" in their model number's Option section (the three right-most characters) are equipped with communication feature.



**7 TTM-10L Unit Communication Format*

Depending on the unit's model number, the TTM-10L can use, either the RS-485 or the RS-232C format. Select the Communication Format as shown below (Communication Format can be selected either RS-485 or RS-232C.).

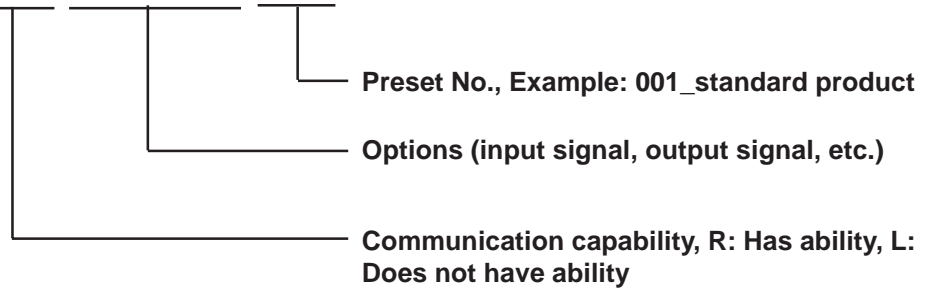
TTM-10L-□-□-□

Symbol	Option
	No options
A	Event Output
M1	RS-485 Communication Format
M2	RS-232C Communication Format

**8 Fenwal's Temperature Controller Model Number*

When connected to the LT, only a model with RS-485 communication ability can be used for communication. Such a model can be identified using a suffix to the basic model, which represents that communication capability. For further information on models, refer to the AL series catalog.

AL24R-□□□-□□□-□□□



**9 For the temperature controller, a production number of 02010023 or later and a serial number of 0204 or later are required.*

**10 Shimaden Co., Ltd. Controller Model Number*

The model data "□" will vary depending on the type of option. For detailed temperature Controller information, refer to that unit's catalog. Serial data transfer option types use a "7" for RS-232C, "6" for RS-422 - 4 wire and "5" for RS-422 - 2 wire.

**11 RKC INSTRUMENT INC. Model Number*

The model data "□" will vary depending on the type of option. For detailed temperature Controller information, refer to that unit's catalog. For CB Series applicable to the RKC driver and LE100 Series, serial data transfer option types use a "5". For REX-F Series, serial data transfer option types use a "1" for RS-232C, "4" for RS-422 - 2 wire and "5" for RS-422 - 4 wire.





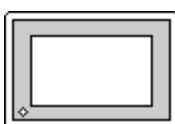
2.2 Yokogawa M&C Controllers

2.2.1 System Structure

This chapter describes the system configuration used when connecting this Controller to the LT.

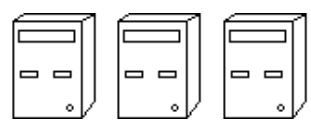

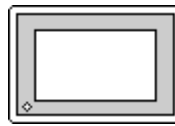
■ UT2000 Series/GREEN SERIES

(1:1 communication)

Controller ^{*1}	Cable Diagram	Unit Type
		
UT2400-□ UT2800-□ UT320-□1 UT350-□1 UT420-□7 UT450-□1 UT450-□2	RS-422 (4 wires) <Cable Diagram 1>	LT Type C



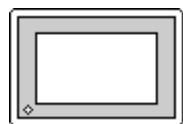
**1 The Controller's model number "□" will vary depending on each controller's functionality specifications.*

(1:n (multi-drop) Communication)

Controller ^{*1}	Cable Diagram	Unit Type
		
UT2400-□ UT2800-□ UT320-□1 UT350-□1 UT420-□7 UT450-□1 UT450-□2	RS-422 (4 wires) <Cable Diagram 2>	LT Type C




**1 The Controller's model number "□" will vary depending on each controller's functionality specifications.*

■ **UT3000**

Controller ^{*1}	Cable Diagram	Unit Type
		
UT3040-□□1 UT3080-□□1 UT3160-□□1	RS-422 (1:1 connection) <Cable Diagram 3> RS-422 (1:n connection) <Cable Diagram 4>	LT Type C

**1 The Controller's model number "□" will vary depending on each controller's functionality specifications.*

■ **UT100**

Controller ^{*1}	Cable Diagram	Unit Type
		
UT130, UT150, UP150	RS-422 (1:1 connection) <Cable Diagram 5>	LT Type C
	RS-422 (1:n connection) <Cable Diagram 6>	
UT152, UT155	RS-422 (1:1 connection) <Cable Diagram 7>	
	RS-422 (1:n connection) <Cable Diagram 8>	

2.2.2 Cable Diagrams

The cable diagrams shown below and those recommended by Yokogawa or Yokogawa M&C may differ, however, using these cable connections for your Controller's operations will not cause any problems.



- *Ground the Controller's FG terminal according to your country's applicable standard.*



- *When connecting the FG wire to the cable connector's hood, be sure that the hood material is conductive.*
- *The maximum RS-422 cable length is 500 meters. When connecting this cable, be sure to connect the SG terminal.*

■ Terminal Numbers Used When Using an RS-422 Cable



- *The terminal numbers used when using an RS-422 cable for connection will vary depending on each Controller model.*

On the cable diagram, however, these terminal numbers are not shown, and please refer to the numbers shown below for cable connection.

◆ UT2000 Series

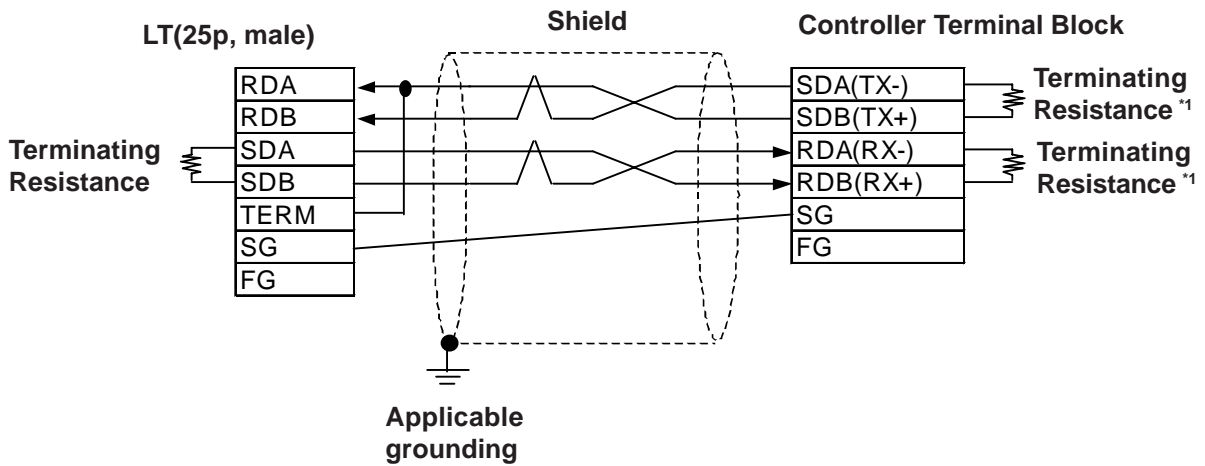
Signal Name	Terminal No.
TX+	4
TX-	6
RX+	3
RX-	5
SG	2
FG	1

◆ GREEN Series

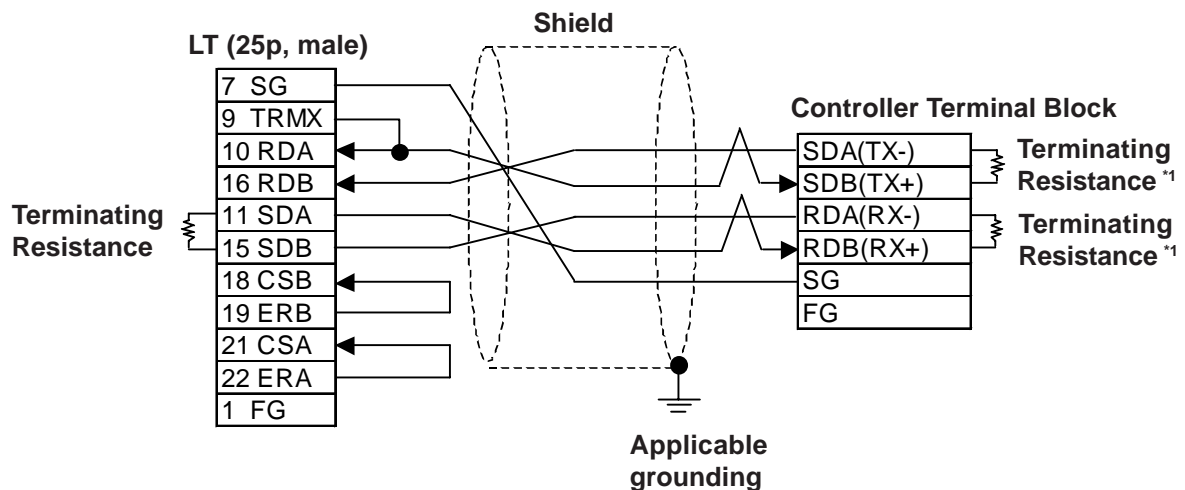
Signal Name	Terminal No.
SDA(-)	24
SDB(+)	23
RDA(-)	26
RDB(+)	25
SG	27

Cable Diagram 1 (1:1) (RS-422 4 Wires)

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When preparing a cable on your own specifications>



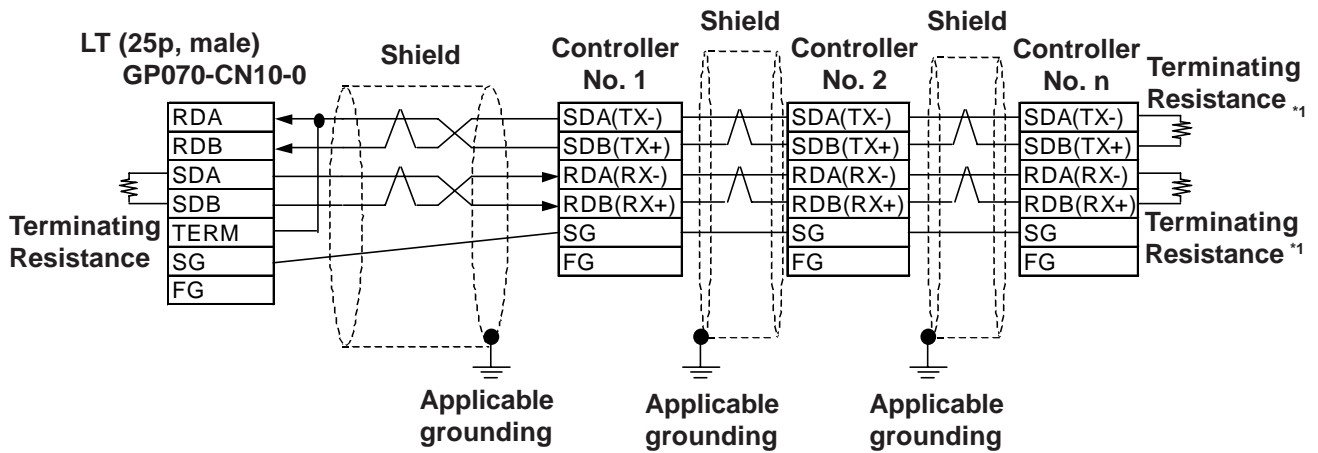
*1 The GREEN SERIES' terminating resistance is 220W (1/4W) and the UT2000 Series' terminating resistance is 100W(1/2W) or more.



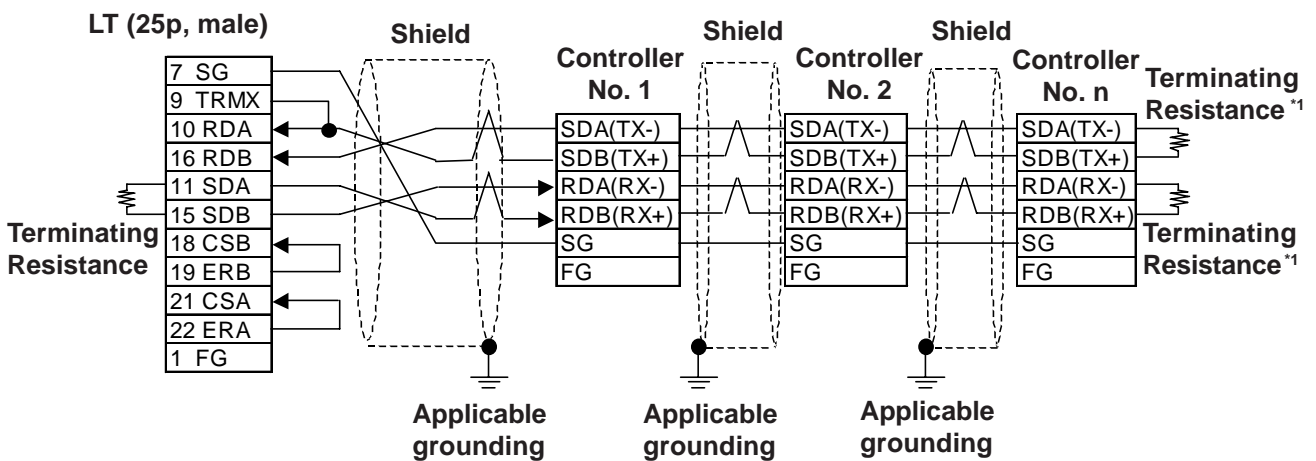
- Hitachi Densen's CO-SPEV-SB(A)3P*0.5SQ cable is recommended.
- Depending on the Controller model, the FG terminal may not be equipped.
- Connecting the LT serial interface's Nos. 9 and 10 pins will insert 100Ω terminating resistance between RDA and RDB.
- When using an RS-422 cable, be sure to keep its length within 500 meters.

Cable Diagram 2 (1:n) (RS-422 4 Wires)

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When preparing a cable on your own specifications>



*1 The GREEN SERIES' terminating resistance is 220Ω (1/4W) and the UT2000 Series' terminating resistance is 100Ω (1/2W) or more.

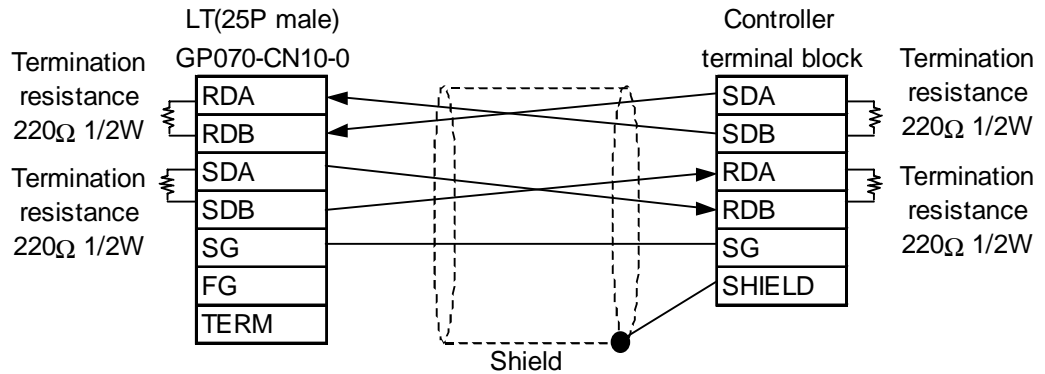


Note:

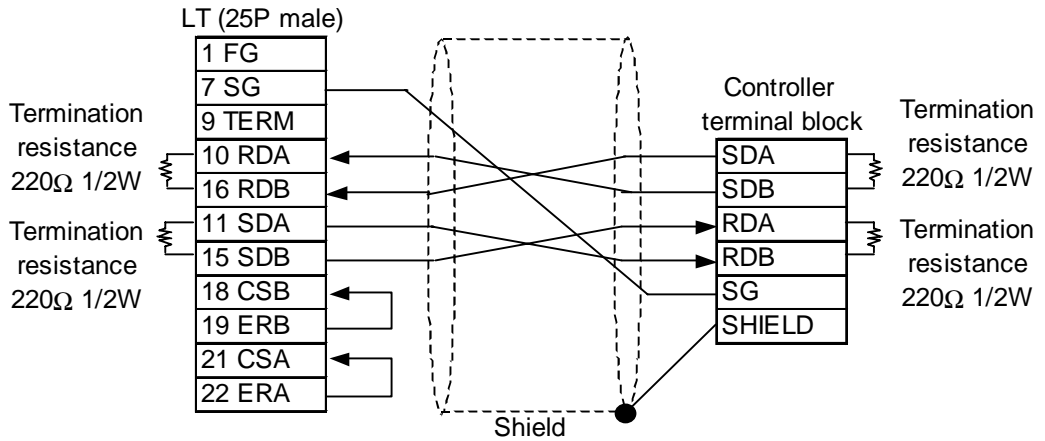
- The maximum RS-422 (4 wires) cable length is 500 meters.
- Up to 31 Controllers (up to 16 for UT2000 Series) can be connected.
- Depending on the Controller model, the FG terminal may not be equipped.
- The GREEN SERIES' terminating resistance is 220Ω (1/4W) and the UT2000 Series' terminating resistance is 100Ω (1/2W) or more.

Cable Diagram 3 (1:1) (RS-422 4 Wires)

<When using Digital's RS-422 connector terminal adapter CP-070-CN10-0>



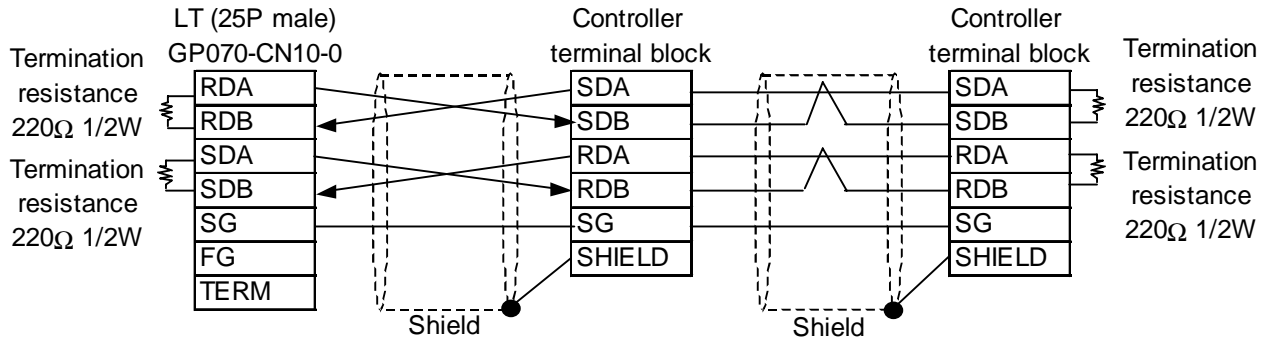
<When making your own cable>



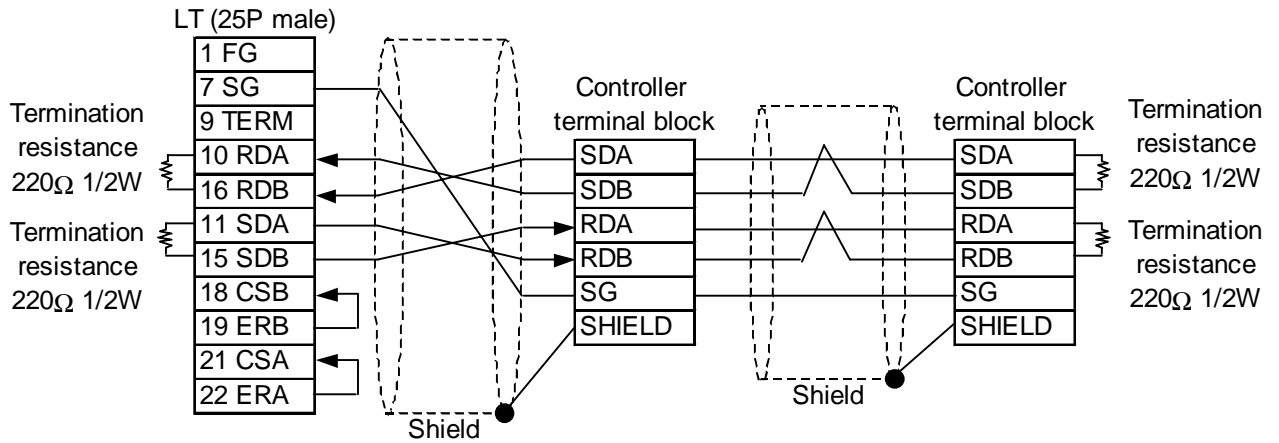
- **Maximum cable length is 600 m.**

Cable Diagram 4 (1:n) (RS-422 4 Wires)

<When using Digital's RS-422 connector terminal adapter CP-070-CN10-0>



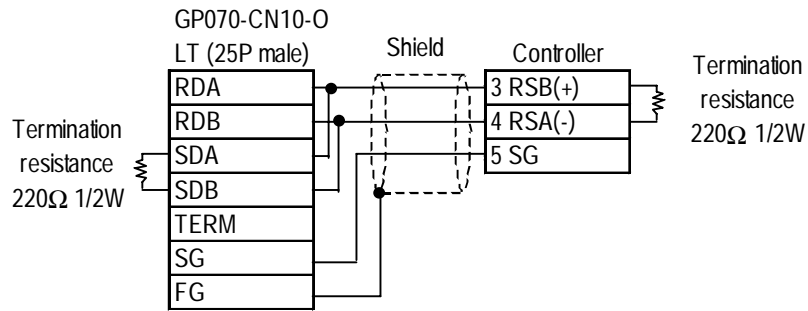
<When making your own cable>



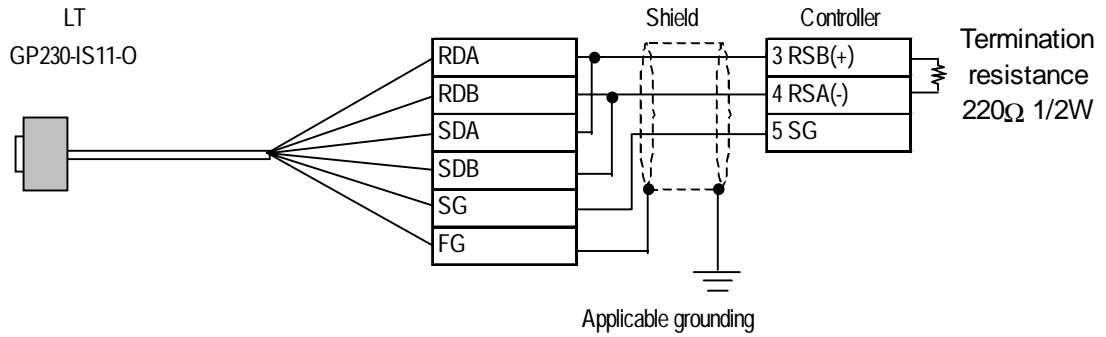
• **Maximum cable length is 600 m.**

Cable Diagram 5 (1:1) (RS-422 2 Wires)

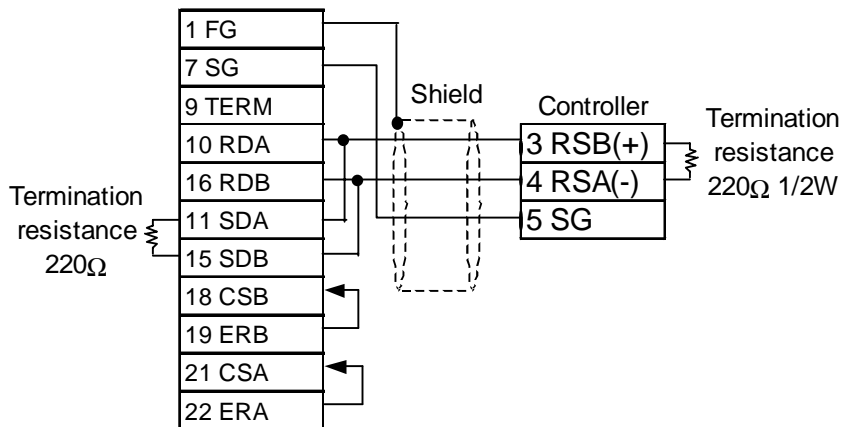
<When using Digital's RS-422 connector terminal adapter CP-070-CN10-0>



<When using Digital's RS-422 cable GP230-IS11-0>

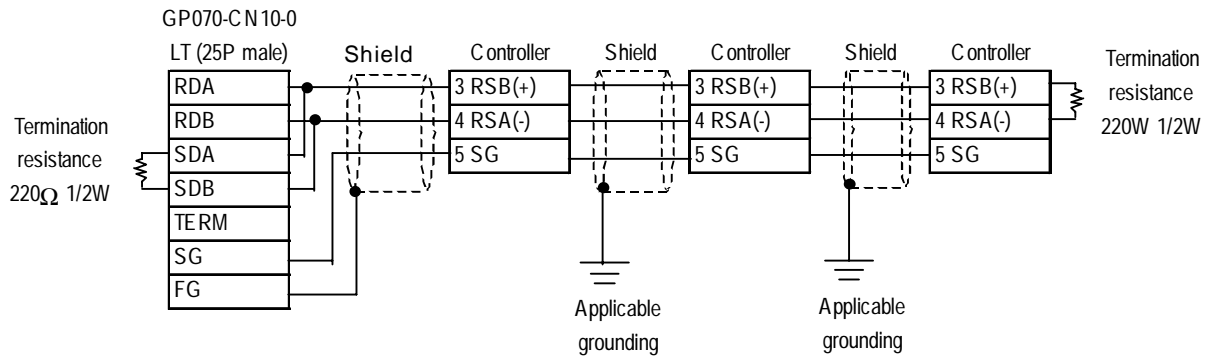


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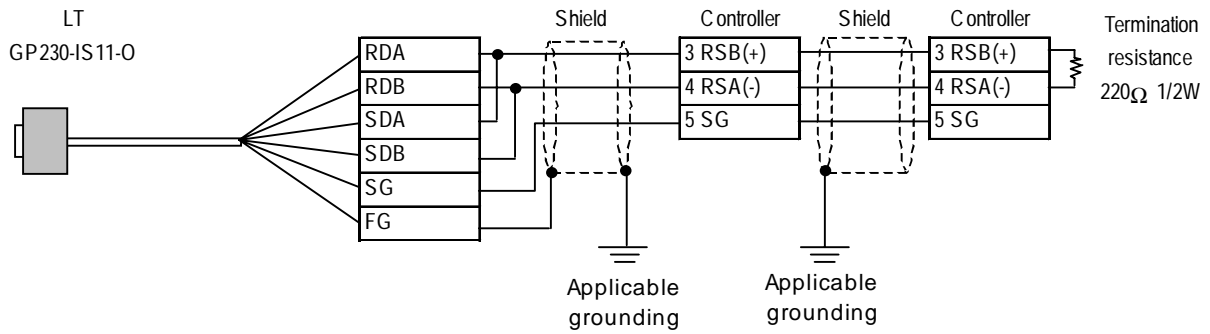


Cable Diagram 6 (1:n) (RS-422 2 Wires)

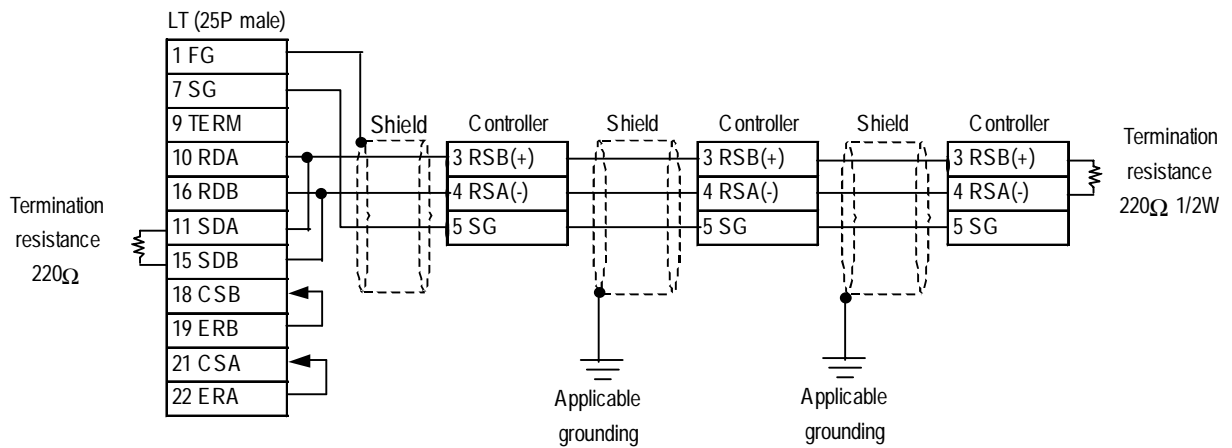
<When using Digital's RS-422 connector terminal adapter CP-070-CN10-0>



<When using Digital's RS-422 cable GP230-IS11-0>

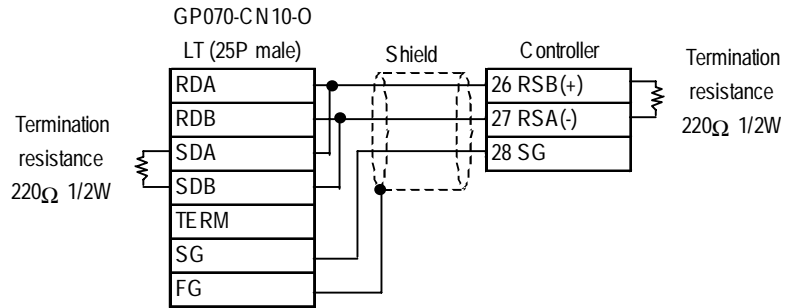


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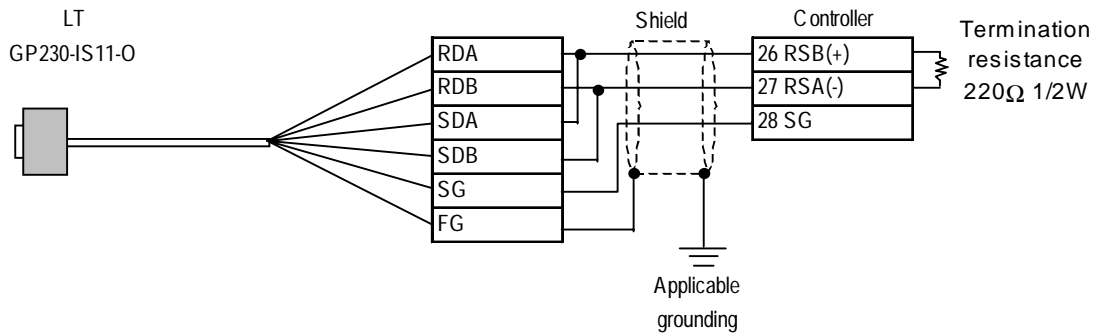


Cable Diagram 7 (1:1) (RS-422 2 Wires)

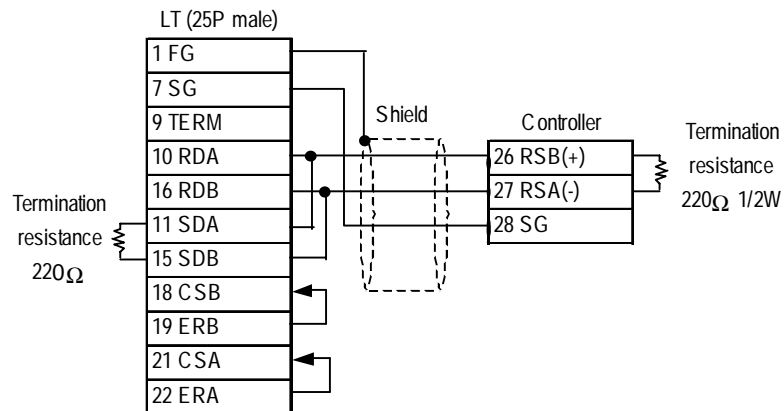
<When using Digital's RS-422 connector terminal adapter CP-070-CN10-0>



<When using Digital's RS-422 cable GP230-IS11-0>

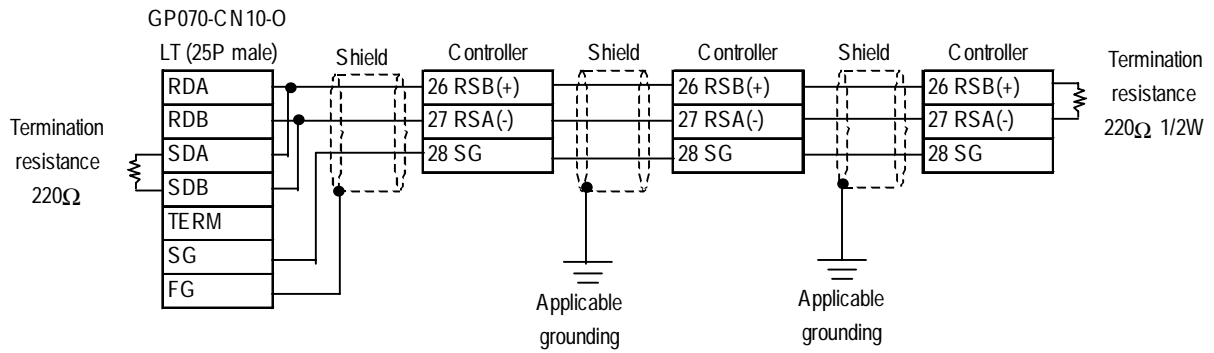


<When making your own cable>

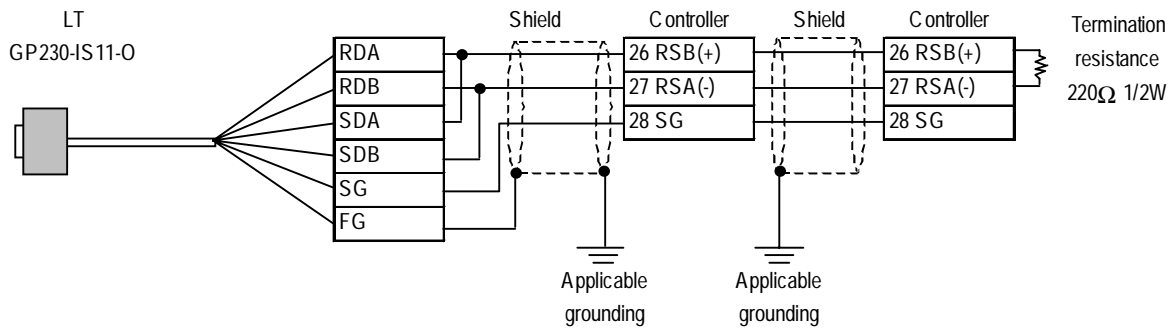


Cable Diagram 8 (1:n) (RS-422 2 Wires)

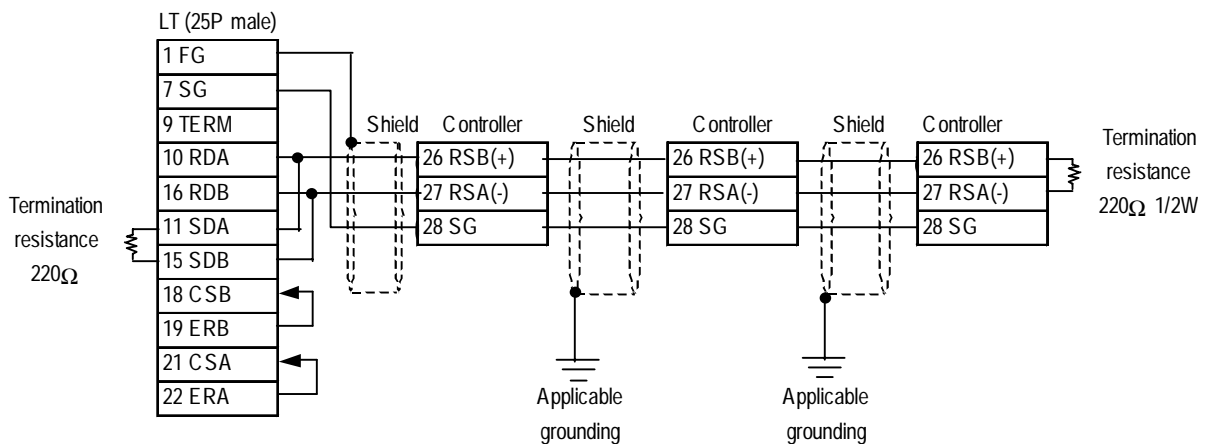
<When using Digital's RS-422 connector terminal adapter CP-070-CN10-0>



<When using Digital's RS-422 cable GP230-IS11-0>



<When making your own cable>



2.2.3 Supported Devices

The following lists show the ranges of devices supported by the LT.

■ UT2000 Series

Depending on the Controller model, prohibit areas are specified even within the following ranges.

Reference Refer to Yokogawa's "UT2000 Detailed operation manual"

Device	Bit Address	Word Address	Remarks
I	I0001 ~ I1024	I0001 ~ I1009	$\div 16 + 1$
D	—————	D0001 ~ D1024	Bit 5

L/H

■ GREEN SERIES

Depending on the Controller model, prohibit areas are specified even within the following ranges.

Reference Refer to Yokogawa M&C's "UT350/UT320 Digital Indicated Controllers Operation Manual" and "GREEN SERIES further User's Manual".

Device	Bit Address	Word Address	Remarks
I	I0001 ~ I2048	I0001 ~ I2033	$\div 16 + 1$
D	—————	D0001 ~ D1274	Bit 5

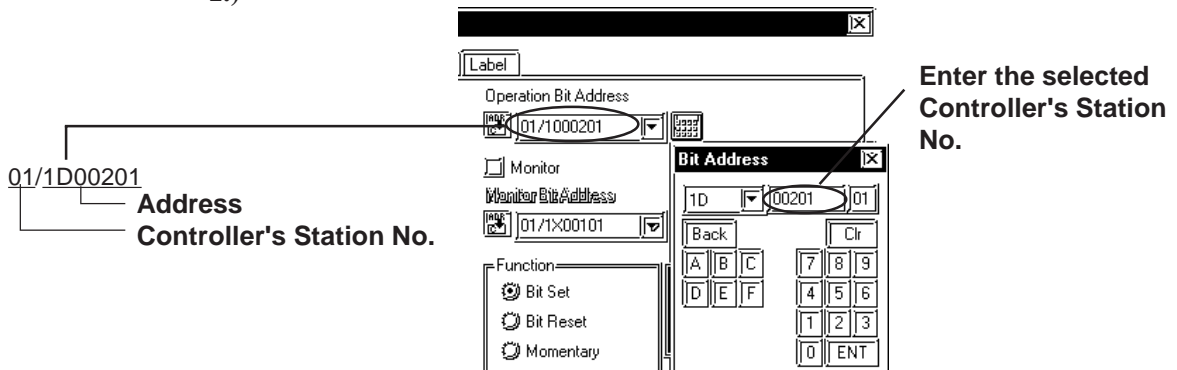
H/L



- **The system area (20 words) cannot be allocated to the Controller's own data area. Even though you can enter the system area settings via the LT Editor, or via LT's OFFLINE screen, it is impossible to actually allocate the system area to the Controller's data area.**
- **Be careful as the Device fields differ depending on the type of Controller. Refer to the Controller's manual for the range allowed for the device address area.**
After screen data is converted from a different type of Controller, be sure to check if the device addresses used are correct. Be sure to check the supported device addresses before using Trend graphs or tags in your screens that use multiple words over continuous addresses.



Note: When using tags in the screen editor software, the PLC Station number can be designated during address input. When a station number is not designated, the previously entered station number is automatically used. (The default value is 1.)



■ UT3000

Device	Bit Address	Word Address	Remarks
D-register	—————	D0101 ~ D3206	*1 *2 *3
I-relay	I0001 ~ I1024	I0001 ~ I0497	*1 L/H
W-register	—————	W0101 ~ W1606	

*1 Writing a value to any write-protected address will not result in an error, however that value will not be reflected.

*2 The T-tag cannot be used to write a value to an address that is not used by a parameter between loops (e.g., an address from D207 to D300 that are not used and is between loops 1 and 2).


*3 Yokogawa's FACTORY ACE 1:n communication protocol only allows you to specify addresses D00001 to D02047. For addresses D02048 or larger, use the W-device. For the address maps of the W-register and D-register, refer to the list of D-registers/I-relays in the PC-LINK communication interface volume of the user's manual for UT3000 network temperature controller.




- **System information is stored at D0001 to D0040. Therefore, do not write any value to these addresses. If any illegal value is written to such an address, the RUN LED on the CPU will turn OFF and the ERR LED will turn ON. Data will be sent, but the UT3000 will not operate. Since the default value for the first address in the system area is D0001, be very careful of the above point. Previously change the first address in the system area on the LT Editor or do not use the system area.**

■ **UT100**

◆ **1:1 communication**

Device	Bit Address	Word Address	Remarks
D-register	_____	d1 ~ d32768	 *1 *2 *3 L/H

◆ **1:n communication**

Device	Bit Address	Word Address	Remarks
D-register	_____	d1 ~ d2047	 *1 *2 *3 L/H

*1 Some devices are write-protected. For their addresses, refer to Yokogawa M&C's TU100 series user's manual.

*2 Only d401 to d420 may be allocated as system area memory for the controller. Be careful of this point when the system area is set on the LT Editor or In the LT's OFFLINE mode.

*3 This protocol is shared by Yokogawa's PLC. When a screen is set up with the LT Editor, even though many values may be input for the PLC's devices, only d is available for a UT100 series controller.

2.2.4 Environment Setup

The following list shows the recommended Controller and LT communication settings.

■ UT2000 Series/GREEN SERIES

LT Settings			Controller Settings		
Baud Rate	9600 bps		Baud Rate	9600 bps	
Data Length	8 bit		Data Length	8 bit	
Stop Bit	1 bit		Stop Bit	1 bit	
Parity Bit	Even		Parity Bit	Even	
Data Flow Control	ER		————	————	
Communication Format (When using RS-422)	4-wire Type		————	————	
————	————		For Dip Switch Communication Mode Selection	UT2000 Series	ON
			Protocol Selection (PSL)	GREEN SERIES	Personal computer link communication
Unit No.	UT2000 Series	1 ~ 16	Station No. (communication address)	UT2000 Series	1 ~ 16
	GREEN SERIES	1 ~ 31		GREEN SERIES	1 ~ 31

◆ Controller Communication Settings

<UT2000 Series>

Use the unit's rear face rotary switches:

- (1) Use the communication condition setting rotary switch to enter the communication condition.
- (2) Use the station number selection rotary switch to enter the unit number.
- (3) Turn the communication mode selection dip switch ON.

<GREEN SERIES>

Use the unit's front keys:

- (1) Hold down the Controller's [SET/ENT] key for 3 seconds or more to change the screen from [operation] to [operation parameter] .
- (2) When "OP.PA" appears on the measurement value (PV) display, use either Δ or ∇ key to display "STUP".
- (3) For UT350/UT320, every time you press the [SET/ENT] key, the screen will change one by one, in the order of [Protocol Selection] --> [Baud Rate] --> [Parity] --> [Stop Bit] --> [Data Length] --> [Communication Address].

For UT450/UT420, press the [SET/ENT] key once, and the [Setup Parameter Settings] screen will appear. Use either Δ or ∇ key to select "r485", and then, press the [SET/ENT] key again. After this, use the same procedure used for UT350/UT320.

■ UT3000

LT Settings		Controller Settings	
Baud Rate	9600 bps	Baud Rate	9600 bps
Data Length	8 bits	Data Length	8 bits
Stop Bit	1 bit	Stop Bit	1 bit
Parity Bit	None	Parity Bit	None
Data Flow Control	ER Control	Sum Check	ON
Communication Format	4-wire Type	Designation of Terminating Character	None
Unit No.	1	Protection	None
—		Station No.	1

■ UT100

LT Settings		Controller Settings ^{*1}		Settings
Baud Rate	9600 bps	Baud Rate	9600 bps	BPS: 9.6
Data Length	8 bits	Data Length	8 bits	DLN: 8
Stop Bit	1 bit	Stop Bit	1 bit	STP: 1
Parity Bit	Even	Parity Bit	Even	PR1: EVN
Control Method	ER Control	—	—	—
Communication Format	2-wire Type	Communication Format	RS-485 Communication	—
Unit No.	1	Communication Address ^{*2}	1	ADR: 1
—		Protocol	PC Link Communication (without Sum Check)	PSL: 0

**1. In order to comply with Yokogawa M&C's UT100 series controller, the existing Yokogawa's protocol applicable for the PLC has been expanded. The default values for the LT remain unchanged to comply with the PLC. To communicate with the controller, change the communication settings to those for the controller.*

**2. The communication addresses for the controller can be specified in a range between 1 and 99. However, those for setting parts and tags on the LT Editor are only allowed in a range between 1 and 32. Communication between a single LT unit and a maximum of 31 controllers is only possible. Therefore, take care not to specify wrong communication addresses for the controllers.*

2.3 Yamatake Controllers

2.3.1 System Structure

This chapter describes the system configuration used when connecting this Controller to the LT.





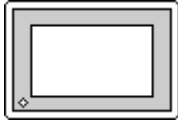
LT's System Area (LS0 to LS19) Settings

The LT's system area (20 words) cannot be allocated to the Controller's own data area. Even though you can enter the system area settings via the LT OFFLINE mode, it is impossible to actually allocate the system area to the Controller's data area.



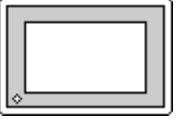
■ SDC Series (1:1 communication)

Controller	Cable Diagram	Unit Type
SDC 20 SDC 21 SDC 40A SDC 40B SDC 40G	RS-232C <Cable Diagram 1>	LT Type C
SDC 20 SDC 21 SDC 30 SDC 31 SDC 40A SDC 40B SDC 40G	RS-422 (4 wires) <Cable Diagram 2>	
	RS-422 (2 wires) <Cable Diagram 3>	




■ SDC Series (1:n (multi-drop) communication)

CPU	Cable Diagram	Unit Type
		
SDC 20 SDC 21 SDC 30 SDC 31 SDC 40A SDC 40B SDC 40G	RS-422 (4-wire) <Cable Diagram 4>	LT Type C
	RS-422 (2-wire) <Cable Diagram 5>	

■ DMC10 (1:1 communication)

CPU	Cable Diagram	Unit Type
		
DMC10	RS-422 (2-wire) <Cable Diagram 6>	LT Type C

■ DMC10 (1:n (multi-drop) communication)

CPU	Cable Diagram	Unit Type
		
DMC10	RS-422 (2-wire) <Cable Diagram 7>	LT Type C

2.3.2 Cable Diagrams

The cable diagrams shown below and those recommended by Yamatake may differ, however, using these cables for Controller's operations will not cause any problems.

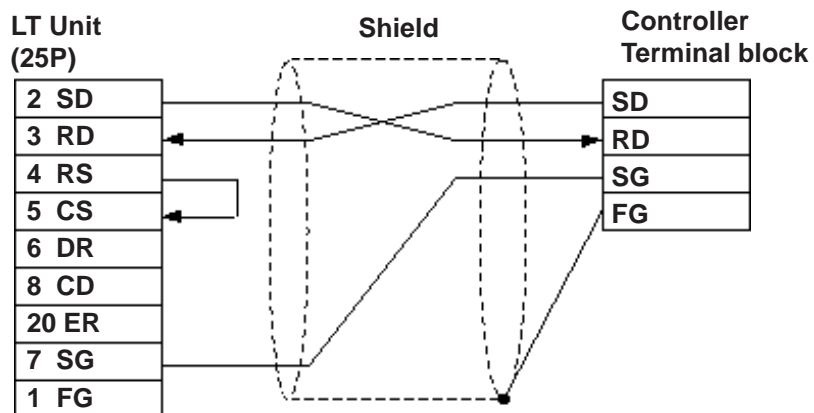


- **When connecting the FG terminal to the connector cover, be sure that the connector cover material is conductive.**
- **Ground the Controller's FG terminal according to your country's applicable standard. For details, refer to your Controller's manual.**
- **When connecting a cable's shield line to an FG terminal, consider the needs of your system when deciding which side of the cable (LT or Controller) to connect. (The example below connects to the Controller's FG terminal.)**
- **The maximum RS-232C cable length is 15 meters. If a communication cable is used, be sure to connect its SG (signal ground) terminal.**
- **The maximum RS-422 cable length is 500 meters.**
- **The recommended RS-422 cables are as follows:**

Company		Type
Fujikura Densen	2-wire	IPEV-S-0.9mm ² ×1P
	3-wire	ITEV-S-0.9mm ² ×1T
Hitachi Densen	2-wire	KPEV-S-0.9mm ² ×1P
	3-wire	KTEV-S-0.9mm ² ×1T

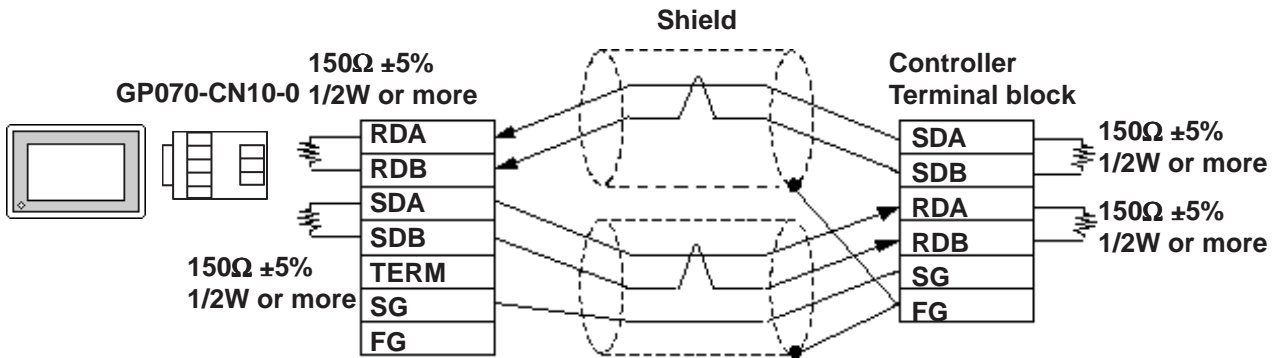
- **Since the Controller's terminal numbers will differ depending on the type of additional functions, check these numbers with the Controller's appropriate manual.**

Cable Diagram 1 (1:1) (RS-232C)

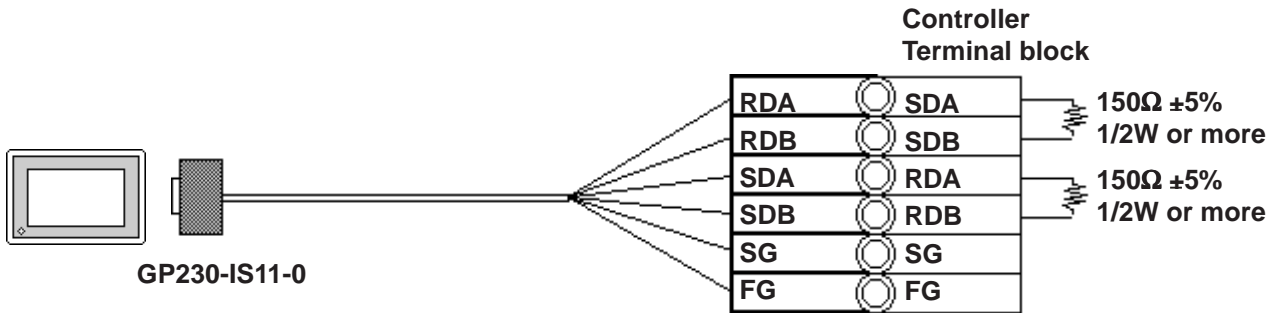


Cable Diagram 2 (1:1) RS-422 4-wire, RS-422 5-wire Cable

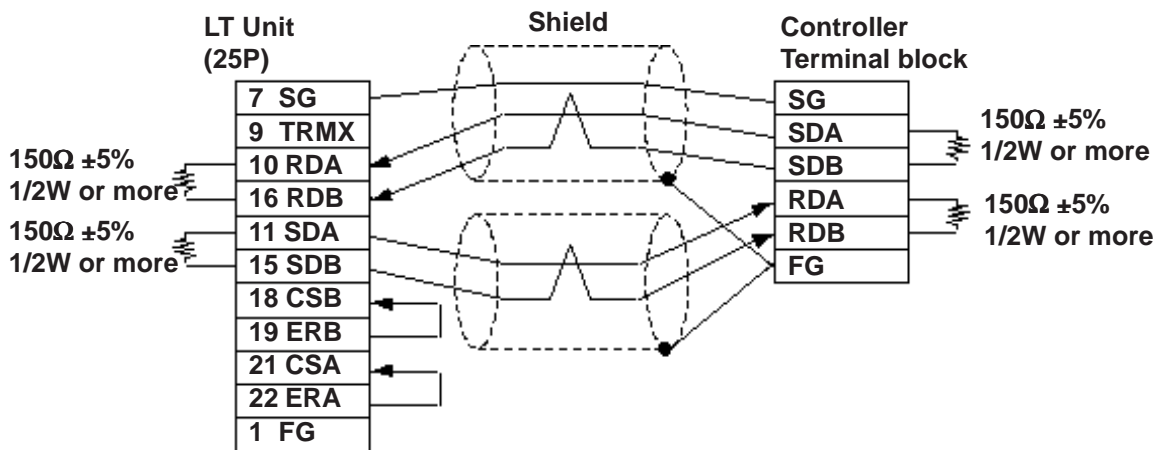
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When using Digital's RS-422 cable GP0230-IS11-0

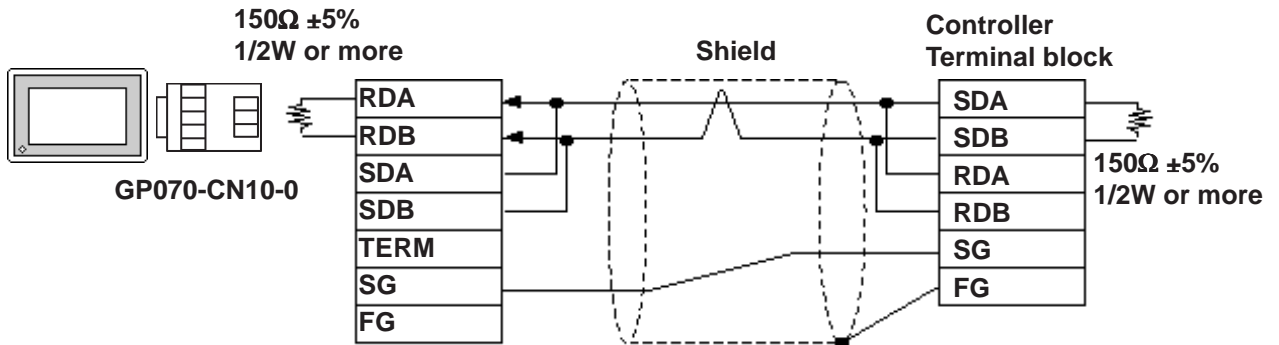


- When preparing your own cable

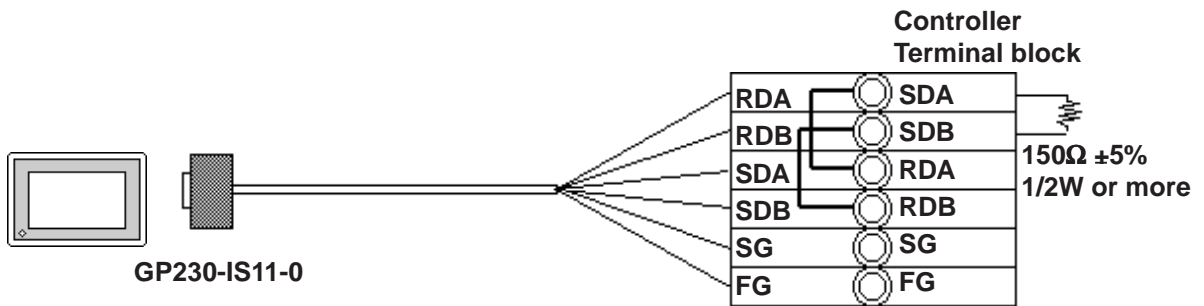


Cable Diagram 3 (1:1) RS-422 2-wire, RS-422 3-wire Cable

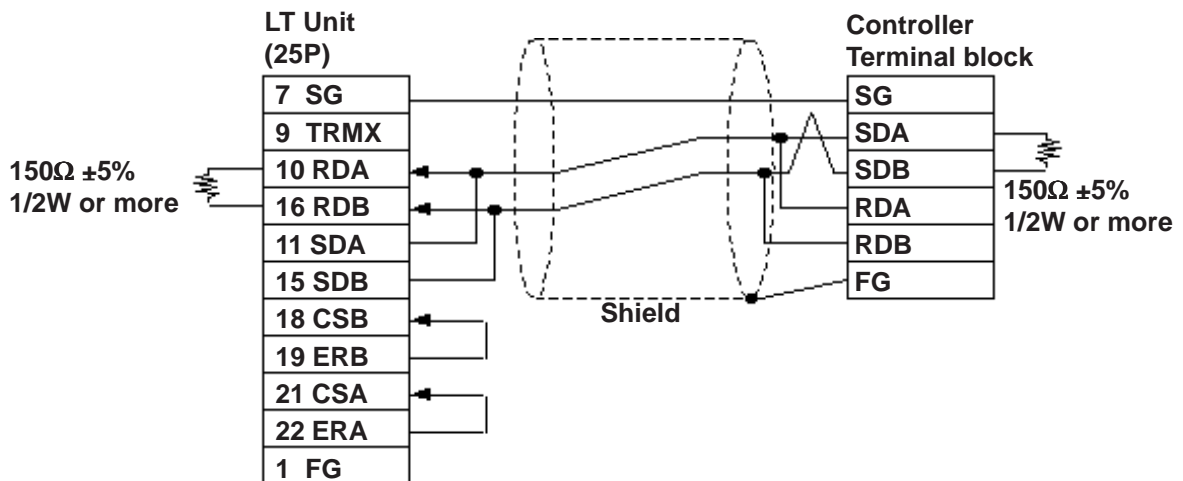
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When using Digital's RS-422 cable GP230-IS11-0

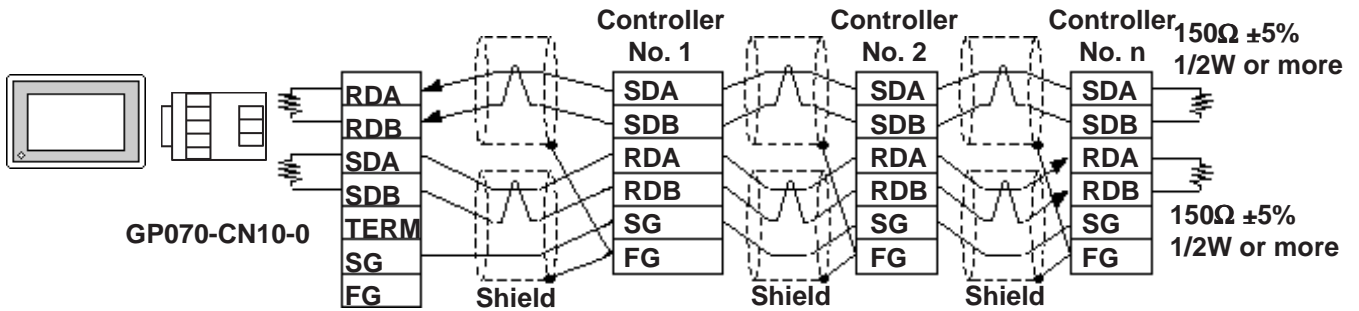


- When preparing your own cable

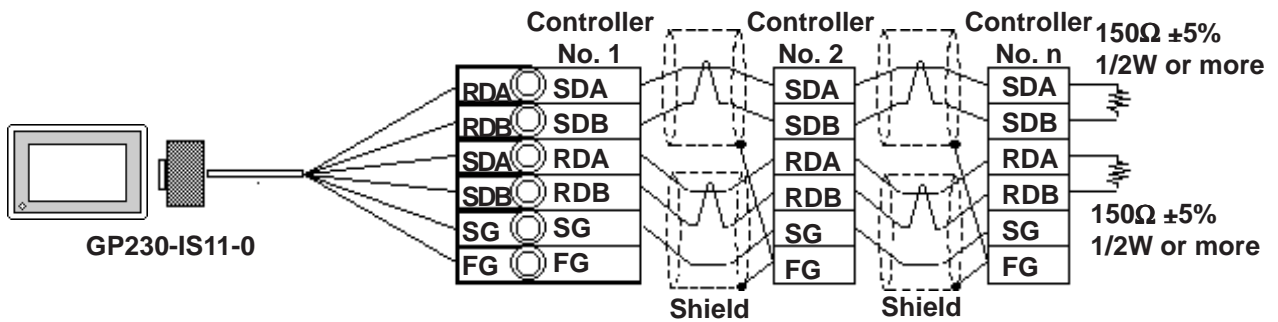


Cable Diagram 4 (1:n) RS-422 4-wire, RS-422 5-wire Cable

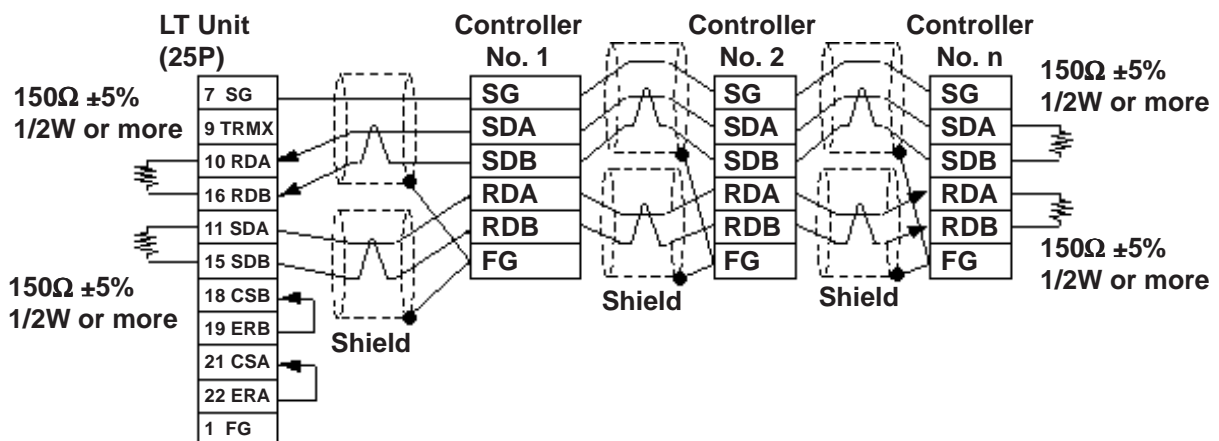
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When using Digital's RS-422 cable GP230-IS11-0

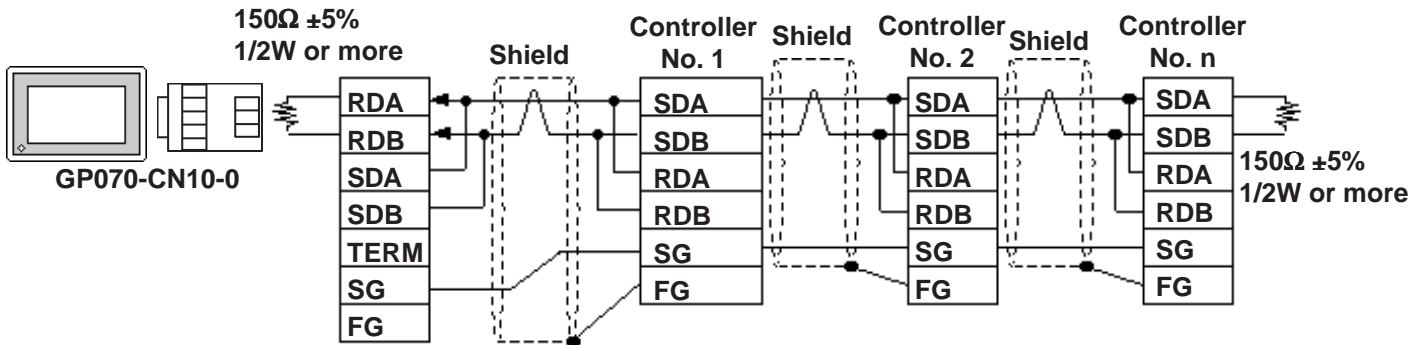


- When preparing your own cable

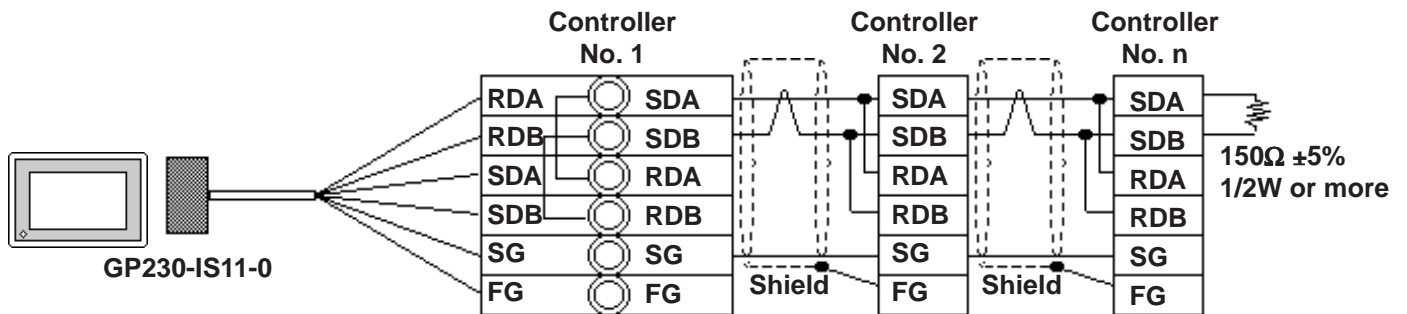


Cable Diagram 5 (1:n) RS-422 2-wire, RS-422 3-wire Cable

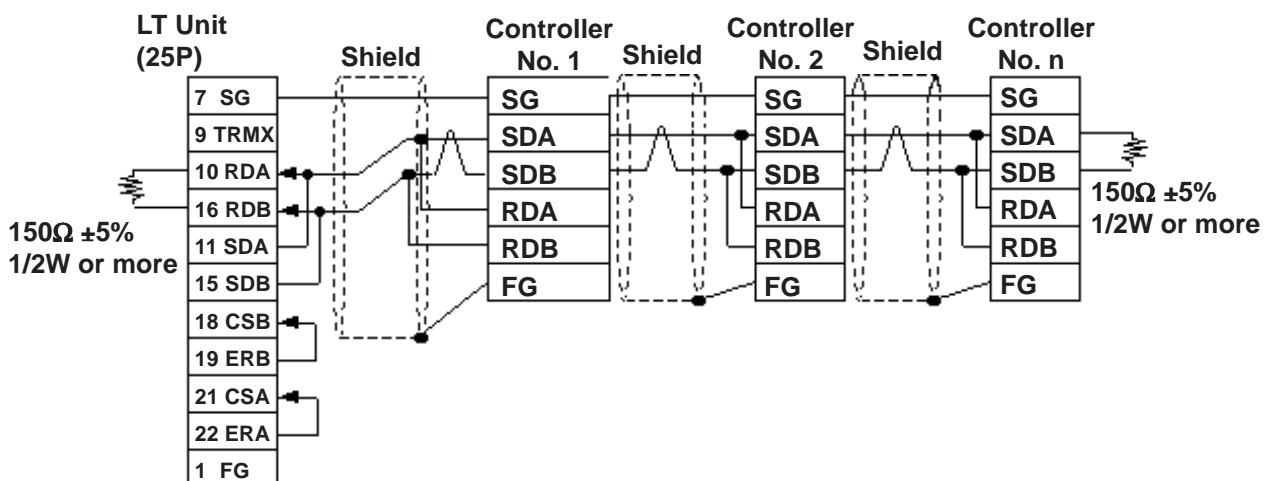
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When using Digital's RS-422 cable GP230-IS11-0

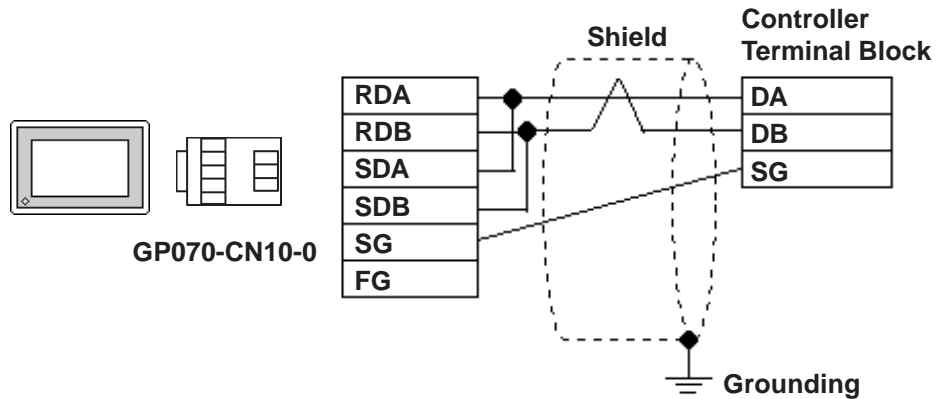


- When preparing your own cable

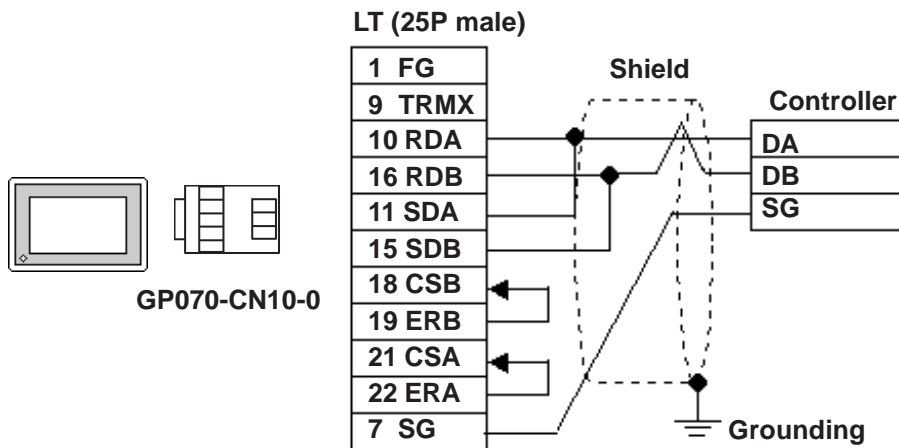


Cable Diagram 6 (1:1) RS-422 2-wire, RS-422 3-wire Cable

- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



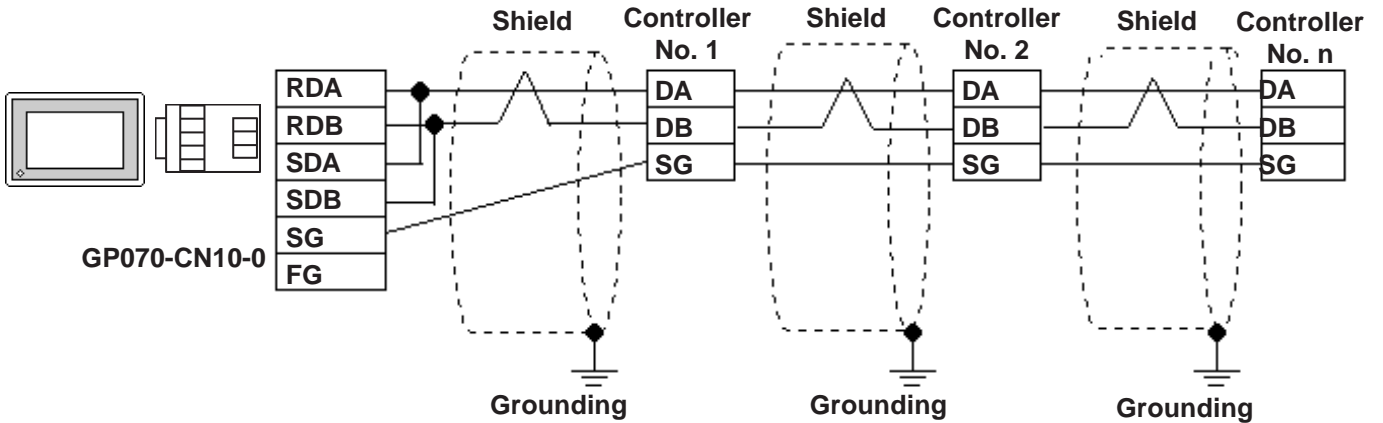
- When preparing your own cable



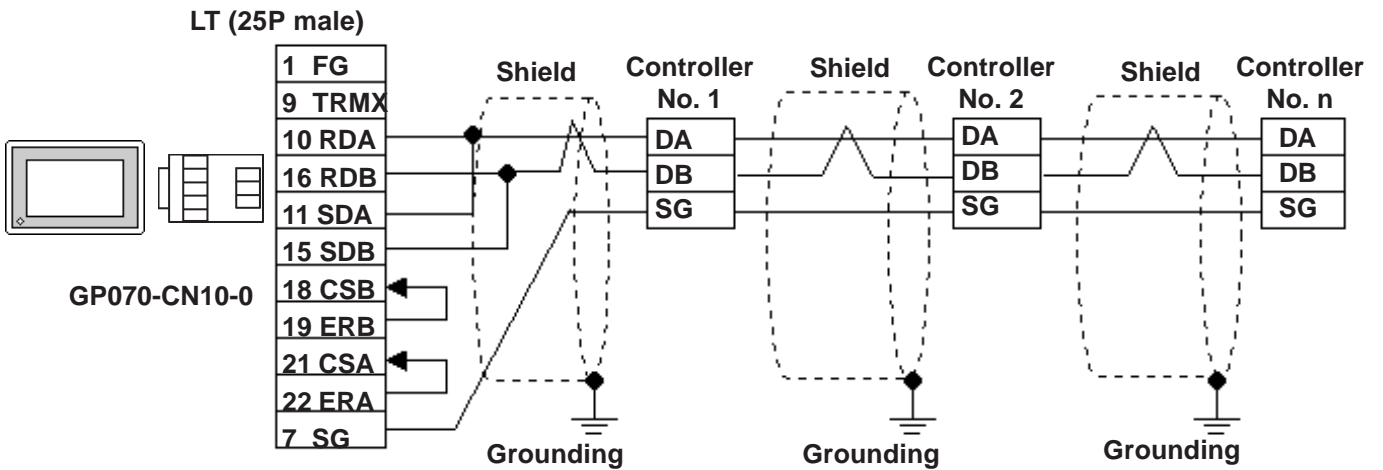
Since terminating resistance is provided inside the Controller, DO NOT connect additional terminating resistance.

Cable Diagram 7 (1:n) RS-422 2-wire, RS-422 3-wire Cable

- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When preparing your own cable



Since terminating resistance is provided inside the Controller, DO NOT connect additional terminating resistance.

2.3.3 Supported Devices

The following lists show the ranges of devices supported by the LT.

■ **SDC Series**

Device	Bit Address	Word Address	Remarks
Data	00000 ~ 8999F	0000 ~ 8999	H/L

■ **DMC10*1**

Device	Bit Address	Word Address	Remarks
Data	10010 ~ 7804F	1001 ~ 7804	H/L

*1. Data cannot be written or read to certain Addresses. For more detailed information, refer to the Yamatake unit's appropriate Operation Manual.



• **LT's System Data Area (LS0 to LS19) Settings**

The LT's system area (20 words) cannot be allocated to the Controller's own data area. Even though you can enter the system area settings via the LT OFFLINE mode, it is impossible to actually allocate the system area to the Controller's data area.

- *Be careful that the Device fields differ depending on the type of Controller. Refer to the Controller's manual for the range allowed for the device address area.*

After screen data is converted from a different type of Controller, be sure to check if the device addresses used are correct.

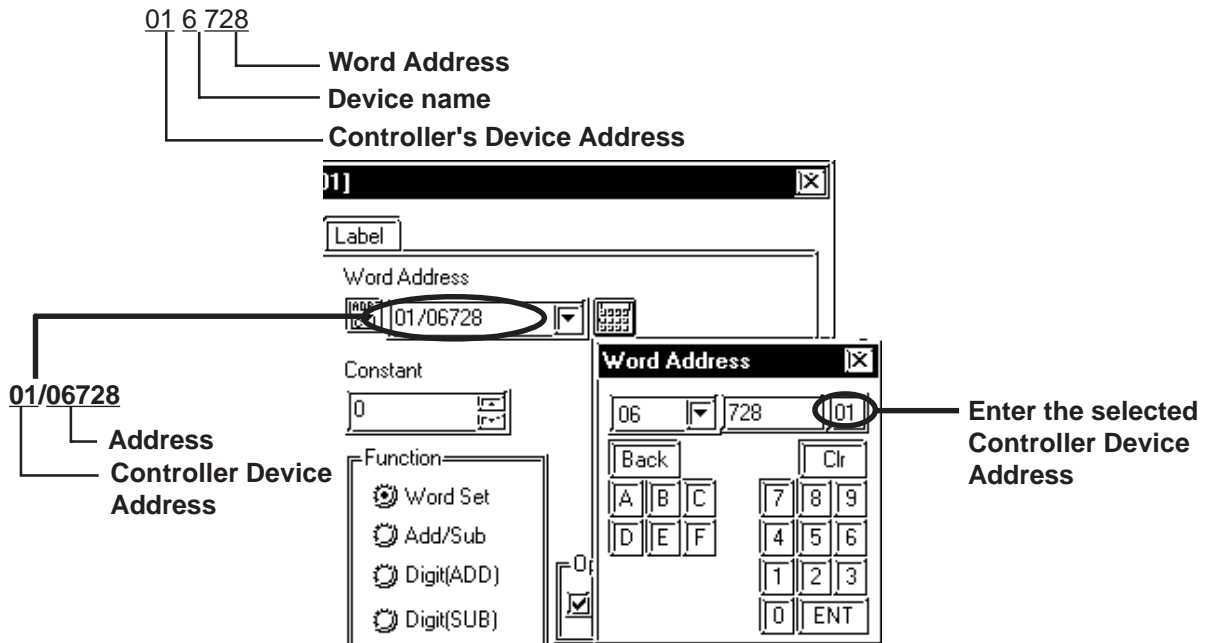
Be sure to check the supported device addresses before using Trend graphs in your screens that use multiple words over continuous addresses.



- **When entering device addresses via the LT Editor, the top address (left-most digit) is used for the device name and remaining three digits (0 to 999) are used for the Controller data addresses.**
- **When settings Parts in LT Editor, the device address can be designated during address input. When a device number is not designated, the previously entered device number is automatically used. (The default value is 1.)**

Ex. When entering Device Address "6728":

Enter the device name "6", and then the Word Address "728".



2.3.4 Environment Setup

The following tables show Digital's recommended Controller and LT communication settings.

■ SDC Series

LT Settings		Controller Settings	
Baud Rate	9600bps	Baud Rate	9600bps
Data Length	8bit	Data Length	8bit
Stop Bit	1bit	Stop Bit	1bit
Parity Bit	Even	Parity Bit	Even
Data Flow Control	ER	-----	-----
Communication Format (when using RS-232C *1)	RS-232C	-----	-----
Communication Format (when using RS-422)	4-wire	-----	-----
Communication Format (when using RS-422)	2-wire	-----	-----
Unit No.	Select a desired unit number from 1 to 32.	Device Address	Enter all different Controller device addresses.

**1 RS-232C communication can be performed with SDC20, SDC21, SDC40A, SDC40B, and SDC40G.*



- **Although the Controller's device address input range is from 0 to 127, be sure to use only from 1 to 32 on the LT to match the Controller's device address to the LT's.**
- **When using 1:n communication, up to 31 Controllers can be connected.**
- **When the device address is designated as 0 (default value), communication cannot be performed.**

■ DMC10

LT Settings		Controller Settings	
Baud Rate	19200bps	Baud Rate	19200bps
Data Length	8bit	Data Length	8bit
Stop Bit	1bit	Stop Bit	1bit
Parity Bit	Even	Parity Bit	Even
Data Flow Control	ER	-----	-----
Communication Format (when using RS-422)	2-wire	-----	-----
Unit No. *2	Select a desired unit number from 1 to 15.	Device Address	Enter all different Controller device addresses (1 to F).

**2 Unit numbers entered on the LT are decimal numbers.*

2.4 RKC INSTRUMENT INC. Controllers

2.4.1 System Structure

The following describes the system configuration used when connecting the LT to an RKC Controller.



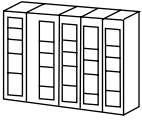


- **LT's System Area (LS0 to LS19) Settings**

The LT's system area (20 words) cannot be allocated to the Controller's own data area. When you are entering the system area settings via the screen editor software or via the LT's OFFLINE screen, be careful that you do not use the Controller's own data area.

■ CB Series (Modbus protocol)

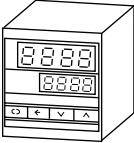


Controller	Cable Diagram	Unit Type
CB100 Z-1021 CB400 Z-1021 CB500 Z-1021 CB700 Z-1021 CB900 Z-1021 (Applicable for Modbus Protocol)	RS-422(2-wire) (Cable Diagram 3)	LT Type C
	RS-422(2-wire) 1:n connection (Cable Diagram 5)	

■ SR-Mini Series (Modbus protocol)

Controller	Cable Diagram	Cables	Unit Type
			
H-PCP-AZ-1021	RS-232C (Cable Diagram 1)	RKC's	LT Type C
	RS-422(4-wire) (Cable Diagram 2)	W-BF-01-□□□□ *1	
	RS-422(4-wire) 1:n Connection (Cable Diagram 4)	RKC's W-BF-01-□□□□ *1 W-BF-02-□□□□	

*1 □□□□ indicates the cable length (mm).

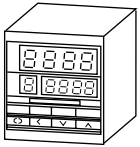


■ CB Series (RKC protocol)

Controller *1	Cable Diagram	Unit Type
		
CB100□□□□-□□*□□-5□/□	RS-422(2-wire) (Cable Diagram 6)	LT Type C
CB400□□□□-□□*□□-5□/□	RS-422(2-wire) 1:n Connection (Cable Diagram 7)	
CB500□□□□-□□*□□-5□/□		
CB700□□□□-□□*□□-5□/□		
CB900□□□□-□□*□□-5□/□		

*1 The model data "□" will vary depending on the type of option.

For detailed temperature Controller information, refer to that unit's catalog.
Units that have an option of serial data transfer will have a "5" in their model code.

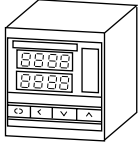


■ REX-F Series (RKC protocol)

Controller ^{*1}	Cable Diagram	Unit Type
		
F400□□□□-□□*□□-□□□-1□ F700□□□□-□□*□□-□□□-1□ F900□□□□-□□*□□-□□□-1□	RS-232C (Cable Diagram 8)	LT Type C
F400□□□□-□□*□□-□□□-4□ F700□□□□-□□*□□-□□□-4□ F900□□□□-□□*□□-□□□-4□	RS-422(4-wire) (Cable Diagram 9)	
	RS-422(4-wire) 1:n Connection (Cable Diagram 10)	
F400□□□□-□□*□□-□□□-5□ F700□□□□-□□*□□-□□□-5□ F900□□□□-□□*□□-□□□-5□	RS-422(2-wire) (Cable Diagram 6)	
	RS-422(2-wire) 1:n Connection (Cable Diagram 7)	

*1 The model data "□" will vary depending on the type of option.

For detailed temperature Controller information, refer to that unit's catalog.
 Serial data transfer option types use a "1" for RS-232C, "4" for RS-422 - 4 wire, and "5" for RS-422 - 2 wire.

■ LE-100 Series (RKC protocol)

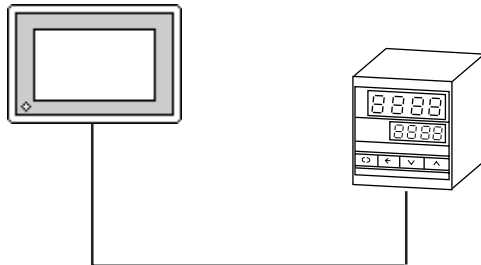
Controller ^{*1}	Cable Diagram	Unit Type
		
LE100-□□*□5□□-□□	RS-422(2-wire) (Cable Diagram 6)	LT Type C
	RS-422(2-wire) 1:n Connection (Cable Diagram 7)	

*1 The model data "□" will vary depending on the type of option.

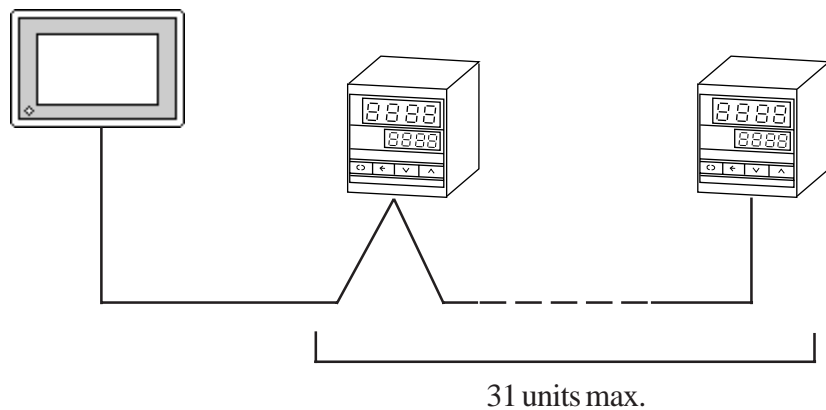
For detailed temperature Controller information, refer to that unit's catalog.
Units that have an option of serial data transfer will have a "5" in their model code.

◆ Connections

•1:1 connection



•1:n connection



(Max. with SR-Mini Series units is 16 units)

2.4.2 Cable Diagrams

The cable diagrams shown below and the cable diagrams recommended by RKC INSTRUMENT INC. may differ, however, using these cables for your Controller's operations will not cause any problems.



- **When connecting the FG terminal to the connector cover, be sure that the connector cover conducts current.**
- **Ground your Controller's FG terminal according to your country's applicable standard. For details, refer to your Controller's manual.**
- **When connecting a cable's Shield line to an FG terminal, consider the needs of your system when deciding which side of the cable (LT or Controller) to connect. (The example below connects to the Controller's FG terminal.)**

■ **CB Series**



- **Up to 31 CB Series units can be connected to a single LT.**
- **If a communications cable is used, be sure to connect its SG (signal ground) terminal.**
- **The following RS-422 cable is recommended.**

Company	Item No.	Type
Hirakawa Densen	2207-510-008	CO-HC-ESV-3P X 7/0.2

- **The Controller terminal number will differ depending on the type of CPU used. The following examples reflect all the CB Series units supported by the Digital Electronics Corporation.**

<CB100, CB400, CB500, CB900>

Terminal No.	Signal Name
13	SG
14	T/R(A)
15	T/R(B)

<CB700>

Terminal No.	Signal Name
7	SG
8	T/R(A)
9	T/R(B)

■ **SR-Mini Series**



- **Up to 16 SR-Mini Series modules can be connected to a single LT.**
- **If a communications cable is used, be sure to connect its SG (signal ground) terminal.**
- **RS-232C cables should be 15 meters or less.**
- **RS-422 (2-wire) cables should be 500 meters or less.**
- **The following RS-422 cables are recommended for SR-Mini Series units.**

Company	Type	Comments
RKC INSTRUMENT INC.	W-BF-01- XXXX *1	Used when connecting an SR-Mini to a LT
RKC INSTRUMENT INC.	W-BF-02- XXXX *1	Used when connecting an SR-Min to an SR-Mini

*1 XXXX indicates the cable length (mm).

■ **REX-F Series**



- **Up to 31 REX-F Series units can be connected to a single LT.**
- **Connect the shield to the LT's FG terminal.**
- **If a communications cable is used, be sure to connect its SG (signal ground) terminal.**
- **RS-232C cables must be 15 meters or less.**
- **RS-422 cables must be 600 meters or less.**
- **With REX-F Series units, the terminal numbers and signal names will vary, depending on the unit's model type and data transfer method used. The following tables show the possible model type and signal name combinations.**

◆ RS-232C Connections

Terminal No.			Signal Name
F400	F700	F900	
12	16	26	SG
13	17	27	SD
14	18	28	RD

◆ RS-422 (2-wire) Connections

Terminal No.			Signal Name
F400	F700	F900	
12	16	26	SG
13	17	27	T/R(A)
14	18	28	T/R(B)

◆ RS-422 (4-wire) Connections

Terminal No.			Signal Name
F400	F700	F900	
12	16	26	SG
13	17	27	T(A)
14	18	28	T(B)
15	19	29	R(A)
16	20	30	R(B)

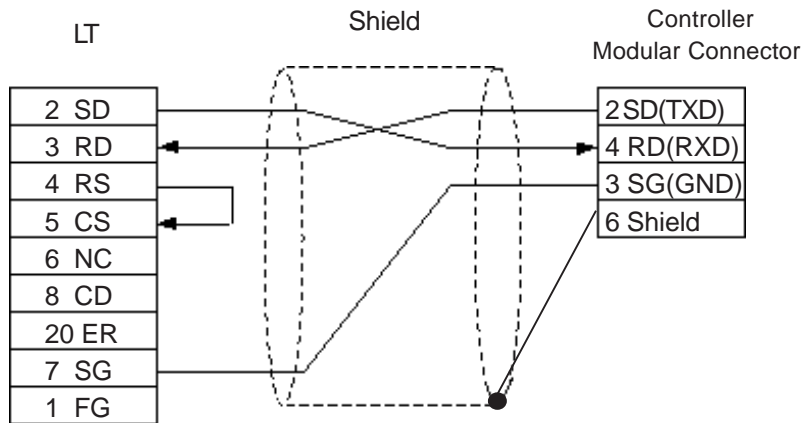
■ LE100 Series



- **Up to 31 LE100 Series units can be connected to a single LT.**
- **Connect the shield to the LT's FG terminal.**
- **If a communications cable is used, be sure to connect its SG (signal ground) terminal.**
- **RS-422 cables must be 600 meters or less.**
- **LE100 Series data transfer signal names are as follows:**

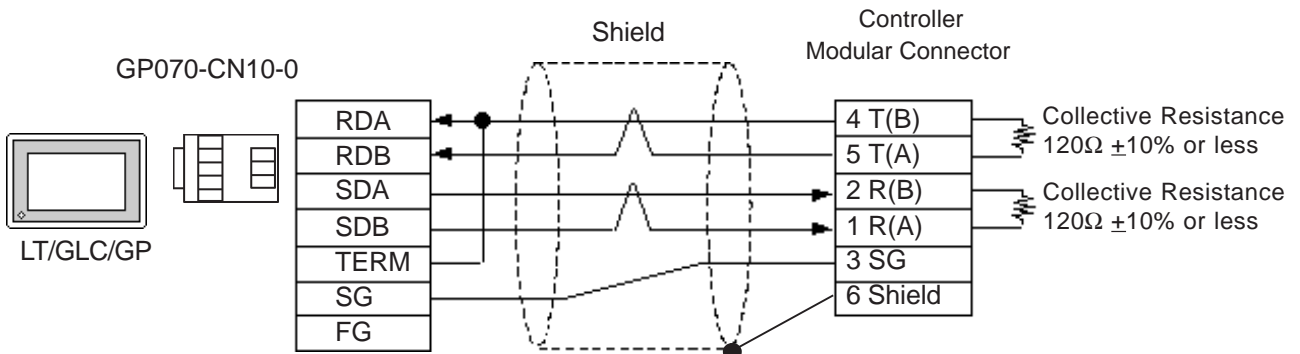
Terminal No.	Signal Name
1	T/R(A)
2	T/R(B)
3	SG

Cable Diagram 1 (1:1) RS-232C

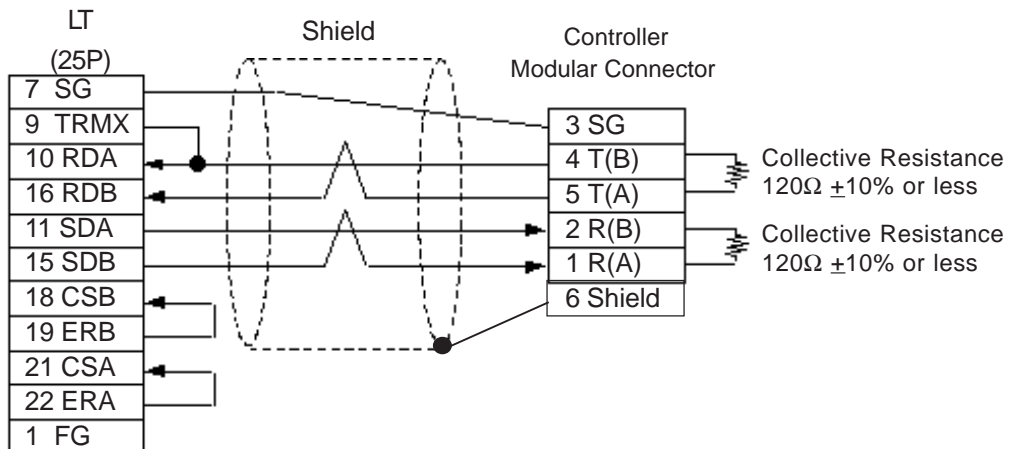


Cable Diagram 2 (1:1) RS-422 4-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

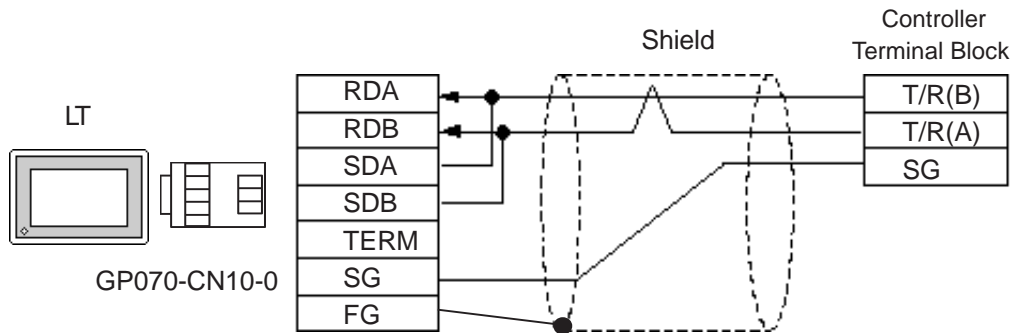


<When making your own cable>

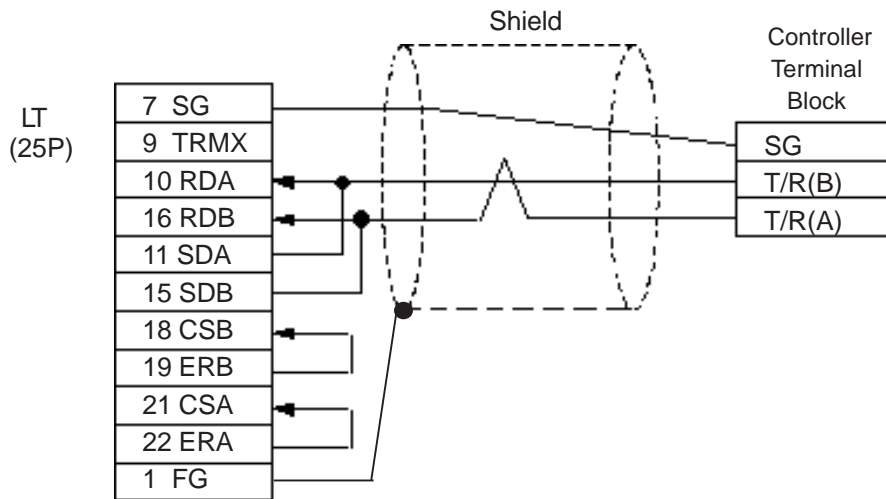


Cable Diagram 3 (1:1) RS-422 2-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

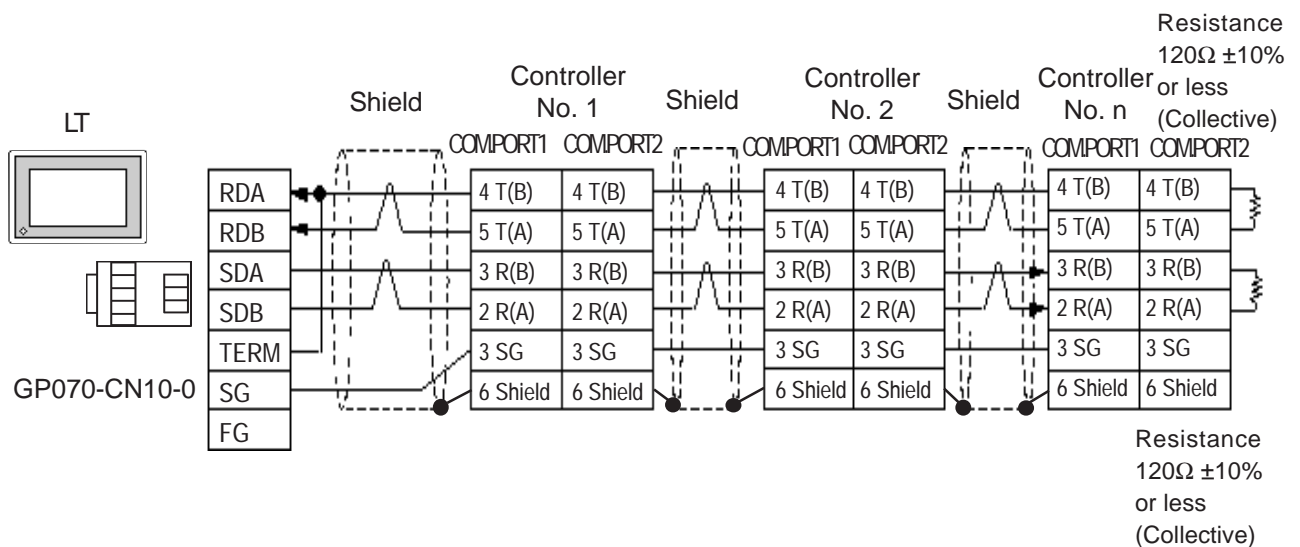


<When making your own cable>

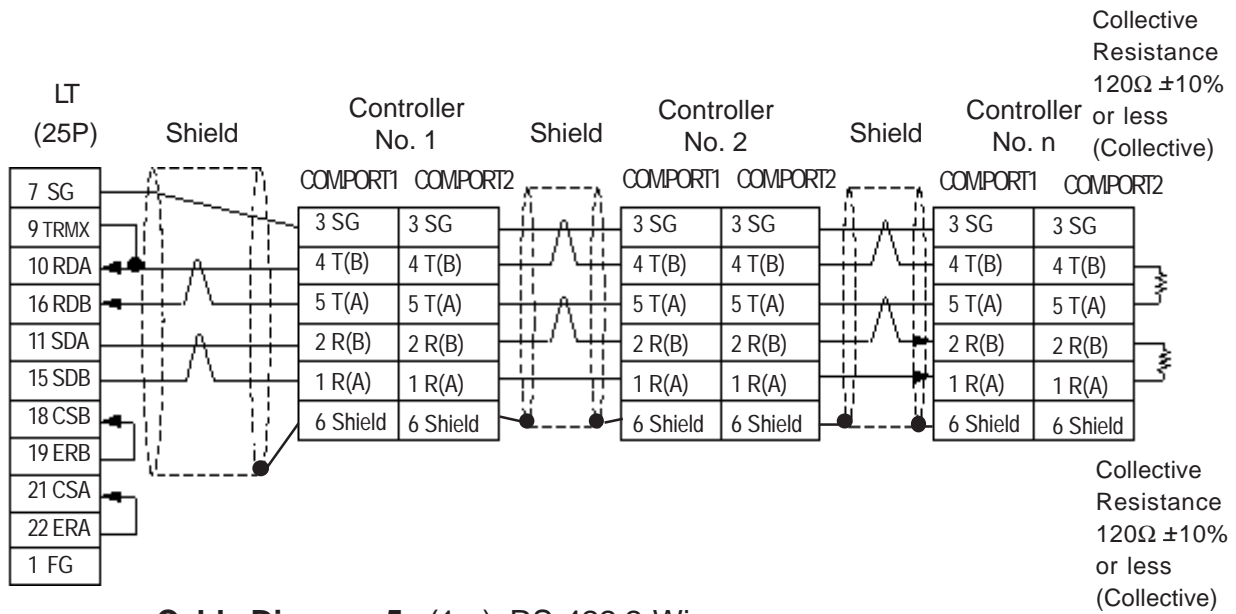


Cable Diagram 4 (1:n) RS-422 4-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

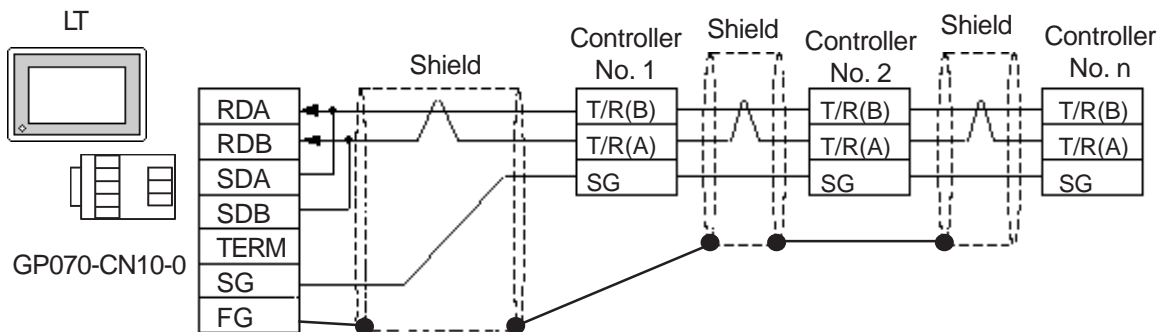


<When making your own cable>

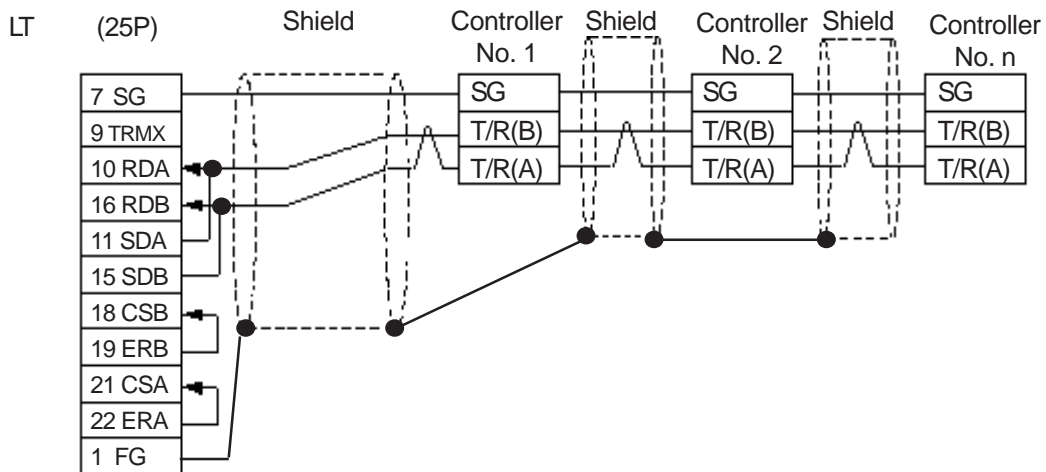


Cable Diagram 5 (1:n) RS-422 2-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

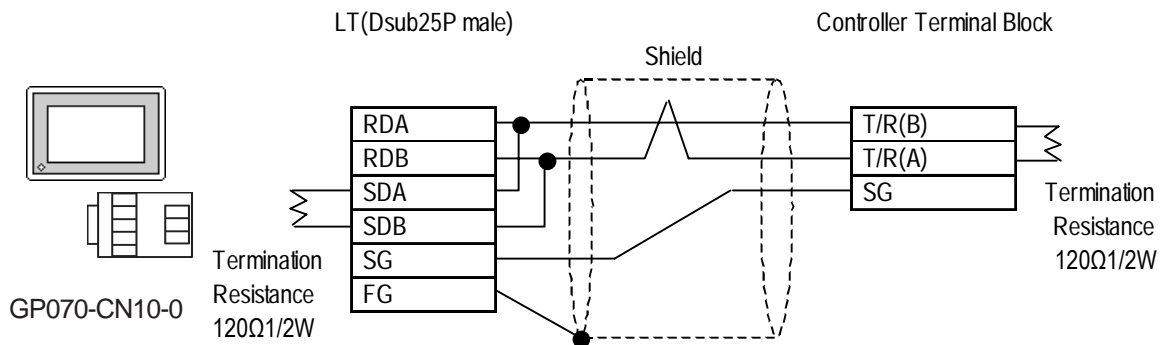


<When making your own cable>

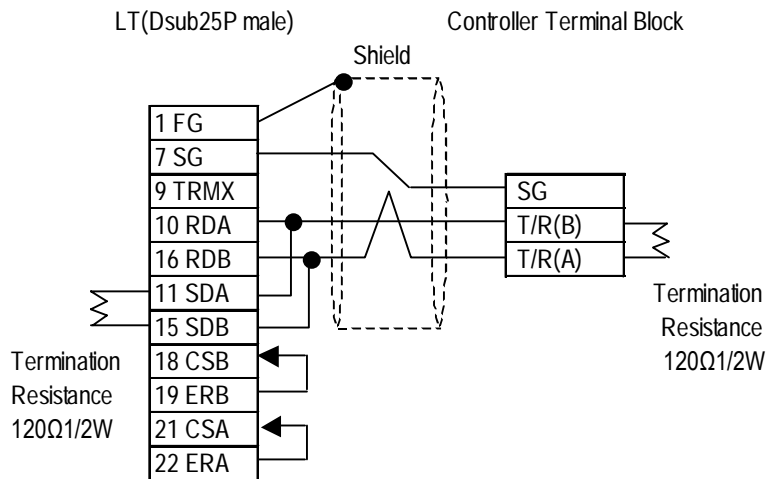


Cable Diagram 6 (1:1) RS-422 2-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

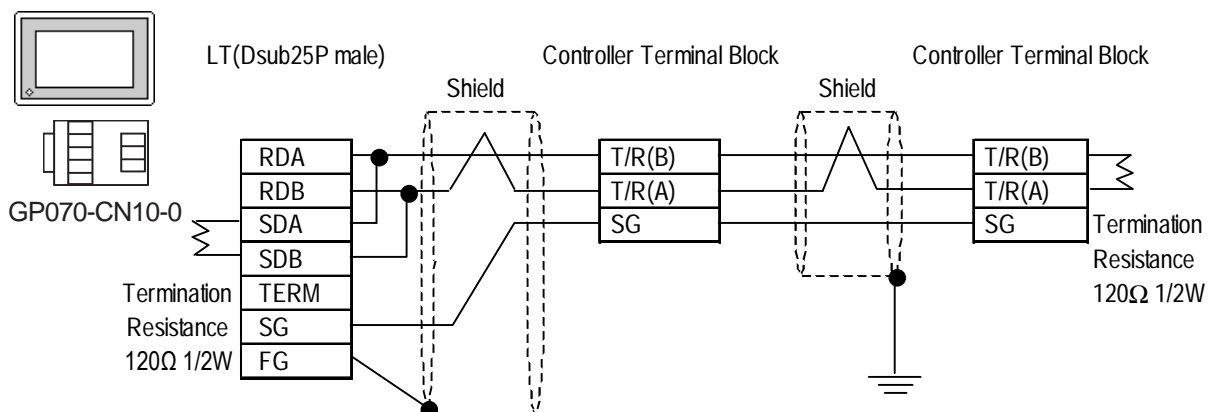


<When making your own cable>

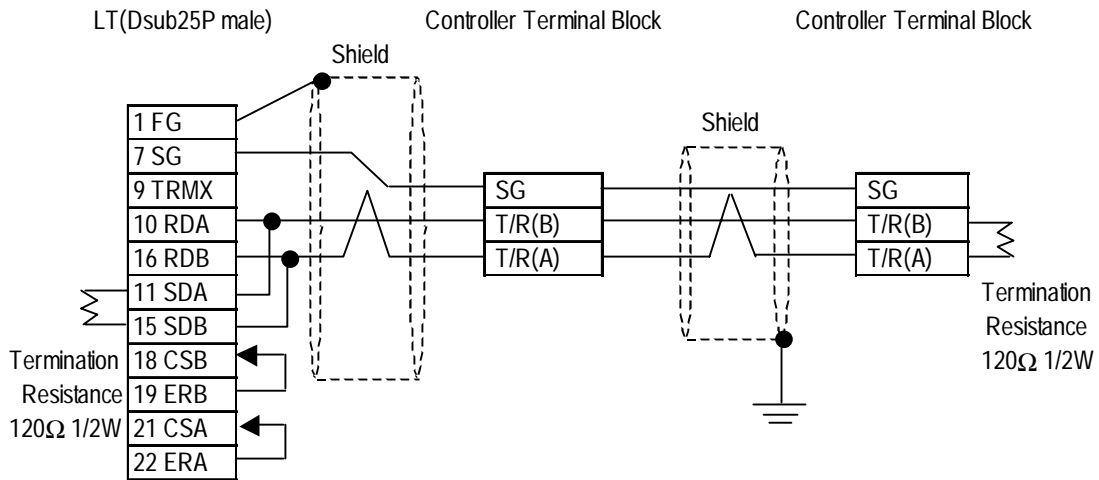


Cable Diagram 7 (1:n) RS-422 2-Wire

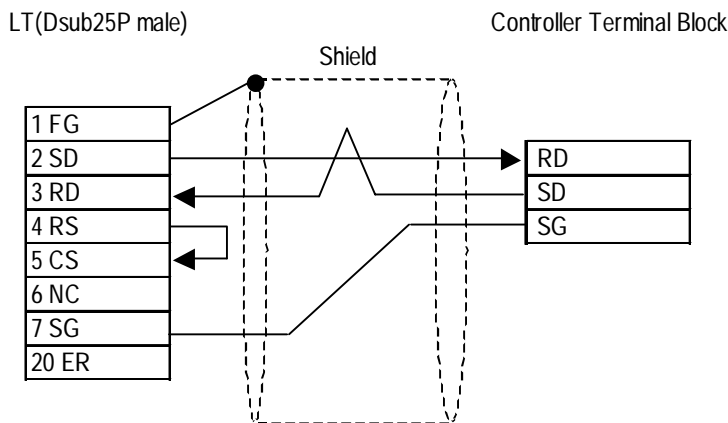
<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When making your own cable>

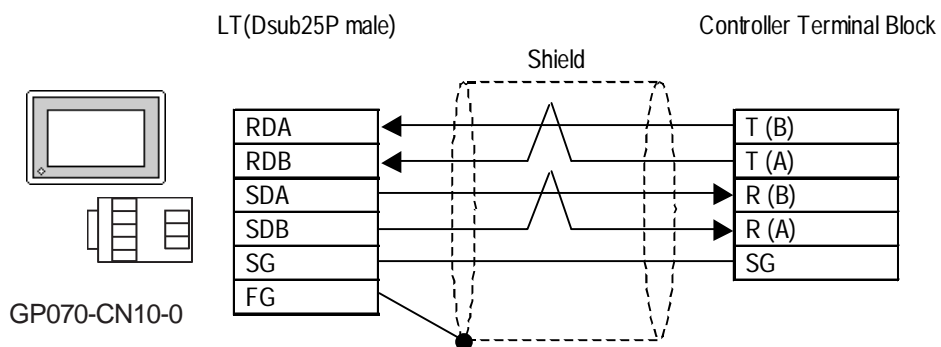


Cable Diagram 8 (1:1) RS-232C

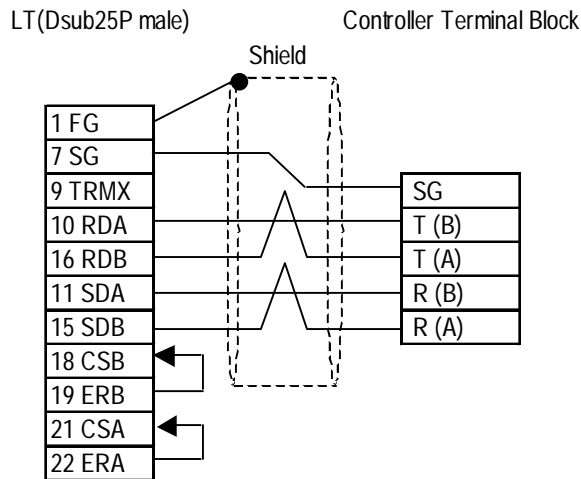


Cable Diagram 9 (1:1) RS-422 4-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

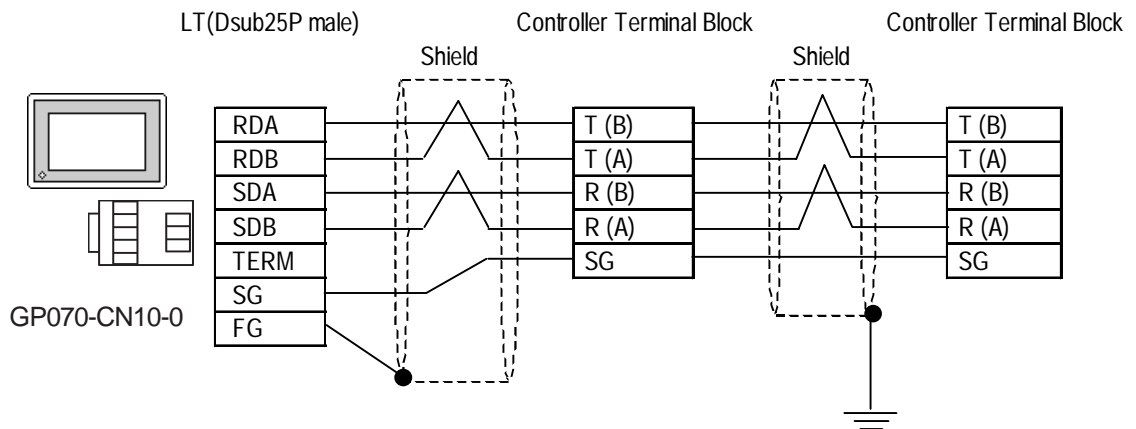


<When making your own cable>

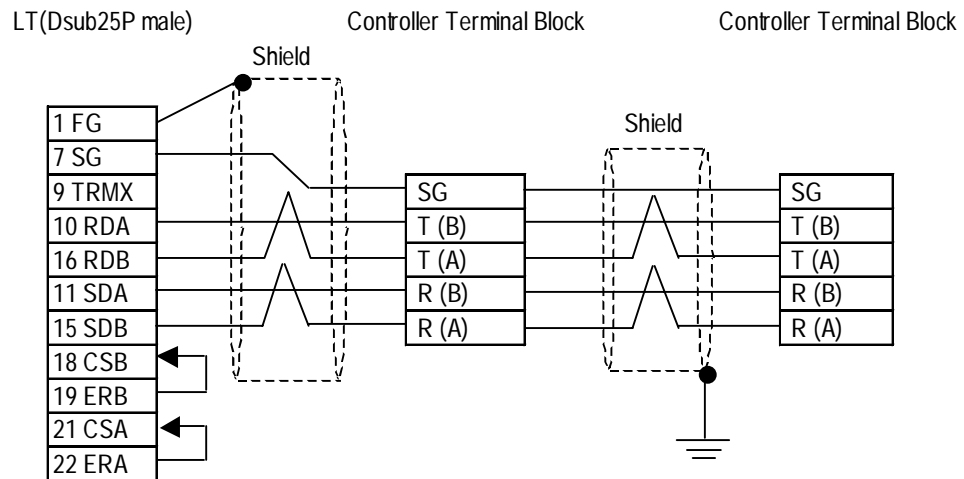


Cable Diagram 10 (1:n) RS-422 4-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When making your own cable>



2.4.3 Supported Devices

The following list shows the range of devices supported by the LT.

■ CB Series / SR-Mini Series (Modbus protocol)

Device	Bit Address	Word Address	Comments
Data	00000 ~ 02EEF	0000 ~ 02EE	H/L



• LT's System Area (LS0 to LS19) Settings

The LT's system area (20 words) cannot be allocated to the Controller's own data area. When you are entering the system area settings via the screen editor software or via the LT's OFFLINE screen, be careful that you do not use the Controller's own data area.

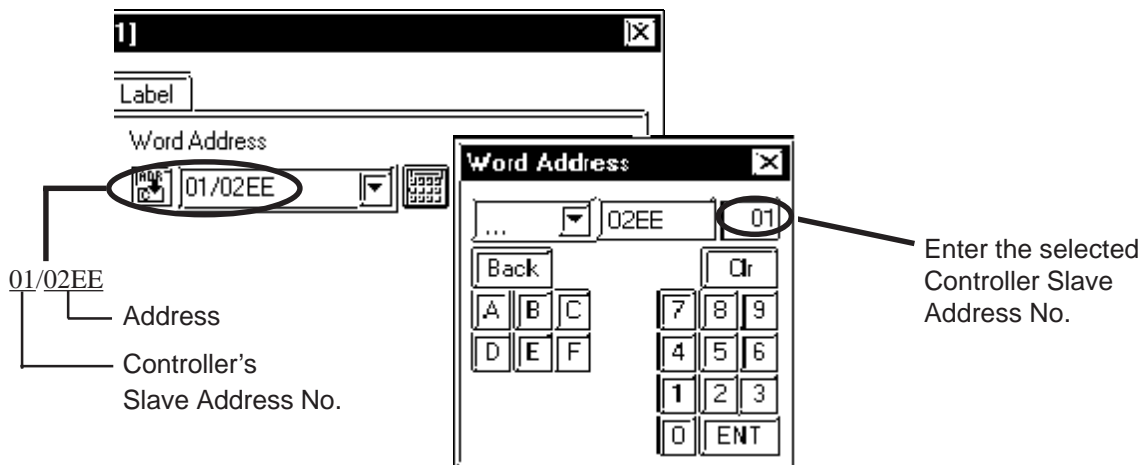
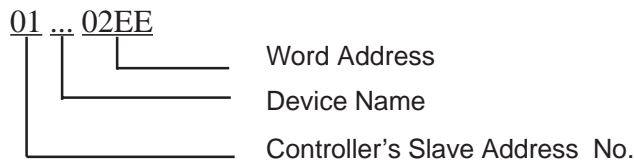
• The data communication feature will not operate when the slave address No. is set to "0". (The default value is 0.)



• Indicating Controller Slave Address settings can be entered in your screen editor software. If a station number is not indicated, the previously entered station number is automatically used. (The default value is 1.)

E.g. When entering Device Address 02EE

Enter the Device Name "...", and the Word Address "02EE".



■ **CB Series / REX-F Series / LE100 Series (RKC protocol)**

◆ **CB Series**

Device	Bit Address	Word Address	Comments
CB	CB00000~CB0036F	CB0000~CB0036	H/L

◆ **REX-F Series**

Device	Bit Address	Word Address	Comments
REX	REX00000~REX0055F	REX0000~REX0055	H/L

◆ **LE100 Series**

Device	Bit Address	Word Address	Comments
LE	LE00000~LE0070F	LE0000~LE0070	H/L



• **LT's System Area (LS0 to LS19) Settings**

The LT's system area (20 words) cannot be allocated to the Controller's own data area. When you are entering the system area settings via the screen editor software or via the LT's OFFLINE screen, be careful that you do not use the Controller's own data area.



• **Indicating Controller identifier data contains data to the right of the decimal point. This decimal point data is handled by the LT as follows:**

■ **When reading out data**

Data read out by the Indicating Controller is handled as integer data.

EX. With a value of 100.0:

Indicating Controller: 100.0

LT : 1000

When displaying decimal point data in a numeric display, use the [Display Data Format] area's [Decimal Places] setting. In this example, only the first decimal place is used, so this setting should be '1'. Now, the data will be handled correctly.

EX. With a value of 100.0:

Indicating Controller: 100.0

LT: 100.0

Depending on the designated address, decimal point will be handled internally as follows:

When the Device List Address is designated with no changes:

no decimal point data is used

When 0x1000 is added to the Device List Address:

one (1) decimal point integer is used

When 0x2000 is added to the Device List Address:

two (2) decimal point integers are used

When 0x3000 is added to the Device List Address:

three (3) decimal point integers are used

Depending on the Address designation method used, the LT's data will be as follows:

Indicating Controller Data	LT Data			
	No change to Address data	Adding 0x1000 to the Address	Adding 0x2000 to the Address	Adding 0x3000 to the Address
123	123	1230	12300	23000
123.4	123	1234	12340	23400
12.34	12	123	1234	12340
1.234	1	12	123	1234

If the address designation method and the Indicating Controller data's decimal point position are not the same, the address' decimal data will be either cut off or replaced with a "0".

When decimal data becomes larger than 5 digits, the left-most digit(s) will be cut.

EX. If "1122334" is used, the number will become "22334".

■ **When writing data**

When writing data to an Indicating Controller, all data must be an integer.

Depending on the designated address, the decimal point will be handled internally as follows:

When the Device List Address is designated with no changes:

no decimal point data is used

When 0x1000 is added to the Device List Address:

one (1) decimal point integer is used

When 0x2000 is added to the Device List Address:

two (2) decimal point integers are used

When 0x3000 is added to the Device List Address:

three (3) decimal point integers are used

EX. 1) When writing "100.0" to the CB Series unit's Alarm 1 Setting (A1)

LT's address value: 0x1007

LT's write value: 1000

EX. 2) When writing "100" to the CB Series unit's Alarm 1 Setting (A1)

LT's address value: 0x0007

LT's write value: 100

Depending on the Address designation method used, the Indicating Controller's write data will be as follows:

LT Data	Indicating Controller Data			
	No change to Address data	Adding 0x1000 to the Address	Adding 0x2000 to the Address	Adding 0x3000 to the Address
1	1	0.1	0.01	0.001
123	123	12.3	1.23	0.123
1234	1234	123.4	12.34	1.234

If the address designation method and the Indicating Controller data's decimal point position are not the same, the address' decimal data will be either cut off or replaced with "0".

Please refer to your RKC Instrument Inc. Indicating Controller installation guide for information about identifier data setting ranges and decimal point positions.



- Indicating Controller device address settings can be entered in your screen editor software. If a device address is not indicated, the previously entered device address is automatically used. (The default value is 0.)

<Example of device settings>

01/CB0000

Address

Controller's Device Address No.

Word Address

Word Address

CB 0000 01

Back Clr

A	B	C	7	8	9
D	E	F	4	5	6
			1	2	3
			0	ENT	

Enter the selected Controller Device Address No.

■ Communication Identifier List (CB Series)

Address	Identifier	Description
00	M1	Measured value (PV)
01	M2	Current transformer input 1
02	M3	Current transformer input 2
03	AA	Alarm 1 status
04	AB	Alarm 2 status
05	B1	Burnout
06	S1	Set value (SV)
07	A1	Alarm 1 setting
08	A2	Alarm 2 setting
09	A3	Heater break alarm 1 setting
0A	A4	Heater break alarm 2 setting
0B	A5	Control loop break alarm setting
0C	A6	LBA deadband
0D	G1	Autotuning (AT)
0E	G2	Self-tuning (ST)
0F	P1	Heat-side proportional band
10	I1	Integral time
11	D1	Derivative time
12	W1	Anti-reset windup
13	T0	Heat-side proportional cycle
14	P2	Cold-side proportional band
15	V1	Deadband
16	T1	Cold-side proportional cycle
17	PB	PV bias
18	LK	Set data lock function
19	RS	RUN/STOP function
1A	ER	Error code
1B	IO	Initialization mode selection
1C	IP	Setting necessary code [Cod]
1D	XI	Input type selection [SL1]
1E	XQ	Engineering unit and cooling type selection [SL2]
1F	LV	Heater break alarm (HBA), control loop break alarm (LBA), special specification, or control loop break alarm (LBA) output selection [SL3]

Address	Identifier	Description
20	XA	First alarm (ALM1) type or First alarm (ALM1) with hold action selection [SL4]
21	XB	Second alarm (ALM2) type or Second alarm (ALM2) with hold action selection [SL5]
22	CA	Control action type selection [SL6]
23	Z1	Energized/de-energized alarm selection, special specification selection 1 [SL7]
24	Z2	Special specification selection 2 [SL8]
25	Z3	Special specification selection 3 [SL9]
26	DH	Option selection [SL10]
27	XC	SV alarm type selection [SL11]
28	XV	Setting limiter (high limit) [SLH]
29	XW	Setting limiter (low limit) [SLL]
2A	XU	Setting the position of decimal point [PGdP]
2B	MH	Differential gap setting of ON/OFF action [oH]
2C	HA	Differential gap setting of first alarm (ALM1) [AH1]
2D	HB	Differential gap setting of second alarm (ALM2) [AH2]
2E	XR	CT ratio setting [CTr]
2F	F1	Digital filter setting [dF]
30	GH	Time factor assumed to be safe [STTM]
31	PU	Factor to calculate proportional band [STPK]
32	IU	Factor to calculate integral time [STIK]
33	IL	Integral time limiter [ILIM]
34	HP	Holding peak ambient temperature [TCJ]
35	UT	Operating time display unit (Upper digits) [WTH]
36	UU	Operating time display unit (Lower digits) [WTL]

■ Communication identifier list (REX-F Series)

Address	Identifier	Description
00	M1	Measured-value (PV) input
01	AA	First alarm output
02	AB	Second alarm output
03	AC	Heater break alarm output
04	O1	Manipulated output (Heating-side)
05	O2	Manipulated output (Cooling-side)
06	B1	Burnout
07	B2	Feedback resistance (FBR) input burnout
08	S2	Remote setting value (RS)
09	M2	Feedback resistance input value (POS)
0A	M3	Current transformer input value
0B	MS	Set-value (SV) monitoring
0C	J1	Auto/manual transfer
0D	C1	Local/remote transfer
0E	E1	Local/external memory area transfer
0F	ZA	Control area No. transfer
10	G1	PID control/auto-tuning transfer
11	RA	Local mode/computer mode identification
12	SR	Operation execution (RUN)/STOP transfer
13	ON	Manipulated output value (MV)
14	S1	Set-value (SV)
15	A1	First alarm setting
16	A2	Second alarm setting
17	P1	Proportional band (Heating-side)
18	I1	Integral time
19	D1	Derivative time
1A	CA	Control response designation parameter
1B	P2	Cooling-side proportional band
1C	V1	Deadband
1D	HH	Setting change rate limit
1E	PB	PV bias
1F	F1	PV digital filter
20	DP	PV low input cut-off
21	RR	RS ratio
22	RB	RS bias
23	F2	RS digital filter
24	OH	Output limit (High limit)
25	OL	Output limit (Low limit)
26	OQ	Cooling output Min. ON time
27	PH	Increase in output change rate limit
28	PL	Decrease in output change rate limit

Address	Identifier	Description
29	IV	Upper ON/OFF action (A) differential gap
2A	IW	Lower ON/OFF action (A) differential gap
2B	OE	Manual output at abnormality
2C	GB	AT bias
2D	HA	First alarm differential gap
2E	TD	First alarm timer setting
2F	A3	Heater break alarm
30	HB	Second alarm differential gap
31	TG	Second alarm timer setting
32	LA	Analog output (AO) Specification selection
33	HV	Analog output (AO) Scale high limit
34	HW	Analog output (AO) Scale low limit
35	V2	Neutral zone
36	VH	Open/close output differential gap
37	SY	Action selection at feedback resistance (FBR) input break
38	DA	Bar-graph display selection
39	XI	PV input type selection
3A	AV	Input abnormality determination point (High limit)
3B	AW	Input abnormality determination point (Low limit)
3C	WH	Action selection at input abnormality (High limit)
3D	WL	Action selection at input abnormality (Low limit)
3E	XV	Input programmable range (High limit)
3F	XW	Input programmable range (Low limit)
40	XU	Decimal-point position selection
41	XH	Square root extraction selection
42	SH	Setting limit (High limit)
43	SL	Setting limit (Low limit)
44	XR	RS input type selection
45	XL	SV tracking selection
46	T0	Proportioning cycle (Heating-side)
47	T1	Cooling-side proportioning cycle
48	XE	Direct/reverse action selection
49	XN	Hot/cold start selection
4A	SX	Start determination point
4B	XA	First alarm Action selection
4C	NA	First alarm Energized/de-energized selection
4D	OA	First alarm Action selection at input abnormality
4E	WA	First alarm Hold action selection
4F	XB	Second alarm Action selection

Address	Identifier	Description
50	NB	Second alarm Energized/de-energized selection
51	OB	Second alarm Action selection at input abnormality
52	WB	Second alarm Hold action selection
53	LK	Set data lock level
54	LL	Area lock
55	DH	Operation RUN/STOP display lock

■ Communication identifier list (LE100 Series)

Address	Identifier	Description
0	M1	Measured value (PV)
1	AA	Output 1 status
2	AB	Output 2 status
3	AC	Output 3 status
4	AD	Output 4 status
5	AE	Output 5 status
6	AF	Output 6 status
7	AG	Output 7 status
8	AH	Output 8 status
9	B1	Burnout
0A	ER	Error code
0B-0D	ID	ID data
0E	MS	Specific gravity monitor
0F	ML	Scale low monitor
10	MH	Scale high monitor
11	HP	Peak hold monitor
12	HQ	Bottom hold monitor
13	MW	Number of water processing times monitor
14	MZ	Amount of emptiness correction monitor
15	A1	Output 1 set value
16	A2	Output 2 set value
17	A3	Output 3 set value
18	A4	Output 4 set value
19	A5	Output 5 set value
1A	A6	Output 6 set value
1B	A7	Output 7 set value
1C	A8	Output 8 set value
1D	A9	Actual liquid output setting
1E	AZ	Emptiness adjustment
1F	WT	Number of water processing times
20	CW	Initializing the number of water processing times
21	HR	Hold reset
22	IR	Interlock release
23	LK	Set data lock
24	IS	Default setting
25	EC	Error release
26	LU	Decimal point position selection
27	LT	Number of linearizing table setting

Address	Identifier	Description
28	L0	Linearizing table setting 0
29	L1	Linearizing table setting 1
2A	L2	Linearizing table setting 2
2B	L3	Linearizing table setting 3
2C	L4	Linearizing table setting 4
2D	L5	Linearizing table setting 5
2E	L6	Linearizing table setting 6
2F	L7	Linearizing table setting 7
30	L8	Linearizing table setting 8
31	L9	Linearizing table setting 9
32	LA	Linearizing table setting 10
33	F1	Digital filter
34	XA	Output 1 type selection
35	DA	Output 1 deviation value setting
36	QA	Output 1 interlocking function selection
37	NA	Output 1 a/b contact selection
38	HA	Output 1 differential gap
39	TA	Output 1 timer setting
3A	XB	Output 2 type selection
3B	DB	Output 2 deviation value setting
3C	QB	Output 2 interlocking function selection
3D	NB	Output 2 a/b contact selection
3E	HB	Output 2 differential gap
3F	TB	Output 2 timer setting
40	XC	Output 3 type selection
41	DC	Output 3 deviation value setting
42	QC	Output 3 interlocking function selection
43	NC	Output 3 a/b contact selection
44	HC	Output 3 differential gap
45	TC	Output 3 timer setting
46	XD	Output 4 type selection
47	DD	Output 4 deviation value setting
48	QD	Output 4 interlocking function selection
49	ND	Output 4 a/b contact selection
4A	HD	Output 4 differential gap
4B	TD	Output 4 timer setting
4C	XE	Output 5 type selection
4D	DE	Output 5 deviation value setting
4E	QE	Output 5 interlocking function selection
4F	NE	Output 5 a/b contact selection
50	HE	Output 5 differential gap
51	TE	Output 5 timer setting

Address	Identifier	Description
52	XF	Output 6 type selection
53	DF	Output 6 deviation value setting
54	QF	Output 6 interlocking function selection
55	NF	Output 6 a/b contact selection
56	HF	Output 6 differential gap
57	TF	Output 6 timer setting
58	XG	Output 7 type selection
59	DG	Output 7 deviation value setting
5A	QG	Output 7 interlocking function selection
5B	NG	Output 7 a/b contact selection
5C	HG	Output 7 differential gap
5D	TG	Output 7 timer setting
5E	XH	Output 8 type selection
5F	DH	Output 8 deviation value setting
60	QH	Output 8 interlocking function selection
61	NH	Output 8 a/b contact selection
62	HH	Output 8 differential gap
63	TH	Output 8 timer setting
64	HV	Monitor output high
65	HW	Monitor output low
66	EG	End specific gravity setting
67	SW	Number of water processing times setting
68	XX	Scale low
69	SG	Specific gravity setting
6A	J1	Scale 1 actual liquid setting
6B	J2	Scale 2 actual liquid setting
6C	J3	Correction on the low limit side by actual liquid 2
6D	J4	Correction on the high limit side by actual liquid 2
6E	UN	Unit setting
6F	SP	Specific gravity setting transfer
70	SS	Specific gravity correction function selection
71	DS	DI function selection
72	MM	Volume/level display selection



Note: When you register an identifier as a symbol, you can then select that identifier when setting up addresses. When installed LT Editor, a sample symbol file of addresses registered for Unit No. 0 is copied in "Sample Folder". When specified the default folder, it is copied in C:\Pro-face\LT\Sample. This sample file can be imported using the Symbol Editor. For information on how to use the Import feature, please refer to your screen editor's Operation Manual.

- Symbol File : RKCsymbol.lbe

After importing the symbol file, a pull-down list of registered symbols (identifiers) will appear when you click on the black triangle. (see below)

CB_M1
└─ Identifier
 └─ Temperature Controller Series Name
 CB :CB Series
 REX :REX-F Series
 LE :LE100 Series

play Format Shape/Color Alarm Settings

Word Address

CB_M1

- CB_M1 - 00/CB0000
- CB_M1 - 00/CB0001
- CB_M3 - 00/CB0002
- CB_AA - 00/CB0003
- CB_AB - 00/CB0004
- CB_B1 - 00/CB0005
- CB_S1 - 00/CB0006

* When using Sta. No. other than the sample file's Sta. No. 0, be sure to change the sample file's Sta. No. data.

2.4.4 Environment Setup

The following table lists Digital's recommended RKC INSTRUMENT INC. Controller and LT communication settings.

■ CB Series (Modbus protocol)

LT Settings		Controller Settings	
Baud Rate	9600bps	Baud Rate	9600bps
Data Length	7bits	Data Length	7bits
Stop Bit	2bits	Stop Bit	2bits
Parity Bit	odd	Parity Bit	odd
Data Flow Control	ER(Fixed)	_____	_____
Communication Format When using RS-422	RS-422(2-wire)	_____	_____
Unit No.	1~32	Slave Address	1~32



- **The Controller's slave address number range is from 0 to 99 for the CB Series units. (the data communication feature does not operate when it is set to "0".) Use only from 1 to 32 on the LT.**

■ SR-Mini Series (Modbus protocol)

LT Settings		Controller Settings	
Baud Rate	9600bps	Baud Rate	9600bps
Data Length	8bits	Data Length	8bits
Stop Bit	1bit	Stop Bit	1bit
Parity Bit	None	Parity Bit	None
Data Flow Control	ER(fixed)	_____	_____
Communication Format When using RS-232C	RS-232C	_____	_____
Communication Format When using RS-422	RS-422(4-wire)	_____	_____
Unit No.	1~16	Slave Address	1~16



- **The Controller's slave address number range is from 1 to 16 for the SR-Mini Series units. (the data communication feature does not operate when it is set to "0".) Use only from 1 to 16 on the LT.**

■ **CB Series (RKC protocol)**

LT Settings		Controller Settings	
Baud Rate	9600bps	Baud Rate	9600bps
Data Length	8bits	Data Length	8bits
Stop Bit	1bit	Stop Bit	1bit
Parity Bit	None	Parity Bit	None
Data Flow Control	ER(fixed)	_____	_____
Communication Format When using RS-422	RS-422(2-wire)	_____	_____
Unit No.	0~31	Device Address	0~31



- **The Controller's device address number range is from 0 to 99 for the CB Series units. Use only from 0 to 31 on the LT.**

■ **REX-F Series (RKC protocol)**

LT Settings		Controller Settings	
Baud Rate	9600bps	Baud Rate	9600bps
Data Length	7bits	DataLength	7bits
Stop Bit	2bits	Stop Bit	2bits
Parity Bit	odd	Parity Bit	odd
Data Flow Control	ER(Fixed)	_____	_____
Communication Format When using RS-232C	RS-232C	_____	_____
Communication Format When using RS-422	RS-422(4-wire)	_____	_____
	RS-422(2-wire)	_____	_____
Unit No.	0~31	Device Address	0~31



- **The Controller's device address number range is from 0 to 99 for the REX-F Series units. Use only from 0 to 31 on the LT.**

■ **LE100 Series** (RKC protocol)

LT Settings		Controller Settings	
Baud Rate	9600bps	Baud Rate	9600bps
Data Length	8bits	Data Length	8bits
Stop Bit	1bit	Stop Bit	1bit
Parity Bit	None	Parity Bit	None
Data Flow Control	ER(fixed)	_____	_____
Communication Format When using RS-422	RS-422(2-wire)	_____	_____
Unit No.	0~31	Device Address	0~31



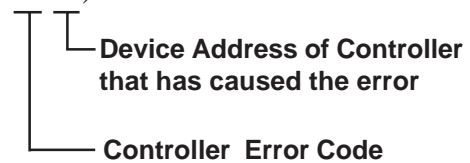
- **The Controller's device address number range is from 0 to 99 for the LE100 Series units. Use only from 0 to 31 on the LT.**

2.4.5 Error Codes

■ **Controller Error Codes**

Error messages (Ex. Host communication error (02:**:##)) are displayed in the lower left corner of the LT screen (** stands for an error code specific to the Controller).

Host Communication Error (02:**:##)



Error Code	Description
04	Occurs when a read out is performed from an address that cannot be read from.
15	Occurs when writing setting values that are outside of the allowed range.

2.5 Omron Corporation Controllers

2.5.1 System Structure

The following describes the system configuration used when connecting the LT to this Controller.






LT's System Area (LS0 to LS19) Settings

The LT's system area (20 words) cannot be allocated to the Controller area. Even though you can enter the system area settings via the LT OFFLINE mode, be careful that you do not actually use the Controller area.

■ THERMAC NEO Electronic Temperature Controller




◆ 1:1 Connection

Electronic *1 Temperature Controller	Cable Diagram	Unit Type
		
E5EN-□□□□□-FLK E5AN-□□□□□-FLK	RS-232C <Cable diagram 1>	LT Type C
E5EN-□□□□□-FLK E5CN-□□□□□-FLK E5GN-□□□□□-FLK E5AN-□□□□□-FLK	RS-422 (2-wire type) <Cable diagram 2>	

*1 The Controller's model number "□" will vary, depending on each controller's functional specifications.

■ THERMAC NEO Electronic Temperature Controller

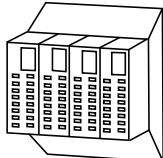


◆ 1:n Connection

Electronic *1 Temperature Controller	Cable Diagram	Unit Type
		
E5EN-□□□□-FLK E5CN-□□□□-FLK E5GN-□□□□-FLK E5AN-□□□□-FLK	RS-422 (2-wire type) <Cable diagram 3>	LT Type C

*1 The Controller's model number "□" will vary, depending on each controller's functional specifications.

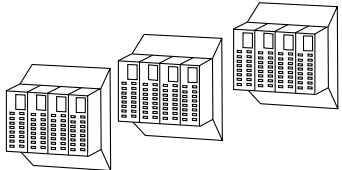


■ In-Panel NEO Temperature Controller

◆ 1:1 Connection

Temperature Controller *1	Cable Diagram	Unit Type
		
E5ZN-□□□□-FLK	RS-422 (2-wire type) <Cable diagram 2>	LT Type C

*1 The Controller's model number "□" will vary depending on each controller functionality specifications.

◆ 1:n Connection

Temperature Controller *1	Cable Diagram	Unit Type
		
E5ZN-□□□□-FLK	RS-422 (2-wire type) <Cable diagram 3>	LT Type C

*1 The Controller's model number "□" will vary depending on each controller functionality specifications.

2.5.2 Cable Diagrams

The cable diagrams shown below and the cable diagrams recommended by Omron Corporation may differ, however, using these cables for your Controller's operations will not cause any problems.



- **An RS-232C cable must be 15 meters or less. Also, be sure to connect its SG (signal ground) terminal.**
- **An RS-422 cable, use a cable length less than 500 meters or less.**
- **Digital recommends the following RS-422 cables.**

Recommended RS-422 Cable

No.	Model *1	Standard
1	E5EN-□□□□□-FLK	AWG28 or above
	E5CN-□□□□□-FLK	
	E5AN-□□□□□-FLK	
2	E5GN-□□□□□-FLK	AWG14 to AWG24

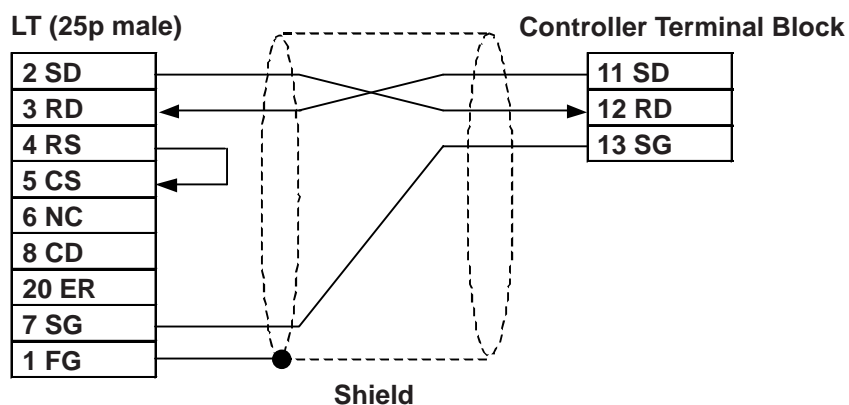
*1 The Controller's model number "□" will vary depending on each controller functionality specifications.

Recommended RS-232C Cable

No.	Model *1	Standard
1	E5EN-□□□□□-FLK	Twisted pair wire with shield, AWG28 or above
	E5AN-□□□□□-FLK	

*1 The Controller's model number "□" will vary depending on each controller functionality specifications.

Cable Diagram 1 (1:1) RS-232C



Cable Diagram 2 (1:1) RS-422



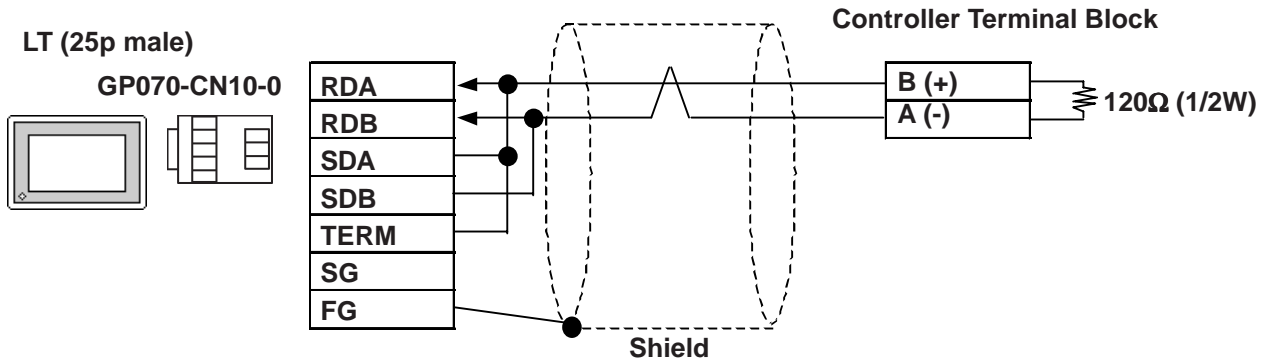
Important

The Pin Nos. used with a RS-422 connection will vary depending on the type of controller used. The controller pin assignment diagrams are shown below. Terminal numbers are not shown in the following RS-422 cable diagrams. Refer to the following tables and diagrams when making all wiring connections.

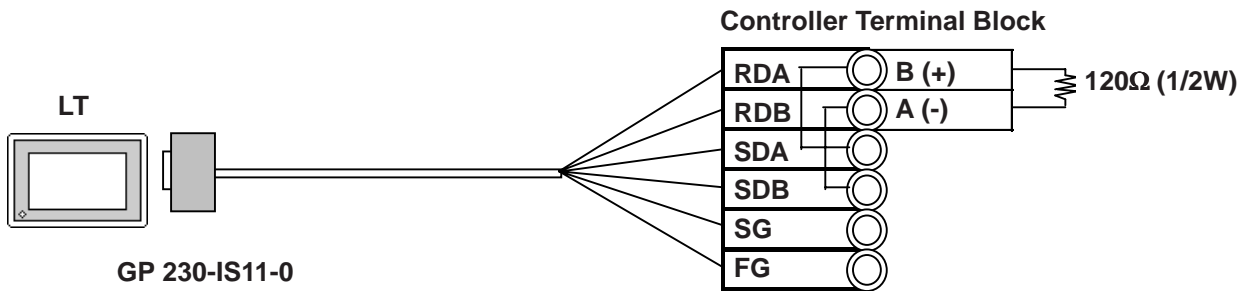
■ Pin No.

Abbreviation	E5EN/E5CN/E5AN	E5GN	E5ZN
A (-)	12	6	24
B (+)	11	5	23

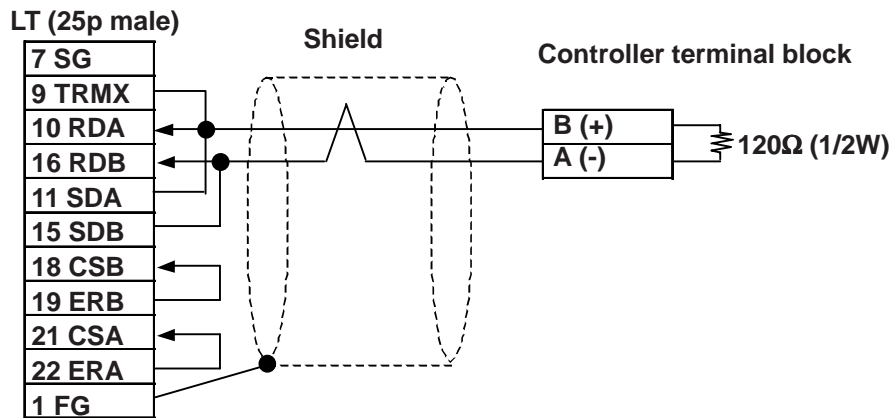
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When using Digital's RS-422 cable, GP230-IS11-0



- When making your own cable



Cable Diagram 3 (1:n) RS-422 2-wires



Important The Pin Nos. used with a RS-422 connection will vary depending on the type of controller used. The controller pin assignment diagrams are shown below. Terminal numbers are not shown in the following RS-422 cable diagrams. Refer to the following tables and diagrams when making all wiring connections.

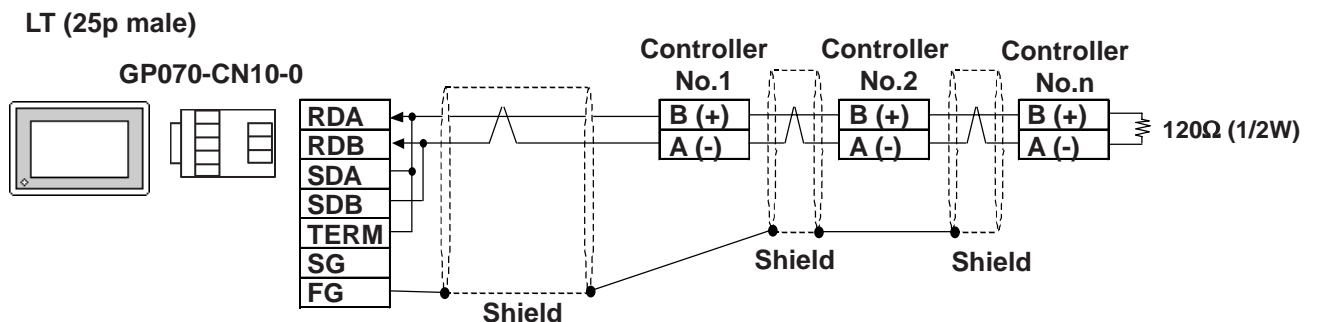


Note: For the shield wire grounding, be sure to use dispersion grounding, parallel grounding or series grounding (shown below), depending on your electrical equipment conditions.

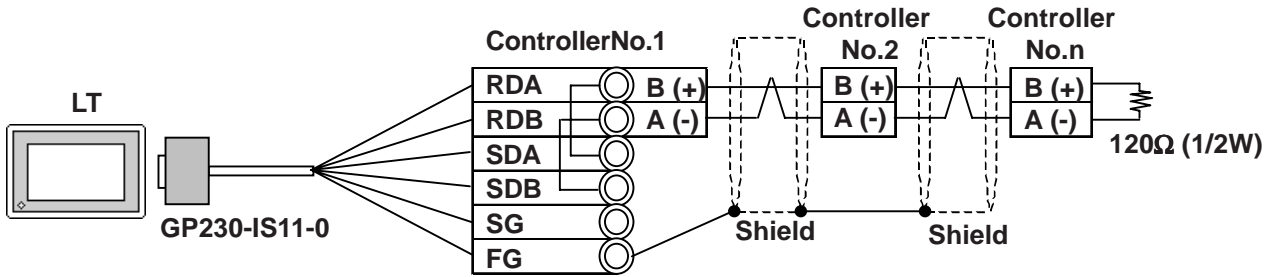
■ Pin No.

Abbreviation	E5EN/E5CN/E5AN	E5GN	E5ZN
A (-)	12	6	24
B (+)	11	5	23

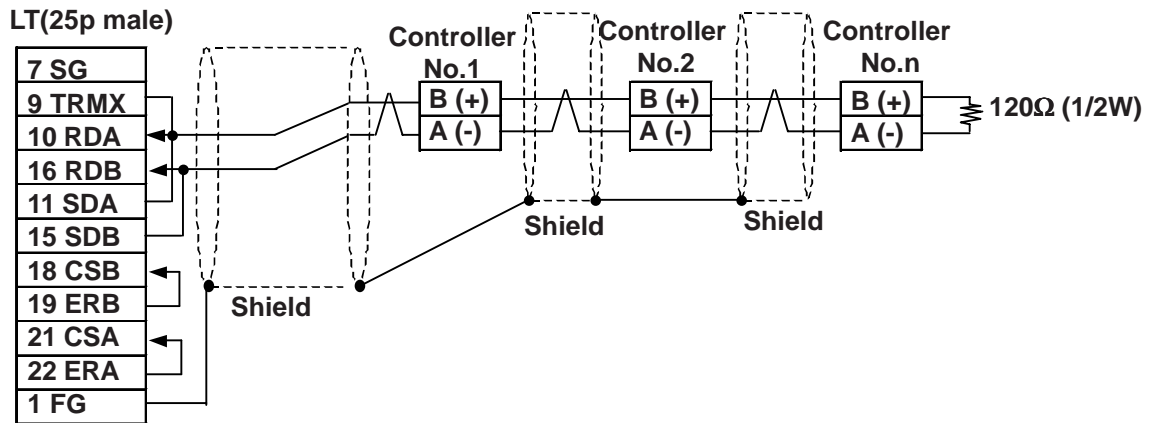
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0 (An example of series grounding)



- When using Digital's RS-422 cable, GP230-IS11-0
(An example of series grounding)



- When making your own cable
(An example of series grounding)



2.5.3 Supported Devices

The following list shows the range of devices supported by the LT.

■ THERMAC NEO Electronic Temperature Controller

Device	Bit Addresses	Word Addresses	Remarks	
Variable Areas	C0000000 to C0000531	C00000 to C00005	Double word device (write disabled) *1	H/L
	C1000000 to C1001C31	C10000 to C1001C	Double word device	
	C3000000 to C3003531	C30000 to C30035	Double word device	
Operation Commands	A000000 to A000815	A0000 to A0008	Word device	

■ In-Panel NEO Temperature Controller

Device	Bit Addresses	Word Addresses	Remarks	
Variable Areas	C0000000 to C0000631	C00000 to C00006	Double word device *1	H/L
	C0010000 to C0010631	C00100 to C00106		
	C1000000 to C1001931	C10000 to C10019	Double word device	
	C1010000 to C1011931	C10100 to C10119		
	C3000000 to C3002E31	C30000 to C3002E	Double word device *2	
C3010000 to C3012E31	C30100 to C3012E			
Operation Commands	A000000 to A000B15	A0000 to A000B	Word device *3*4	

*1 No data can be written.

*2 Switch over to the setup area 1 when writing data. If not, the upper communication error (02:22:03:**) message will appear on the LT screen.

▼ **Reference** ▲ 11.5.5. "Error Codes."

*3 No data can be read out.

*4 To execute the operation command (write), specify the command code at the device address. For the value to be written, specify related information. To specify related information, use a hexadecimal number, e.g., 0x00, 0x01, 0x10, or 0x11.

▼ **Reference** ▲ Omron Corporation "User's Manual for Model E5ZN Temperature Controller - Communication"

E.g.) When the command code is "00"

Command code	Description	Related information		LT Setup
"00"	Communication write	"00" or "10": OFF (write protected)	←→	0x00 or 0x10
		"01" or "11": ON (write unprotected)		0x01 or 0x11



LT Editor's Simulation feature is not available with this protocol. To avoid a possible LT malfunction, do not use this feature.



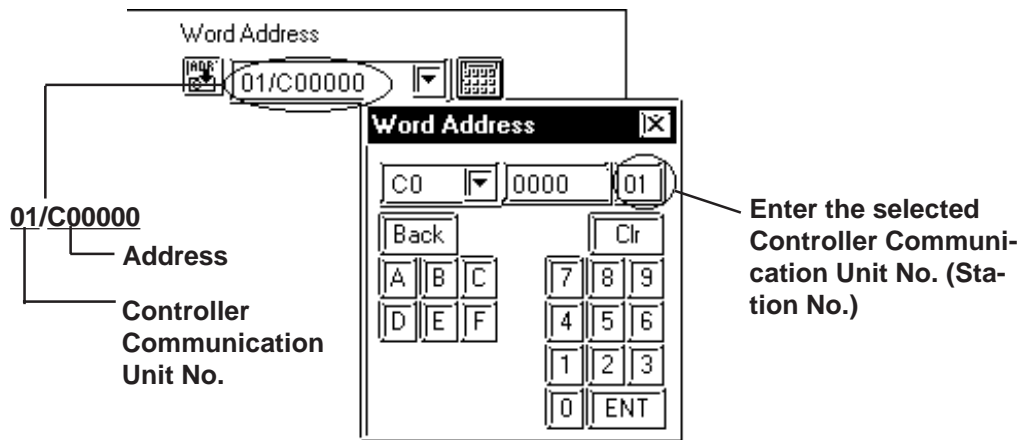
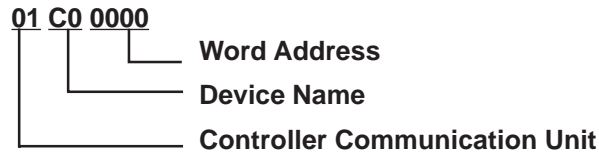
- ***The system area (20 words) of LT cannot be used. Although it is possible to set addresses for this area with the LT editor , or via the LT's OFFLINE mode, it is impossible to actually allocate the system area to the controller's data area.***
- ***Be careful as the Device fields differ depending on the type of Controller. Refer to the Controller's manual for the range allowed for the device address area.***
- ***After screen data is converted from a different type of Controller, be sure to check if the device addresses used are correct.***
- ***Be sure to check that the device addresses are supported before using. Trend graphs or Parts in your screens which use multiple words over continuous addresses.***



- This protocol's LS area uses a 32-bit device.
- When setting Parts in the LT Editor, the Controller communication unit No. can be specified during address input. If a communication unit No. is not indicated, the previously entered communication unit No. is automatically used. (The default value is 1.)

Ex. When entering Device Address C00000

Enter the Device Name "C0", and the Word Address "0000".



After the Controller's power is turned ON, it may take a few seconds until the Controller starts. Therefore, if the LT and the Controller are turned ON at the same time, there may be a delay of several seconds until communication starts.

■ Operation Commands

Command codes 00 to 08 are used for operation command service (command) to provide a total of 9 write commands.

Certain command operations are identical, and the result (arbitrary value) is written to a variable area.

Device code	Word address	Command code	Meaning
A	0000	00	Data Transfer Write
	0001	01	RUN / STOP
	0002	02	Multi-SP
	0003	03	AT RUN / STOP
	0004	04	Write mode
	0005	05	Store RAM data
	0006	06	Software reset
	0007	07	Setting area shift 1
	0008	08	Protection level shift



- When a write command is performed, the device code used in LT Editor is 'A', and that command code is entered instead of the device address.

Related data (2 bytes) is designated by each word switch part's setting value. Since this device is a write-only device, readout is disabled. If used for readout, i.e. an Numeric display, a host communication error (02:F0:**) (** is set parts unit No.) will appear in the lower left corner of the LT screen.

- Device "C0, C1, C3"

C0, C1 and C3 devices are not used as device symbols. Instead they identify a variable area's data type.



User Manual (SGTD-706) for OMRON's E5AN/E5EN/E5CN/E5GN Electronic Temperature Controller

2.5.4 Environment Setup

The following table lists the recommended Controller and LT communication settings.

■ THERMAC NEO Controller

LT Settings		Controller Settings	
Baud Rate	9600 bps	Baud Rate	9600 bps
Data Length	7 bits	Data Length	7 bits
Stop Bit	2 bit	Stop Bit	2 bit
Parity Bit	Even	Parity Bit	Even
Data Flow control	ER	-----	-----
Communication Format (using RS-232C) ^{*1}	RS-232C	-----	-----
Communication Format (using RS-422 - 4-line)	4-wire type	-----	-----
Communication Format (using RS-422 - 2-line)	2-wire type	-----	-----
Unit No. ^{*2}	1 to 32	Unit No.	1 to 32

**1 The E5EN and the E5AN use an RS-232C connection.*

**2 It is possible to set a Controller communication unit No. from 0 to 99, however, the LT can only be set from 1 to 32.*

With a 1:n connection, up to 31 controllers can be connected to a single LT.

■ THERMAC NEO Controller

LT Setup		Temperature Controller Setup	
Baud Rate	9600 bps	Baud Rate	9600 bps
Data Length	7 bits	Data Length	7 bits
Stop Bit	2 bits	Stop Bit	2 bits
Parity Bit	Even	Parity Bit	Even
Data Flow control	ER Control	-----	-----
Communication Format	RS-422 (2-Wire Type)	-----	-----
Unit No. ^{*1}	1 to 15	Communication Unit No.	1 to 15

**1 Even though the communication unit number may be specified in a range between 0 and F on the temperature controller, only a range between 1 and F can be used on the LT unit. To load data to the LT unit, match the LT unit number with the converted decimal number of the controller address where the data to be loaded is stored. In case of 1:n, a maximum of 15 temperature controllers may be connected.*

2.5.5 Error Codes

Error codes are indicated in the left lower corner of the LT screen.

Error codes consist of three types. When an error occurs, the corresponding error code and LT station number (where the error occurred) are saved either in LS2039 or LS2070. Since the method used will vary depending on the error type, refer to the following list for details. (Data saved in LS2039 or LS2070 is shown using hexa-decimal characters.)

1. Error Code (02:12) – 2 units

Error Code 0x12
Data saved in LS2039 0x12 (error code)

Data saved in LS2070 0 (fixed as “0”)

2. Error Code (02:12:34) – 3 units

Error Code 0x12. The LT station number where the error occurred is 34(0x22)

Data saved in LS2039 0x1222 (The two digits shown here by “12” represent the error code, and the last two digits “22” represent the station no. Note that “0x” is not shown on the display.)

Data saved in LS2070 0 (fixed as “0”)

3. Error Code (02:12:34:56) – 4 units

Error Code 0x1234. The LT unit number where the error occurred is 56(0x38)

Data saved in LS2039 0x1234 (error code)

Data saved in LS2070 0x38 (station no.)

<Temperature Controller Error Codes>

Any error code specific to the temperature controller is displayed at the lower left part of the LT screen, e.g. “Host Communication Error (02:○○:△△:□□).”

○○: △△ stands for the error code specific to the temperature controller, and □□ indicates the temperature controller number.

Error Code	Error Name	Cause
11:03	Starting Address Error	An address outside the range was specified at drawing
11:04	Ending Address Error	The range of writing consecutive addresses with the Key Input or the like exceeds the setting range of the controller.
11:00	Parameter Error	The data written from the LT exceeds the setting range of the controller.
30:03	Read Only	An attempt was made to write data to “C0 Device” in the write protected range.
22:03	Operation Error	<ul style="list-style-type: none"> • An attempt was made to write data when writes were disabled on the controller. • The temperature controller malfunctions.

2.6 Shinko Technos Corporation Controllers

2.6.1 System Structure

The following describes the system configuration used when connecting the LT to this Controller.



- **Do not use the system area because the LT's system area (LS0 to LS19) cannot be allocated to the Controller area. (Deselect all system area selection items.)**
- **The Controller's read area can be used as normal.**

■ C Series

CPU	Control Unit ^{*1}	Cable Diagram	Cables	Unit Type
CPT-20A	CCT-235-2-□□	RS-422 <Cable Diagram 4>	CPM Shinko Technos Corporation	LT Type C
		RS-422 (1:n) <Cable Diagram 5>	CPM and CPP Shinko Technos Corporation	

^{*1} The Controller's model number "□□" changes, according to the options selected. For details about model numbers, refer to the C Series catalog.

■ FC Series

Controller ^{*1}	Link I/F	Cable Diagram	Unit Type
FCD-13A□□,C FCD-15A□□,C FCR-13A□□,C FCR-15A□□,C	Serial Communication Option:C	RS-232C <Cable Diagram 1>	LT Type C
FCD-13A□□,C5 FCD-15A□□,C5 FCR-13A□□,C5 FCR-15A□□,C5	Serial Communication Option:C5	RS-422 <Cable Diagram 2> RS-422 (1:n) <Cable Diagram 3>	

^{*1} The Controller's model number "□□" changes, according to the options selected. Items with the serial communication option have a "C" or "C5" after the basic model number. For details about model numbers, refer to each series catalog.

■ FIR Series

Controller *1	Link I/F	Cable Diagram	Unit Type
FIR-201-M□□,C FIR-201-M□□,C	Serial Communication Option:C	RS-232C <Cable Diagram 1>	LT Type C
FIR-201-M□□,C5 FIR-201-M□□,C5	Serial Communication Option:C5	RS-422 <Cable Diagram 2> RS-422 (1:n) <Cable Diagram 3>	

■ GC Series

Controller *1	Link I/F	Cable Diagram	Unit Type
GCS-300□□,C5	Serial Communication Option:C5	RS-422 <Cable Diagram 2> RS-422 (1:n Communication) <Cable Diagram 3>	LT Type C

■ FCL Series

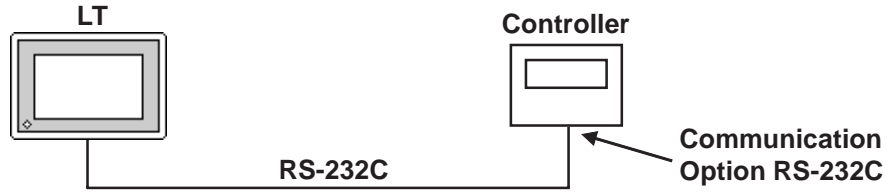
Controller *1	Link I/F	Cable Diagram	Unit Type
FCL-13A□□,C5	Serial Communication Option:C5	RS-422 <Cable Diagram 2> RS-422 (1:n Communication) <Cable Diagram 3>	LT Type C

■ PC-900 Series

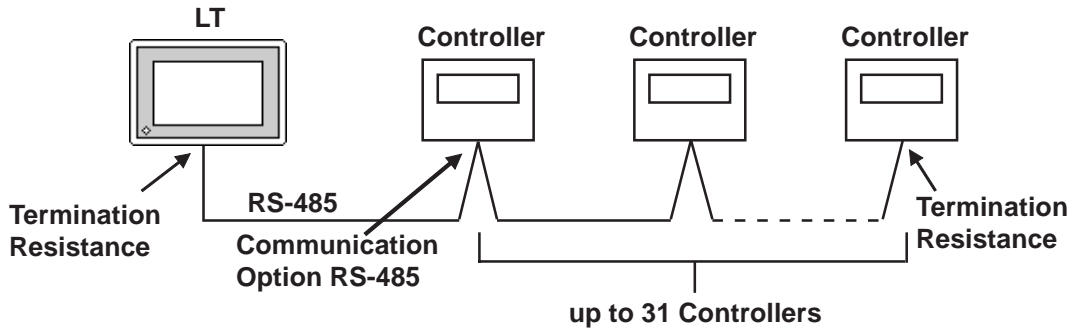
Controller *1	Link I/F	Cable Diagram	Unit type
PC-935□□,C PC-955□□,C	Serial Communication Option:C	RS-232C <Cable Diagram 1>	LT Type C
PC-935□□,C5 PC-955□□,C5	Serial Communication Option:C5	RS-422 <Cable Diagram 2> RS-422 (1:n Communication) <Cable Diagram 3>	

*1 The Controller's model number "□□" changes, according to the options selected. Items with the serial communication option have a ",C" or ",C5" after the basic model number.
For details about model numbers, refer to each series catalog.

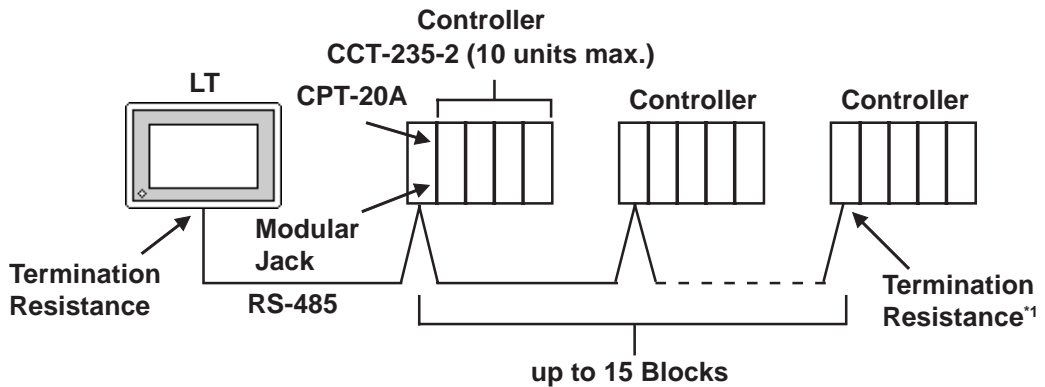
◆ When connecting an RS-232C cable (for RS-232C compatible Controllers)



◆ RS-485 cable (except the C Series Controller)



◆ RS-485 cable (connecting with the C Series Controller)



*1 Turn Controller's termination resistance switch ON.

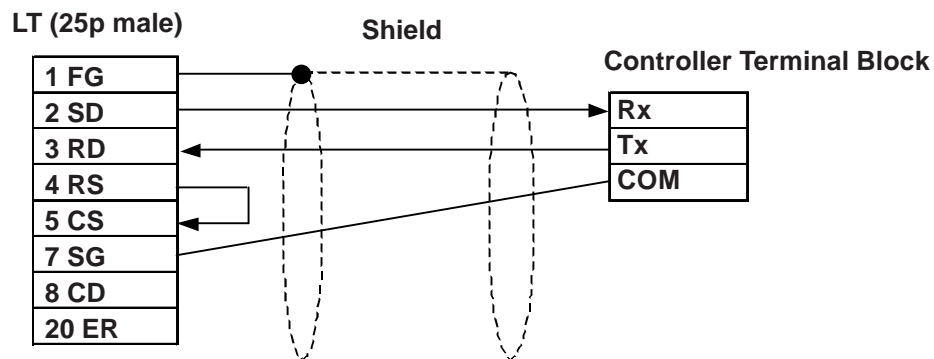
2.6.2 Cable Diagrams

The cable diagrams shown below and the cable diagrams recommended by Shinko Technos Corporation may differ, however, using these cables for your Controller's operations will not cause any problems.



- **Ground your External Device's FG terminal according to your country's applicable standard.**
- **Since some Controllers do not have a GND signal (FG), be careful when selecting the side (LT or Indicating Controller) used for connecting the FG wire to the shield.**
- **When connecting the FG wire to the cable connector's cover, be sure it is made from a conductive material.**
- **For an RS-232C cable, use a cable length of 15 meters or less.**
- **For an RS-422 cable, use a cable length of 600 meters or less.**
- **Pro-face recommends the OTSC-2PVB-7/0.32TA cable, made by O-NAMBA Corporation.**

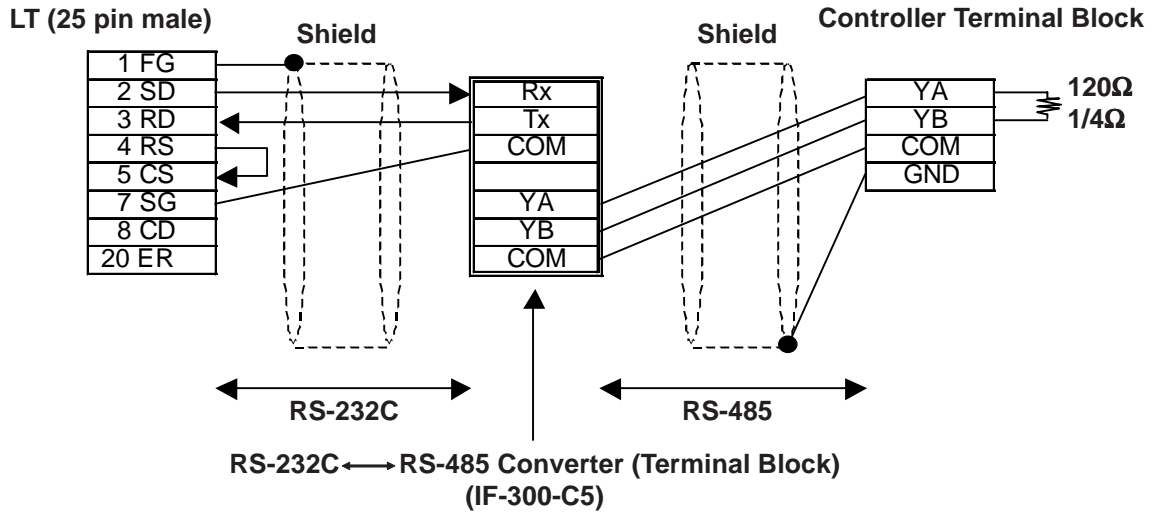
Cable Diagram 1



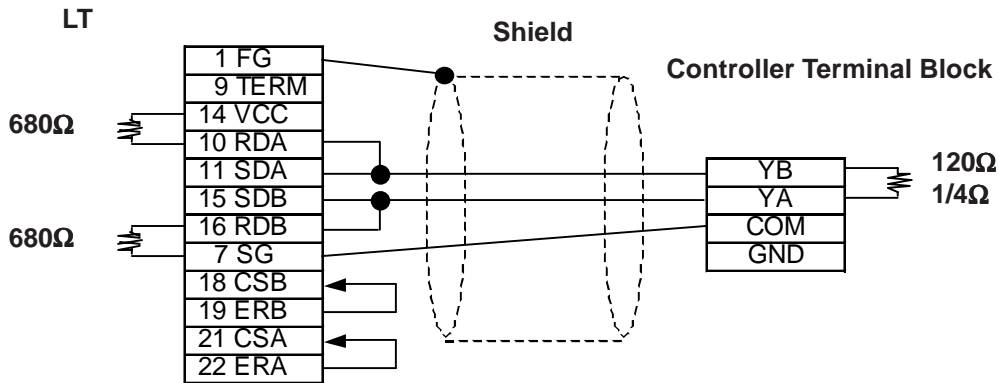
Cable Diagram 2

There are two ways of connecting the LT and the Controller. One is using the Shinko Technos' RS-232C ↔ RS-485 Converter (IF-300-C5). The other is using an RS-485 cable.

- When using Shinko Technos's RS-232C ↔ RS-485 Converter (IF-300-CS) When using this converter, be sure the LT's communication setting is "RS-232C". Do not use any other manufacturer's converter.



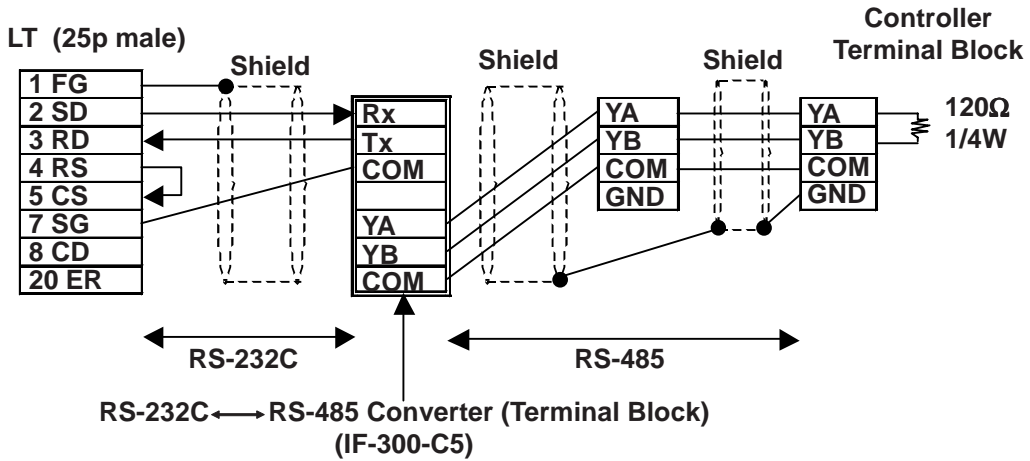
- When connecting the LT and the Controller via RS-485 cable



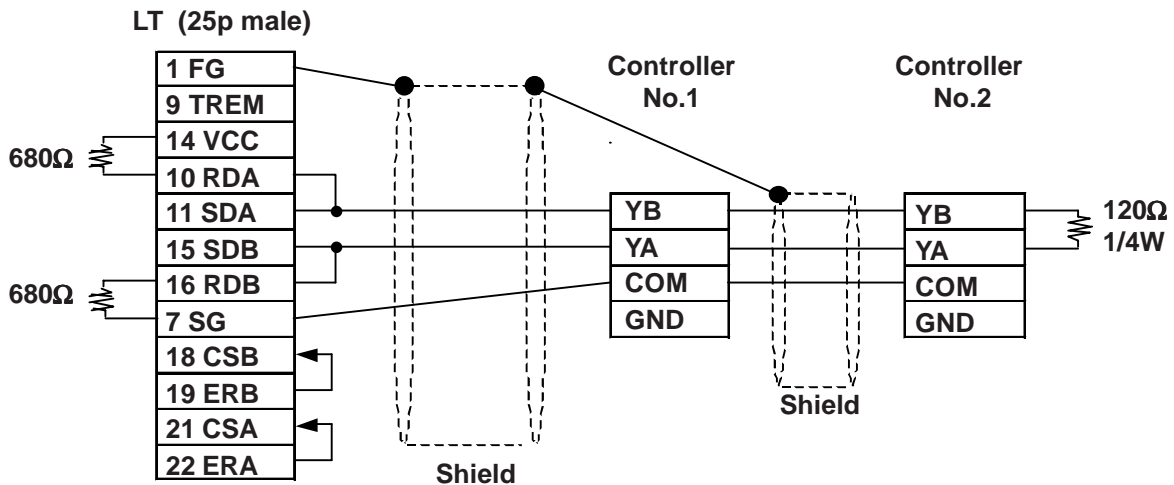
Cable Diagram 3

There are two ways of connecting the LT and the Controller. One is using the Shinko Technos' RS-232C ↔ RS-485 Converter (IF-300-C5). The other is using an RS-485 cable.

- When using Shinko Technos's RS-232C ↔ RS-485 Converter (IF-300-C5)
When using this converter, be sure the LT's communication setting is "RS-232C". Do not use any other manufacturer's converter.

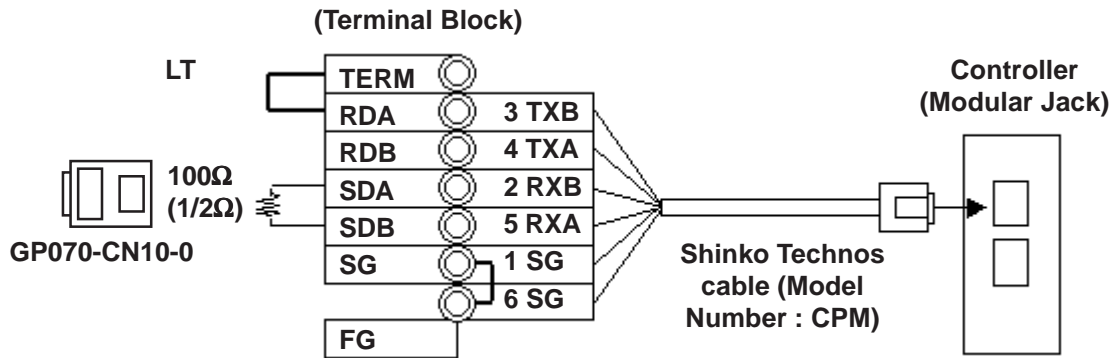


- When connecting the LT and the Controller via an RS-485 cable



Cable Diagram 4 (RS-422)

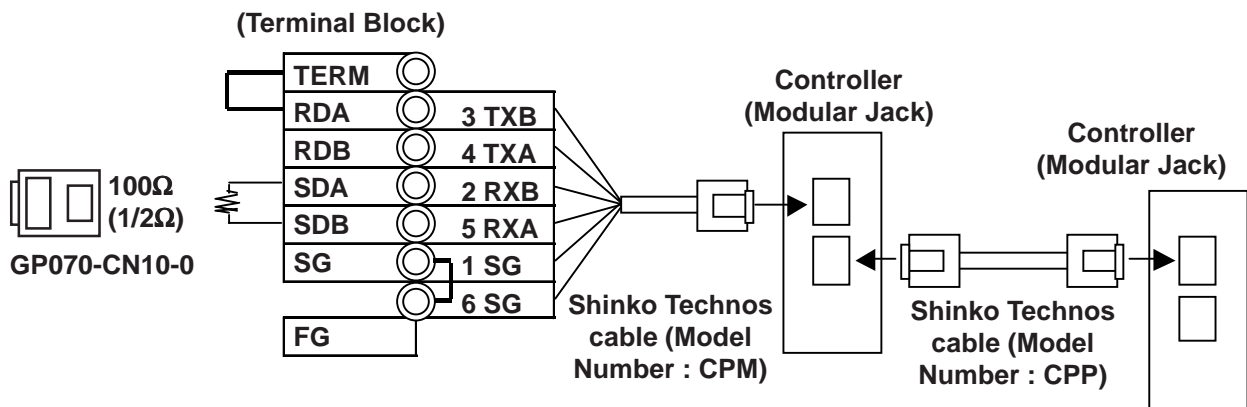
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



Note: Be sure to use only the Shinko Technos Corporation “CPM” cable.

Cable Diagram 5 (RS-422)

- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- Note:**
- Be sure to use only the Shinko Technos Corporation “CPM” and “CPP” cables.
 - Be aware that the A and B signals of the LT and External Device are reversed.
 - To enable the Controller’s termination resistance, turn dip switch No.2 ON.

2.6.3 Supported Devices

The following list shows the range of devices supported by the LT.

■ C Series

Device	Bit Addresses*1	Word Addresses*1	
Channel 1	1CH010 ~ 1CH84F	1CH01 ~ 1CH84	H/L
Channel 2	2CH010 ~ 2CH84F	2CH01 ~ 2CH84	
Channel 3	3CH010 ~ 3CH84F	3CH01 ~ 3CH84	
Channel 4	4CH010 ~ 4CH84F	4CH01 ~ 4CH84	
Channel 5	5CH010 ~ 5CH84F	5CH01 ~ 5CH84	
Channel 6	6CH010 ~ 6CH84F	6CH01 ~ 6CH84	
Channel 7	7CH010 ~ 7CH84F	7CH01 ~ 7CH84	
Channel 8	8CH010 ~ 8CH84F	8CH01 ~ 8CH84	
Channel 9	9CH010 ~ 9CH84F	9CH01 ~ 9CH84	
Channel 10	10CH010 ~ 10CH84F	10CH01 ~ 10CH84	
Channel 11	11CH010 ~ 11CH84F	11CH01 ~ 11CH84	
Channel 12	12CH010 ~ 12CH84F	12CH01 ~ 12CH84	
Channel 13	13CH010 ~ 13CH84F	13CH01 ~ 13CH84	
Channel 14	14CH010 ~ 14CH84F	14CH01 ~ 14CH84	
Channel 15	15CH010 ~ 15CH84F	15CH01 ~ 15CH84	
Channel 16	16CH010 ~ 16CH84F	16CH01 ~ 16CH84	
Channel 17	17CH010 ~ 17CH84F	17CH01 ~ 17CH84	
Channel 18	18CH010 ~ 18CH84F	18CH01 ~ 18CH84	
Channel 19	19CH010 ~ 19CH84F	19CH01 ~ 19CH84	
Channel 20	20CH010 ~ 20CH84F	20CH01 ~ 20CH84	

*1 Input all addresses in hexadecimal characters.



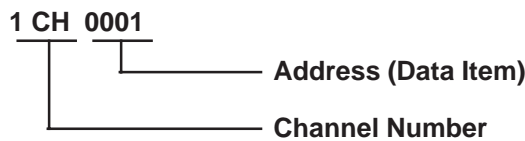
- The LT processes all Controller data items in the same way.
- Designating an address means that the data item number specifies the address.
- For information about data item types and numbers, refer to the Multi Point Temperature Control Unit C Series Guide “Communication Command List”, made by Shinko Technos Corporation.

The following data item list is mentioned in the C Series communication guide for each channel. The C Series supports up to 20 channels.

Command Type	Data Item	Data
20H/50H	0001H : Main setting value (SV) setting	Setting Value
20H/50H	0002H : Main proportional band setting	Setting Value
20H/50H	0003H : Integral time setting	Setting Value
20H/50H	0004H : Derivative time setting	Setting Value
:	:	:

The item Nos. here are the LT addresses.
 20H:Read command can be performed.
 50H:Write command can be performed.

- When the channel 1 data item is “the setting of main setting value (SV)”, the item No. is “0001H”, and the LT’s address is the following:



- The channel 1 data item “the integrated time setting”, has an item number of “0003H”, and the LT address is “1CH0003”.
- The channel 2 data item “the integrated time setting” has an item number of “0003H”, and the LT address is “2CH0003”.
- When the command type is 20H, data read can be performed. When it is 50H, data write can be performed. (20H/50H are used to perform read and write.)

■ FC Series

Device	Bit Addresses*1	Word Addresses*1	
Data Item	00010 ~ 0086F	0001 ~ 0086	H/L
Setting Value Memory 1	1S010 ~ 1S86F	1S01 ~ 1S86	
Setting Value Memory 2	2S010 ~ 2S86F	2S01 ~ 2S86	
Setting Value Memory 3	3S010 ~ 3S86F	3S01 ~ 3S86	
Setting Value Memory 4	4S010 ~ 4S86F	4S01 ~ 4S86	
Setting Value Memory 5	5S010 ~ 5S86F	5S01 ~ 5S86	
Setting Value Memory 6	6S010 ~ 6S86F	6S01 ~ 6S86	
Setting Value Memory 7	7S010 ~ 7S86F	7S01 ~ 7S86	

*1 Input all addresses in hexadecimal characters.



- The LT processes all Controller data items in the same way.
- Designating an address means that the data item number specifies the address.
- For information about data item types and numbers, refer to the FC Series Communication (Option : C,C5) Guide “Communication Command List”, made by Shinko Technos Corporation.

The following data item list is mentioned in the FC Series communication guide for each channel. When the command type is 20H, data read can be performed. When it is 50H, data write can be performed. (20H/50H are used to perform read and write.)

Contents	Sub Addresses	Command Classification	Data Items
Main setting value or step temperature setting value	1 to 7	20H/50H	0001H
Setting value memory number or step number selection	0	20H/50H	0002H
PID auto-tuning Performance / Cancellation	0	20H/50H	0003H
Proportional band setting	1 to 7	20H/50H	0004H
:	:	:	:

Sub Addresses (Setting Memory No.)

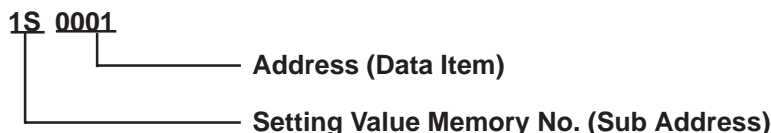
The item No. here is the LT addresses

When using the FC Series, the sub addresses must be selected. Here, “sub addresses” mean “the setting value memory No.”. For example, “sub address 1” means “setting value memory No.1”. The data items that the sub addresses need to be set to, therefore, specify the device of “setting value memory *”.

Data items with the sub addresses that do not need to be set (when the sub address is 0), can specify only the number of data items.

Ex. Data items with the sub addresses that do not need to be set.

When setting value memory No.1, LT address data items (the main setting value, “step temperature setting value”) are as follows:



Ex. Data items with the sub addresses that do not need to be set.
 LT address data items (the setting value memory number selection, “step numbers”) are as follows:



■ FIR/GC/FCL Series

Device	Bit Addresses*1	Word Addresses*1	
Data Item	00010 ~ 00A3F	0001 ~ 00A3	H/L

*1 Input all addresses in hexadecimal characters.

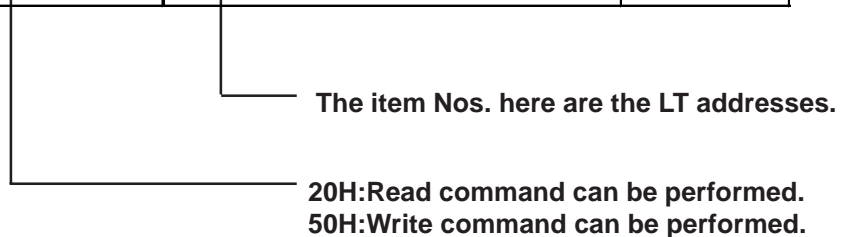


- The LT processes all Controller data items in the same way.
- Designating an address means that the data item number specifies the address.
- For information about data item types and numbers, refer to the FIR-201-M Communication Guide “Communication Command List”, GCS-300 Communication Guide “Communication Command List”, and FCL-13A Communication Guide “Communication Command List”, made by Shinko Technos Corporation.

The following data item list is mentioned in the FIR Series communication guide for each channel. When the command type is 20H, data read can be performed. When it is 50H, data write can be performed.

(20H/50H allow read and write to be performed.)

Command Type	Data Item	Data
20H/50H	0001H : Alarm 1 (A1) Setting	Setting Value
20H/50H	0002H : Alarm 2 (A2) Setting	Setting Value
20H/50H	0003H : Alarm 3 (A3) Setting	Setting Value
20H/50H	0004H : Setting Value Lock Designation	Setting Value
:	:	:



- For the data item “Alarm 1 (A1) Setting”, the item number is 0001H. As a result, the LT address is as follows:



- For the data item “Alarm 2 (A2) Setting”, the item number is 0002H. As a result, the LT address is “0002”.

■ PC-900 Series

Device	Bit Addresses	Word Addresses	Remarks
Data Items	00010 ~ 0400F	0001 ~ 0400	*2 H/L
	04010 ~ 0800F	0401 ~ 0800	
	08010 ~ 0C00F	0801 ~ 0C00	
	0C010 ~ 1000F	0C01 ~ 1000	
	10010 ~ 1400F	1001 ~ 1400	
	14010 ~ 1800F	1401 ~ 1800	
	18010 ~ 1C00F	1801 ~ 1C00	
	1C010 ~ 2000C	1C01 ~ 2000	
	20010 ~ 2400F	2001 ~ 2400	
	24010 ~ 2800F	2401 ~ 2800	
	28010 ~ 2C00F	2801 ~ 2C00	
	2C010 ~ 3000F	2C01 ~ 3000	
	30010 ~ 3400F	3001 ~ 3400	
	34010 ~ 3800F	3401 ~ 3800	
	38010 ~ 3C00F	3801 ~ 3C00	
	3C010 ~ 4000F	3C01 ~ 4000	
	40010 ~ 4400F	4001 ~ 4400	
	44010 ~ 4800F	4401 ~ 4800	
	48010 ~ 4C00F	4801 ~ 4C00	
	4C010 ~ 5000F	4C01 ~ 5000	
	50010 ~ 5400F	5001 ~ 5400	
	54010 ~ 5800F	5401 ~ 5800	
	58010 ~ 5C00F	5801 ~ 5C00	
	5C010 ~ 6000C	5C01 ~ 6000	
	60010 ~ 6400F	6001 ~ 6400	
	64010 ~ 6800F	6401 ~ 6800	
	68010 ~ 6C00F	6801 ~ 6C00	
	6C010 ~ 7000C	6C01 ~ 7000	
	70010 ~ 7400F	7001 ~ 7400	
	74010 ~ 7800F	7401 ~ 7800	
78010 ~ 7C00F	7801 ~ 7C00		
7C010 ~ 7991F	7C01 ~ 7991		

*1 Input all addresses in hexadecimal characters.

*2 The data items are internally processed, with each “block” being divided into 1024 words (0x400). Therefore, be aware of that the following functions cannot be used with settings that cross a block (1024 words). Be sure to set the data items within one block when using this type of unit.

- 1) Alarm setting
(alarms will not displayed)



- The LT processes all Controller data items in the same way.
- Designating an address means that the data item number specifies the address.
- For information about data item types and numbers, refer to the PC-935, PC-955 communication (option : C, C5, SVTC) guide “Communication Command List”, made by Shinko Technos Corporation.

The following data item list is mentioned in the PC-900 Series communication guide for each channel. When the command type is 20H, data read can be performed. When it is 50H, data write can be performed.

(20H/50H are used to perform read and write.)

Command Classification	Data Item	Data
20H/50H	0001H : Fixed value control / Main setting value setting	Setting Value
20H/50H	0002H : Fixed value control / Control output (OUT 1) proportional band setting	Setting Value
20H/50H	0003H : Fixed value control / Integral time setting	Setting Value
20H/50H	0004H : Fixed value control / Derivative time setting	Setting Value
:	:	:

The item Nos. here are the LT addresses.

20H:Read command can be performed.
50H:Write command can be performed.

For data item “The setting of the main setting value (SV) for the stationary position control”, the item number is 0001H. As a result, the LT address is as follows.

0002

Address (Data Item)

For data item “The setting of the integrated time for the stationary position control”, the item number is 0003H. As a result, the LT address is “0003”.

For data item details, refer to the following Shinko Technos Corporation communication guides.

Series	Models	Guides
C	CPT-20A	Multi-Point Temperature Control Unit C Series Guide
FC	FCD-130	FC Series Communication (Option:C,C5) Guide
	FCD-150	
	FCR-130	
	FCR-150	
	FCS-200	
FIR	FIR-200	FIR Communication Guide
GC	GCS-300	GCS Communication Guide
FCL	FCL-100	FCL Communication Guide
PC-900	PC-935	PC-935, PC-955 Communication (Option:C,C5,SVTC) Guide
	PC-955	



- Note:** • When the data item's setting value uses a decimal point items, the LT displays a value 10 times larger than the setting value. Also, when writing, be sure to write a value 10 times larger than the setting value.

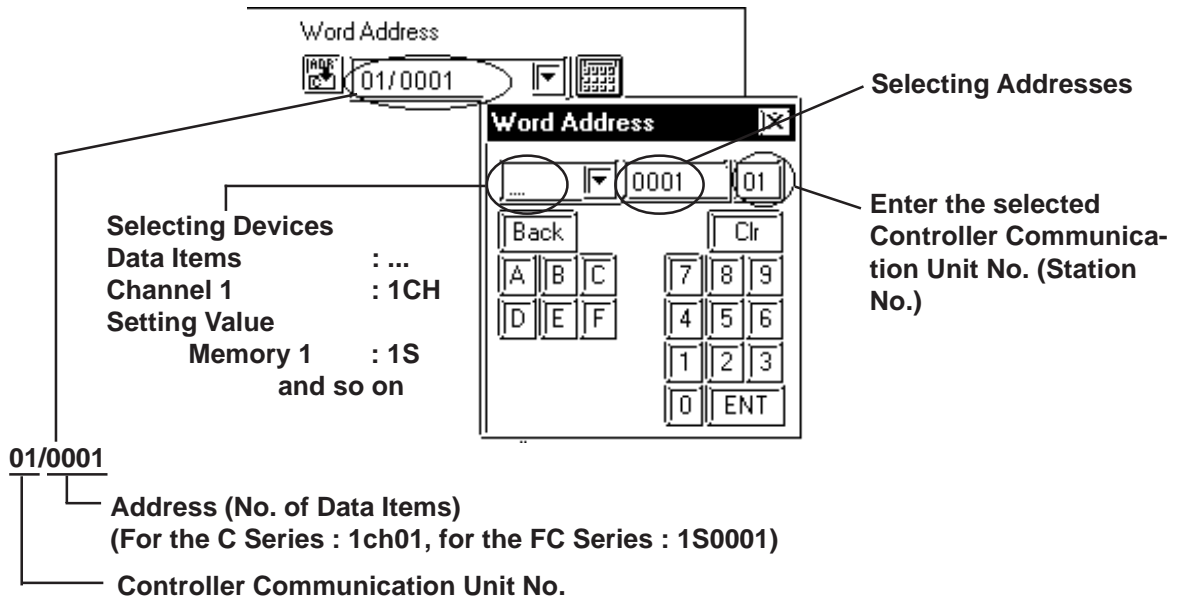
Ex. In case of the PC-900 Series' control output (OUT1) proportional zone

Indication of Controllers / Setting Value : 2.5%

Indication of the LT : 25

Also, refer to each model's communication guide for details (with/without a decimal point) about data item setting value ranges.

- When setting parts in LT Editor, the Controller communication unit No. can be specified during address input. If a communication unit No. is not indicated, the previously entered communication unit No. is automatically used. (The default value is 1.)



Do not use the system area because the LT's system area (LS0 to LS19) cannot be allocated to the Controller area. (Do not select all the system area.) The Controller's read area can be used as normal.

2.6.4 Environment Setup

The following table lists the recommended Controller and LT communication settings.

■ C Series

LT Settings		Controller Settings	
Baud Rate	9600 bps	Baud Rate	9600 bps
Data Length	7 bits	-----	-----
Stop Bit	1 bit	-----	-----
Parity Bit	Even	-----	-----
Data Flow control	ER	-----	-----
Communication Format	4 Wires	-----	-----
Unit No.	1	Unit No. ^{*1}	1

**1 It is possible to set a Controller communication unit No. from 0 to 15, however, the LT can only be set from 1 to 15.*

■ FC/FIR/GC/FCL/PC-900 Series

LT Settings		Controller Settings	
Baud Rate	9600 bps	Baud Rate	9600 bps
Data Length	7 bits	-----	-----
Stop Bit	1 bit	-----	-----
Parity Bit	Even	-----	-----
Data Flow control	ER	-----	-----
Communication Format (using RS-232C)	RS-232C	Communication Format ^{*1}	Serial Communication
Communication Format (using RS-422)	2 wire type	Communication Format ^{*1}	Serial Communication
Unit No.	1	Unit No. ^{*2}	1

**1 PC-900 series only*

**2 It is possible to set a Controller communication unit No. from 0 to 95, however, the LT can only be set from 1 to 32.*

2.6.5 Error Code

Controller error codes are represented by the “Host communication error (02:**:##)”, and indicated in the left lower corner of the LT screen.

Error Codes	Meaning
01	Command does not exist
03	Exceeds setting value range
04	Unable to set (during AT execution)
05	Keyoperation has activated Setting Mode

For more details about the error codes, see

Reference *“The Controller Manual : Communication Guide for each series made by Shinko Technos Corporation”*






2.7 Fuji Electronic Corporation Controllers

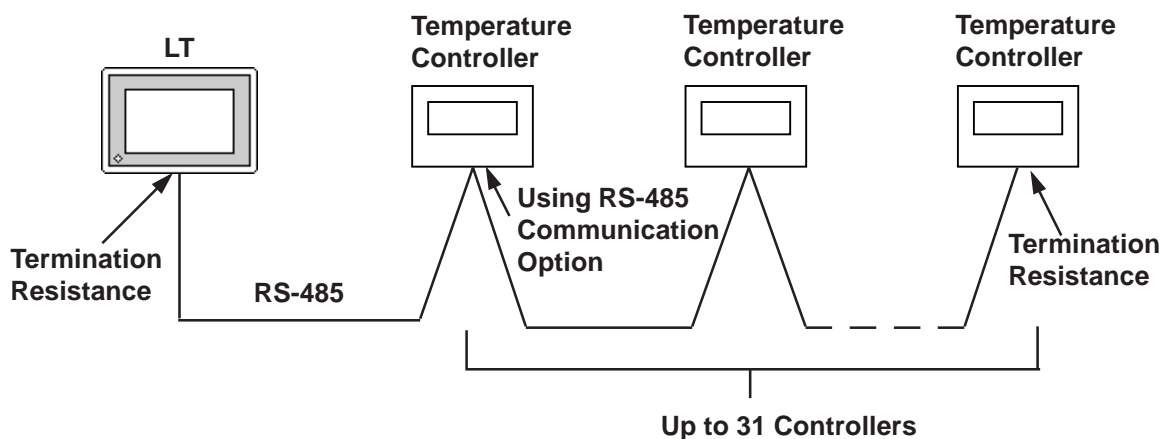
2.7.1 System Structure

The following describes the system configuration used when connecting the LT to this Controller.

■ Micro-Controller X Series (Model:PXR)

Controller *1	Cable Diagram	Unit Type
		
PXR4□□□□-□□M00 PXR4□□□□-□□V00	RS-422 <Cable diagram 1>	LT Type C
	RS-422 (1:n) <Cable diagram 2>	

*1 The Controller's model number "□" will change, according to the options selected. For model number details, refer to the PXR4 Series catalog. When connecting the Controller to an LT, the RS-485 (MODBUS) option "M00" or "V00" is required.



2.7.2 Cable Diagrams

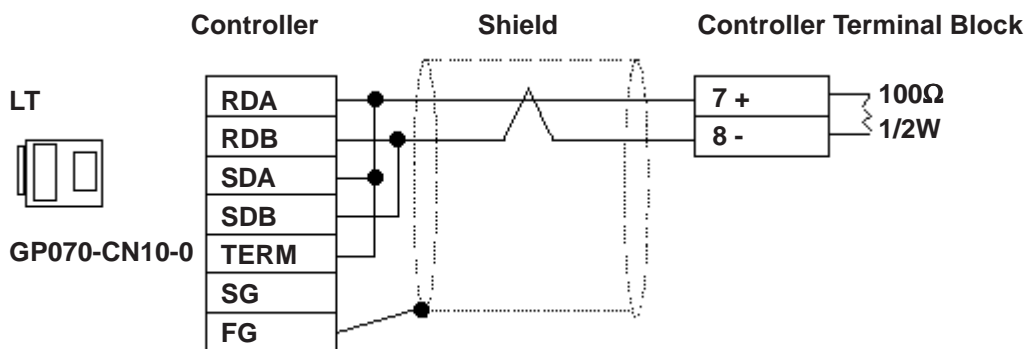
The cable diagrams shown below and the cable diagrams recommended by Fuji Electric Co., Ltd. differ, however, using these cables for your Controller's operations will not cause any problems.



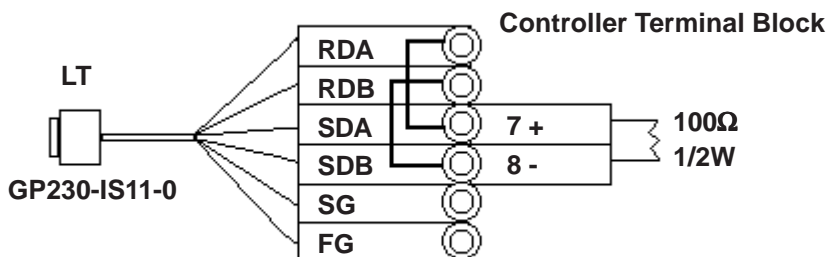
- **Ground your External Device's FG terminal according to your country's applicable standard.**
- **All RS-422 cables must be 500 meters long or less.**

■ Cable Diagram 1 (1:1) RS-422(2-wire type)

- Using Digital's RS-422 connector terminal adapter GP070-CN10-0



- Using Digital's RS-422 Cable GP230-IS11-0

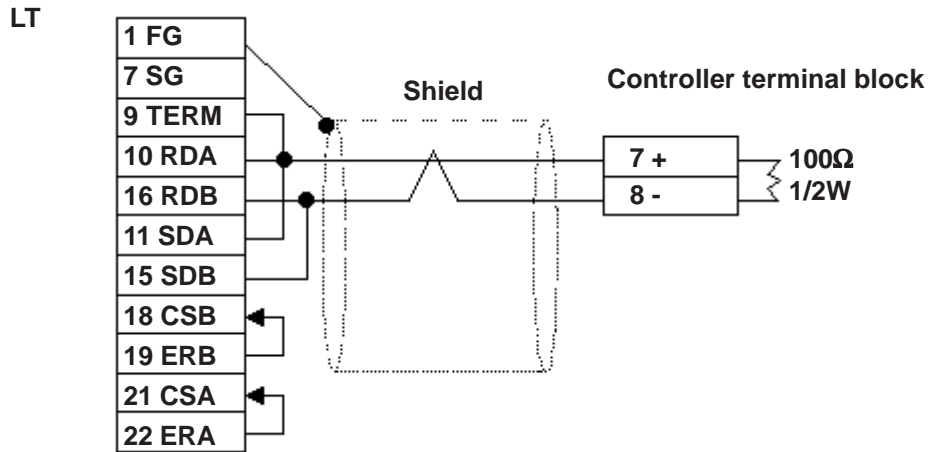


Be sure that RDA - SDA and RDB - SDB are both connected to the Controller terminal block.



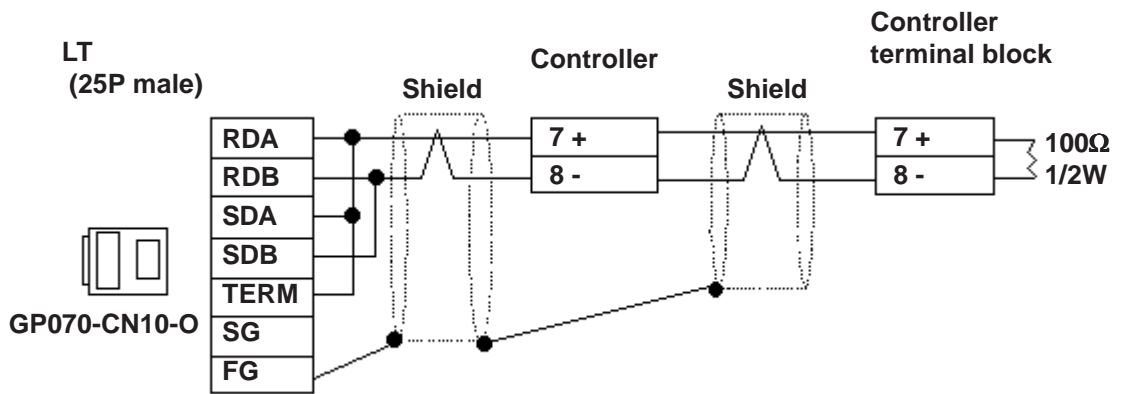
Since the SG and FG lines cannot be connected to the controller terminal block, be sure to cover them with insulating tape.

- When making your own cables

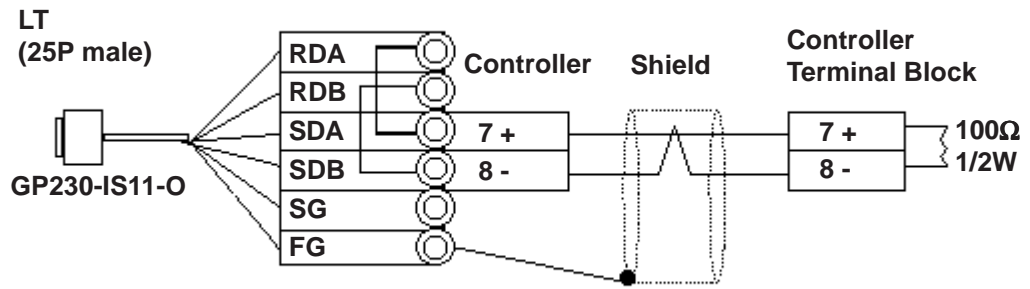


■ Cable Diagram 2 (1:n) RS-422

- Using Digital's RS-422 connector terminal adapter GP070-CN10-0



- Using Digital's RS-422 cable, GP230-IS11-0



Note:

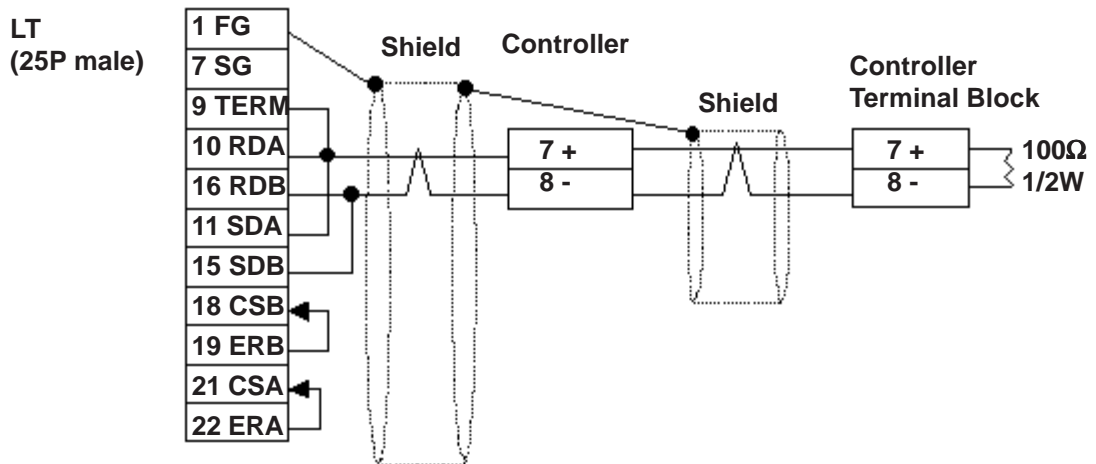
Be sure that RDA - SDA and RDB - SDB are both connected to the Controller terminal block.



important

Since the SG line cannot be connected to the controller terminal block, be sure to cover them with insulating tape.

- When making your own cable connections



2.7.3 Supported Devices

The following list shows the range of devices supported by the LT.

Micro-Controller X Series (Model:PXR)

Device	Bit Address	Word Address	Comments
Parameter	00001	_____	*1
	10001 ~ 10016	10001	*2
	3000100 ~ 3001515	30001 ~ 30015	Internal Calculation Value *2
	4000100 ~ 4011315	40001 ~ 40113	Internal Calculation Value *1
	3100100 ~ 3101515	31001 ~ 31015	Engineering Unit *2
	4100100 ~ 4111315	41001 ~ 41113	Engineering Unit *1

*1 Addresses 00001, 40001 and 41001 are used to store write commands (FIX Processing) in non-volatile memory. The non-volatile memory's write is performed via the writing of "Write Value 1". FIX processing lasts approximately 5 seconds. The Display Communication cannot be performed for 5 seconds if there are any Read-out function setting on the same screen.

Reference Instruction Manual for Fuji Electric Corporation's MICRO CONTROLLER X COMMUNICATION FUNCTION (RS-485 MODBUS), "FIX Processing"



During the writing of data to non-volatile memory, do not turn off the Controller's power. If the Controller's power is cut, the data in non-volatile memory will be destroyed, thereby disabling the Controller.

*2 Data write is not possible.



- Note:**
- In the LT, the Controller's parameters are set via the Coil No. and Register No. For each Coil No. (00001~, 10001~) the last digit is recognized as the device. For Register No.s (30001~, 40001~, 31001~, 41001~) the last two digits are recognized as the device.
 - For information about data item types and numbers, refer to the Instruction Manual for Fuji Electric Co., Ltd.'s MICRO CONTROLLER X COMMUNICATION FUNCTION (RS-485 MODBUS), "CHAPTER 7 ADDRESS MAP AND DATA FORMAT"
 - The LT supports two types of Address Maps, the "Engineering Unit Address Map" and the "Internal Calculation Value Address Map".

The following data shows the memory maps for each parameter.

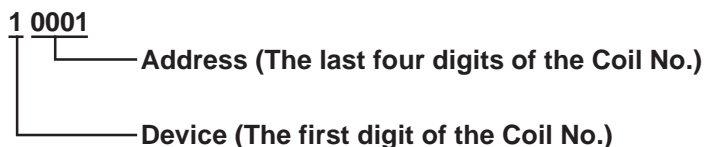
- When using Bit Data

Bit Data (Read Only) : Function [02H]

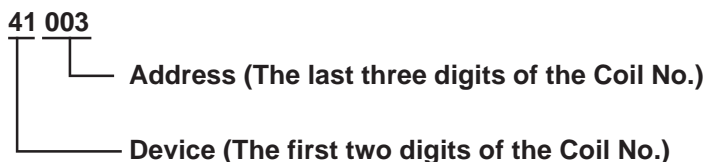
Relative Address	Coil No.	Type	Memory Contents	Read-out Data
0000H	10001	Bit	Alarm1 ON/OFF	0:Alarm1 OFF, 1:Alarm1 ON
0001H	10002		(Reserved)	
0002H	10003		(Reserved)	
0003H	10004		(Reserved)	
0004H	10005	Bit	Alarm2 ON/OFF	0:Alarm2 OFF, 1:Alarm2 ON
0005H	10006		(Reserved)	
:	:	:	:	:

The item Nos. here are the LT addresses.

Ex. For the parameter “Alarm1 ON/OFF” of Coil No. 10001, the LT’s designated address is as follows. Use the first digit of the Coil No. (00001~, 10001~) to designate the device.



Ex. For the parameter “front surface control SV data” of Register No. 41003, the LT’s designated address is as follows. Use the first two digits of the Register No.s 30001~, 40001~, 31001~ and 41001~ to designate the device.



Note: The Controller’s parameter data, when data transfer is performed, will have no decimal places. Thus, in the LT, processing must be performed to correct the data. For example, if a numeric display is used that includes decimal places, the “Data Type” and “No. of Decimals” settings must be used. Also, when writing data to a Controller, it is necessary to write decimal values as integers.

Ex. Register No. 41025’s “Output 1 Lower Limit”

Controller Display/Setting Value : 3.00%

LT value/setting : 300

Reference Also, refer to “Instruction Manual for Fuji Electric Co., Ltd.’s MICRO CONTROLLER X COMMUNICATION FUNCTIONS (RS-485 MODBUS)” for details (with/without a decimal point) about data item setting value ranges.



Note:

When setting parts in LT Editor, the Controller communication unit No. can be specified during address input. If a communication unit No. is not indicated, the previously entered communication unit No. is automatically used. (The default value is 1)

01/10001

Address (Parameter No.)

Controller's Station No.

Word Address

01/10001

Constant

0

Function

- Word Set
- Add/Sub
- Digit(ADD)
- Digit(SUB)

Word Address

1 0001 01

Back Clr

A	B	C	7	8	9
D	E	F	4	5	6
			1	2	3
			0	ENT	

Enter the desired Controller Unit No.



Important

The LT's system area (LS0 to LS19) cannot be allocated for the Controller and should not be used. (De-select all system area selection.) The Controller's read area can be used as normal.

2.7.4 Environment Setup

The following table lists the recommended Controller and LT communication settings.

■ Micro-Controller X Series (Model:PXR)

LT Settings		Controller Settings	
Baud Rate	9600 bps (Fixed)	-----	-----
Data Length	8 bits (Fixed)	-----	-----
Stop Bit	1 bit (Fixed)	-----	-----
Parity Bit	Odd	Parity Settings (CoM)	0 : Odd
Data Flow control	ER	-----	-----
Communication Format (using RS-422)	2-wire type	-----	-----
Unit No. ^{*1}	1	Unit Station No. (Stno)	1

**1 It is possible to set a Controller communication unit No. from 0 to 255, however, the LT can only be set from 1 to 32. Zero cannot be used because it means "Communication function stop". The Read-in area can be used in the Controller that has set the Unit No. here.*

2.7.5 Error Code

Controller error codes are displayed by the “Host Communication Error (02:**:##)”, and indicated in the left lower corner of the LT screen ** indicates the Controller’s error code, and ## indicates the number of the Controller unit. However, when “the PLC is not correctly connected (02:FF)”, the unit number will not be shown.

Error Code	Meaning
01	Illegal function
02	Illegal data address
03	Illegal data value

For more details about error codes, see

Reference *Instruction Manual for Fuji Electric Co., Ltd.’s MICRO CONTROLLER X COMMUNICATION FUNCTION (RS485 MODBUS)*



2.8 Toho Electronics Inc. Controllers

2.8.1 System Structure

The following describes the system configuration used when connecting the LT to this Controller.



Important

- After the Controller's power is turned ON, no communication is performed for about four seconds. As a result, note that it may take several seconds to start communication when the LT and the Controller are turned ON at the same time.
- When a save request command is sent to the Controller (STR write command), it can take up to six seconds for the controller to respond. At this time, note that the communication speed may slow significantly, which is indicated by the slowing of the update frequency of the LT display, as the LT enters the standby state.

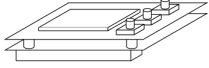


■ TTM-004/X04

Temperature Controller	Cable Diagram	Unit Type
TTM-004-□-A□□□ TTM-X04-□-□□□□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	

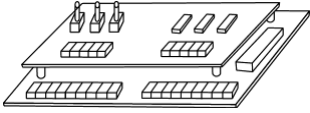


■ TTM-00B

Temperature Controller	Cable Diagram	Unit Type
TTM-00B-□-□□□□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	




■ **TTM-10L**

Temperature Controller	Cable Diagram	Unit Type
		
TTM-10L-□-□-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-232C <Cable diagram 2>	
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	

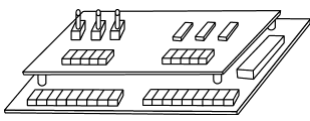


■ **TTM-100B**

Temperature Controller	Cable Diagram	Unit Type
		
TTM-100B4-□ □-□ □ □ □-□ □ □ TTM-100B8-□ □-□ □ □ □ □-□ □ □	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	




■ **TTM-110 Series**

Temperature Controller	Cable Diagram	Unit Type
		
TTM-114-□-□ □-□ □ □ □ □ □ □-□ TTM-115-□-□ □-□ □ □ □ □ □ □ □-□ TTM-117-□-□ □-□ □ □ □ □ □ □ □-□ TTM-119-□-□ □-□ □ □ □ □ □ □ □-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	




■ TTM-110B Series

Temperature Controller	Cable Diagram	Unit Type
		
TTM-110B-□-□ □-□□□□□□-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	

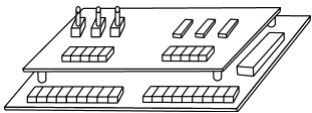


■ TTM-120 Series

Temperature Controller	Cable Diagram	Unit Type
		
TTM-124-□-□ □-□□□□□□-□ TTM-125-□-□ □-□□□□□□-□ TTM-127-□-□ □-□□□□□□-□ TTM-129-□-□ □-□□□□□□-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	



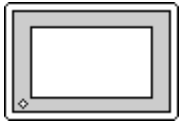
■ TTM-300 Series

Temperature Controller	Cable Diagram	Unit Type
		
TTM-304-□-□N-□□□□-□ TTM-305-□-□N-□□□□-□ TTM-309-□-□N-□□□□-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	

■ TTM-300B

Temperature Controller	Cable Diagram	Unit Type
		
TTM-300B-□-□N-□□□□-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	

■ TTM-1020 Series

Temperature Controller	Cable Diagram	Unit Type
		
TTM-1520-□ □-□ □-□□□□-□ TTM-1521-□ □-□ □-□□□□-□ TTM-1522-□ □-□ □-□□□□-□ TTM-1523-□ □-□ □-□□□□-□ TTM-1524-□ □-□ □-□□□□-□ TTM-1525-□ □-□ □-□□□□-□ TTM-1920-□ □-□ □-□□□□-□ TTM-1921-□ □-□ □-□□□□-□ TTM-1922-□ □-□ □-□□□□-□ TTM-1923-□ □-□ □-□□□□-□ TTM-1924-□ □-□ □-□□□□-□ TTM-1925-□ □-□ □-□□□□-□	RS-422 (2-wire type) <Cable diagram 1>	LT Type C
	RS-422 (2-wire type, 1:n) <Cable diagram 3>	

2.8.2 Cable Diagrams

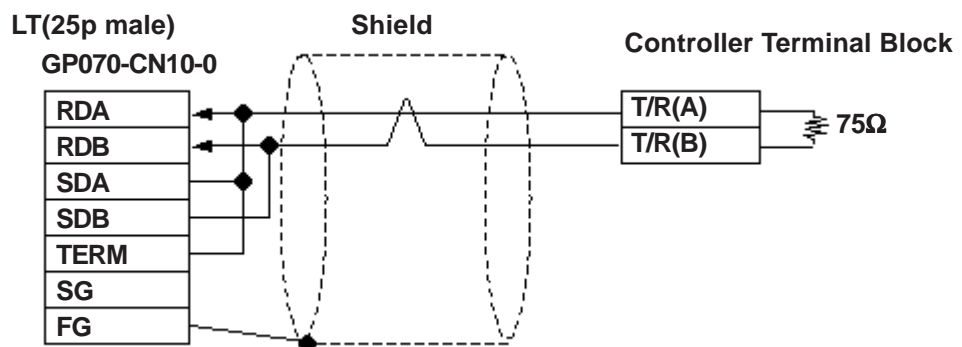
The cable diagrams shown below and the cable diagrams recommended by Toho Electronics Inc. may differ, however, using these cables for your Controller's operations will not cause any problems.



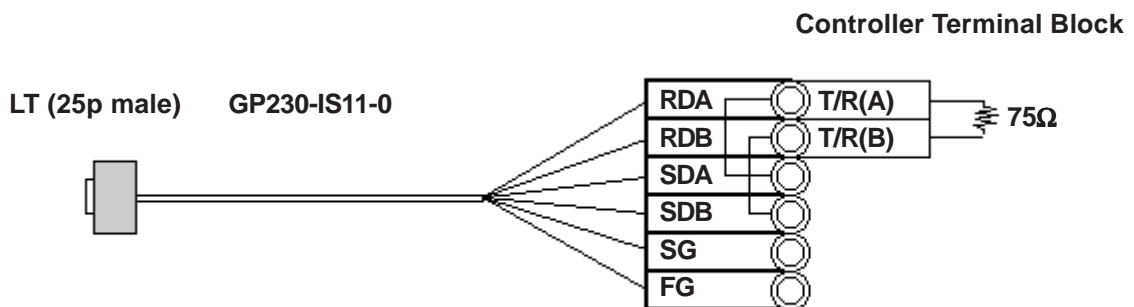
- **RS-422 connector terminal numbers will differ depending on the controller model. Prior to performing wiring, refer to your controller's User Manual.**
- **When using RS-232C format, all cables must be 15 meters or less. With RS-422 format, all cables must be 50 meters long or less.**

■ **Cable Diagram 1 (1:1) RS-422 (2-wire type)**

- Using Digital's RS-422 connector terminal adapter GP070-CN10-0



- Using Digital's RS-422 Cable GP230-IS11-0

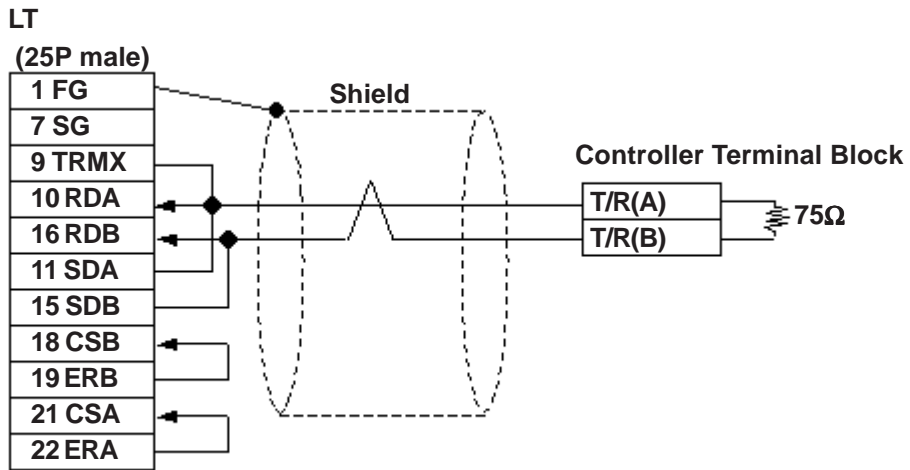


Be sure that RDA - SDA and RDB - SDB are both connected to the Controller terminal block.



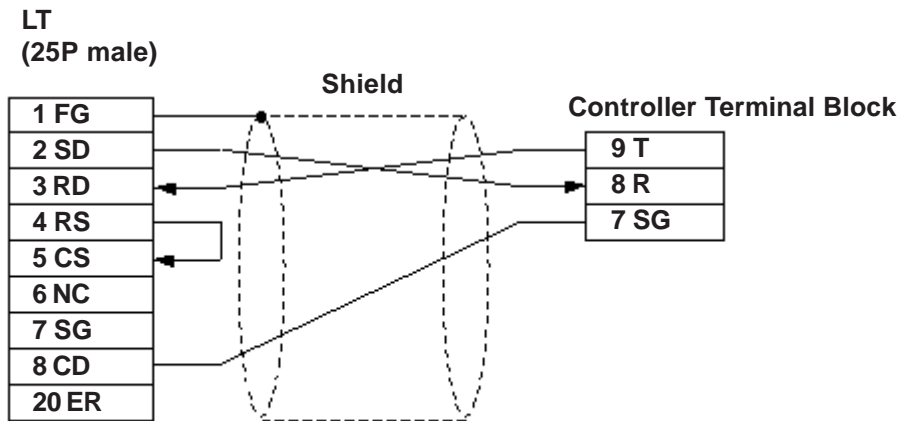
Since the SG and FG lines cannot be connected to the controller terminal block, be sure to cover them with insulating tape.

- When making your own cables



Note: When connecting the No.9 pin and No.10 pin in the LT Serial I/F, a termination resistance of 100Ω is added between RDA and RDB.

■ Cable Diagram 2 RS-232C



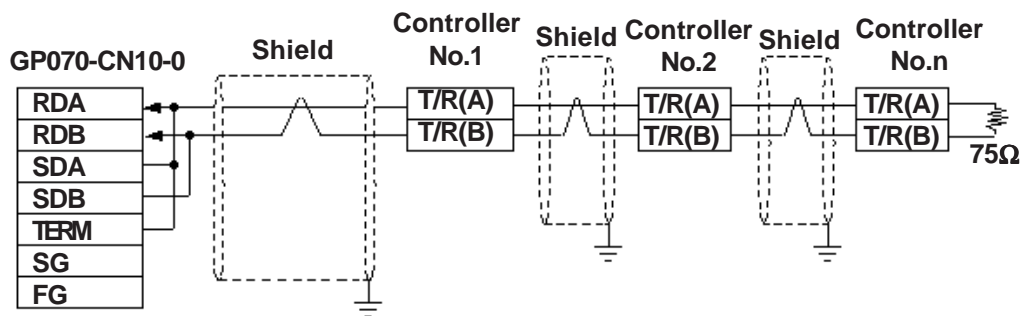
■ Cable Diagram 3 (1:n) RS-422



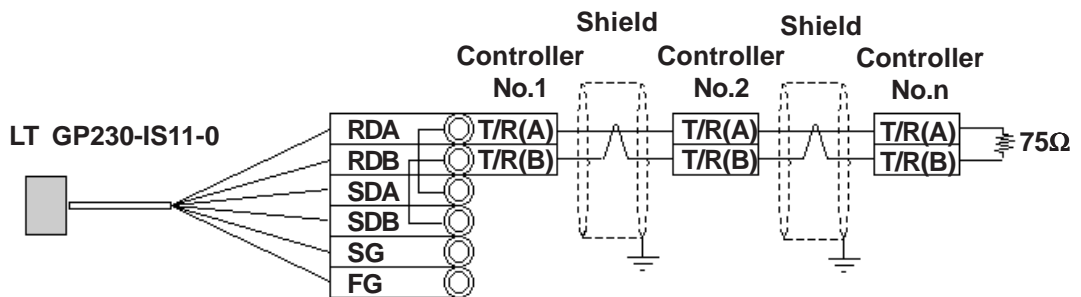
Ground a shielded cable in accordance with the electrical requirements of your system, using one of the following three methods.

- (1) **Distributed grounding (as shown below)**
- (2) **Parallel grounding, or**
- (3) **Serial grounding.**

- Using Digital's RS-422 connector terminal adapter GP070-CN10-0



- Using Digital's RS-422 cable, GP230-IS11-0

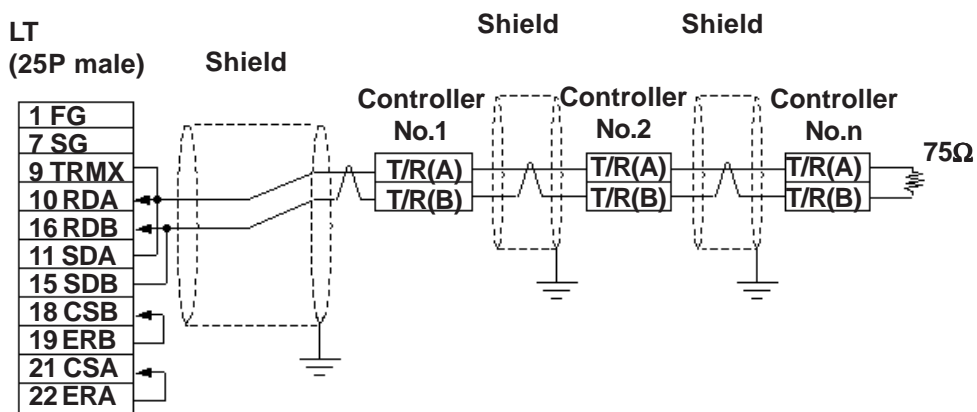


Note: Be sure that RDA - SDA and RDB - SDB are both connected to the Controller terminal block.



Since the SG and FG lines cannot be connected to the controller terminal block, be sure to cover them with insulating tape.

- When making your own cable connections



Note: When connecting the No.9 pin and No.10 pin in the LT Serial I/F, a termination resistance of 100W is added between RDA and RDB.

2.8.3 Supported Devices

The following list shows the range of devices supported by the LT.



- **The Controller identifiers "1" and "2" (refer to your Controller's User Manual) are assigned to predefined addresses and devices. As a result, when you enter devices on the LT Editor, do so as shown below.**

Device Selection
(Select from 00_, 10_, 100_,
110_, 120_, 300_ or 1020_)

Address Selection
(Refer to Supported
Devices List on
following pages.)

Enter the Controller's
Communication Unit No.
(Station No.)

- **Each identifier has read and write limitations detailed information, refer to your Controller's Instruction Manual. For details about precautions when using identifier "2" with LT Editor, refer to TTM-300 Series Supported Device's *1 or *2.**
- **When using a LT and a Controller, no area is available for assigning the LT's System Area (LS0 to LS19) in the LT. Therefore, DO NOT use the System Area (deselect the System Area for all devices). You can use the Read Area as usual.**
- **When you save data to your Controller's EEPROM (send a Save request), write it in the device address corresponding to symbol STR or identifier STR. For the TTM-300 series, this procedure is not needed since it saves data directly to the EEPROM.**
- **When saving data to the EEPROM, write the data to the device address that corresponds to your Controller's STR identifier.**
- **In the Read Area, only the devices "00_", "10_", "100_", "110_", "120_", "300_" and "1020_" can be set. All other devices, "SSV", "END", "STI", "SOK", "SWZ", "SWT", "SON", "SOF", "SRN" and "SEO" cannot be used.**



- Depending on the Controller's setting conditions, the LT's pre-set setting values may be used. Refer to the table as shown below.

Model	Address	Identifier	Controller Condition	Decimal marked values using on LT (Hex)
TTM-004/X04/00B (00_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
	2 ~ 10	PR1 ~ PR9	When an arbitrary identifier has been assigned to the priority screen. (When the display of PR1 to PR9 on the temperature controller is not OFF.)	0011 ~ 0077 ^{*1}
			In the case where no setting has been assigned to the priority screen. (When the display of PR1 to PR9 on the temperature controller is OFF.)	-32768(0x8000)
			In the case where the identifier COM has been assigned to the priority screen.	32767(0x7FFF) ^{*2}
			In the case where the identifier BPS has been assigned to the priority screen.	32766(0x7FFE) ^{*2}
			In the case where the identifier ADR has been assigned to the priority screen.	32765(0x7FFD) ^{*2}
			In the case where the identifier AWT has been assigned to the priority screen.	32764(0x7FFC) ^{*2}
In the case where the identifier MOD has been assigned to the priority screen.	32763(0x7FFB) ^{*2}			
TTM-10L (10_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
	22	□CJ	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
	23	PV2	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
TTM-100B (100_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
TTM-110/110B (110_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
TTM-120 (120_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
TTM-300/300B (300_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)
	4	□TI	When the Operation has finished	-32768(0x8000)
TTM-1020 (1020_)	0	PV1	Over Scale	32767(0x7FFF)
			Under Scale	-32768(0x8000)

*1 Addresses allocated to each identifier.

Reference 2.8.3 Supported Devices n TTM-004/X04/00B

*2 This identifier cannot be registered as the priority screen function setting (PR1 to PR9) via a LT Write command. To register this function, use the front panel of the temperature controller.

- This device cannot be used as a 32-bit device, since each identifier's addresses are not consecutive.

■ TTM-004/X04/00B

Device	Bit Address	Word Address	Controller Setting item	Identifiers	Others
00_	000000 ~ 000015	0000	Process value PV	PV1	
	000100 ~ 000115	0001	Setting value SV	SV1	
	000200 ~ 000215	0002	Priority display set 1	PR1	
	000300 ~ 000315	0003	Priority display set 2	PR2	
	000400 ~ 000415	0004	Priority display set 3	PR3	
	000500 ~ 000515	0005	Priority display set 4	PR4	
	000600 ~ 000615	0006	Priority display set 5	PR5	
	000700 ~ 000715	0007	Priority display set 6	PR6	
	000800 ~ 000815	0008	Priority display set 7	PR7	
	000900 ~ 000915	0009	Priority display set 8	PR8	
	001000 ~ 001015	0010	Priority display set 9	PR9	
	001100 ~ 001115	0011	Set/select of input	INP	
	001200 ~ 001215	0012	Gain for PV correction	PVG	
	001300 ~ 001315	0013	Zero point for PV correction	PVS	
	001400 ~ 001415	0014	Filter input	PDF	
	001500 ~ 001515	0015	Decimal position	<input type="checkbox"/> DP	
	001600 ~ 001615	0016	Function by FUNC Key	<input type="checkbox"/> FU	
	001700 ~ 001715	0017	Lock	LOC	
	001800 ~ 001815	0018	SV H limit	SLH	
	001900 ~ 001915	0019	SV L limit	SLL	
	002000 ~ 002015	0020	Control mode	<input type="checkbox"/> MD	
	002100 ~ 002115	0021	Control type	CNT	
	002200 ~ 002215	0022	Set/select of normal or reverse	DIR	
	002300 ~ 002315	0023	Output1, manipulated value	MV1	
	002400 ~ 002415	0024	Tuning type	TUN	
	002500 ~ 002515	0025	AT coefficient	ATG	
	002600 ~ 002615	0026	AT sensitivity	ATC	
	002700 ~ 002715	0027	Output 1, proportional band	<input type="checkbox"/> P1	
	002800 ~ 002815	0028	Integral time	<input type="checkbox"/> I1	
	002900 ~ 002915	0029	Derivative time	<input type="checkbox"/> D1	
	003000 ~ 003015	0030	Output 1, proportional cycle	<input type="checkbox"/> T1	
	003100 ~ 003115	0031	Anti reset wind-up	ARW	
	003200 ~ 003215	0032	Setting of H limit for Output 2 MV limiter	MH1	
	003300 ~ 003315	0033	Setting of L limit for Output 2 MV limiter	ML1	
	003400 ~ 003415	0034	Output 1, control sensitivity	<input type="checkbox"/> C1	
	003500 ~ 003515	0035	Output 1, OFF position	CP1	
	003600 ~ 003615	0036	Output 2, manipulated value	MV2	
	003700 ~ 003715	0037	Output 2, proportional band	<input type="checkbox"/> P2	
	003800 ~ 003815	0038	Output 2, proportional cycle	<input type="checkbox"/> T2	
	003900 ~ 003915	0039	Setting of H limit for Output 2 MV limiter	MH2	
	004000 ~ 004015	0040	Setting of L limit for Output 2 MV limiter	ML2	
	004100 ~ 004115	0041	Manual reset	PBB	
	004200 ~ 004215	0042	Output 2, control sensitivity	<input type="checkbox"/> C2	
	004300 ~ 004315	0043	Output 2, OFF position	CP2	
	004400 ~ 004415	0044	Dead band	<input type="checkbox"/> DB	
	004500 ~ 004515	0045	EV 1, function	E1F	
	004600 ~ 004615	0046	EV 1, H limit	E1H	
	004700 ~ 004715	0047	EV 1, L limit	E1L	
	004800 ~ 004815	0048	EV 1, sensitivity	E1C	
004900 ~ 004915	0049	EV 1, delay timer	E1T		

Device	Bit Address	Word Address	Controller Setting item	Identifier	other
00_	005000 ~ 005015	0050	Abnormal SV/heater function	E1B	
	005100 ~ 005115	0051	EV 1, polarity	E1P	
	005200 ~ 005215	0052	CT input	CM1	
	005300 ~ 005315	0053	EV 1, abnormal current of heater	CT1	
	005400 ~ 005415	0054	EV 2, function	E2F	
	005500 ~ 005515	0055	EV 2, H limit	E2H	
	005600 ~ 005615	0056	EV 2, L limit	E2L	
	005700 ~ 005715	0057	EV 2, sensitivity	E2C	
	005800 ~ 005815	0058	EV 2, delay timer	E2T	
	005900 ~ 005915	0059	EV 2, abnormal SV/ heater function	E2B	
	006000 ~ 006015	0060	EV 2, polarity	E2P	
	006100 ~ 006115	0061	CT input	CM2	
	006200 ~ 006215	0062	EV 2, abnormal current of heater	CT2	
	006300 ~ 006315	0063	DI input	DIF	
	006400 ~ 006415	0064	Polarity of DI	DIP	
	006500 ~ 006515	0065	Control setting 2	SV2	
	006600 ~ 006615	0066	Timer output	TMO	
	006700 ~ 006715	0067	Timer function	TMF	
	006800 ~ 006815	0068	Timer unit switch	H/M	
	006900 ~ 006915	0069	Allowable width for timer SV start	TSV	
	007000 ~ 007015	0070	Time setting	TIM	
	007100 ~ 007115	0071	Monitor of remaining time	TIA	
	_____	0072	Timer start/stop	TST	<input type="checkbox"/>
	007300 ~ 007315	0073	Output monitor	OM1	
	007400 ~ 007415	0074	AT start/stop	<input type="checkbox"/> AT	
	_____	0075	Data store	STR	<input type="checkbox"/>

■ TTM-10L

Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
10_	000000 ~ 000015	0000	Process Variable (PV)	PV1	
	000100 ~ 000115	0001	Control Setting Value (SV)	<input type="checkbox"/> SV	
	000200 ~ 000215	0002	EV L. Limit Set	1L1	
	000300 ~ 000315	0003	EV H. Limit Set	1H1	
	000400 ~ 000415	0004	Auto-Tuning Start/Release	<input type="checkbox"/> AT	
	000500 ~ 000515	0005	Proportional Band	<input type="checkbox"/> P1	
	000600 ~ 000615	0006	Integral Time	<input type="checkbox"/> I1	
	000700 ~ 000715	0007	Derivative Time	<input type="checkbox"/> D1	
	000800 ~ 000815	0008	P-cycle Time	<input type="checkbox"/> T1	
	000900 ~ 000915	0009	Control Sensitivity	<input type="checkbox"/> C1	
	001000 ~ 001015	0010	Set/Select of Input/Output	<input type="checkbox"/> IO	
	001100 ~ 001115	0011	L. Limit of SV Limiter	SLL	
	001200 ~ 001215	0012	H. Limit of SV Limiter	SLH	
	001300 ~ 001315	0013	Control Type	CNT	
	001400 ~ 001415	0014	PV Correction	PVS	
	001500 ~ 001515	0015	Manual Reset	PBB	
	001600 ~ 001615	0016	OFF Position	<input type="checkbox"/> CP	
	001700 ~ 001715	0017	EV Function	A1F	
	001800 ~ 001815	0018	EV Sensitivity	ALC	
	001900 ~ 001915	0019	Decimal Point Position	<input type="checkbox"/> DP	
	002000 ~ 002015	0020	Selection of C/F	<input type="checkbox"/> CF	
	002100 ~ 002115	0021	Setting of Lock Function	LOC	
	002200 ~ 002215	0022	Temperature of cooling contact compensation	<input type="checkbox"/> CJ	
	002300 ~ 002315	0023	Process Variable (PV) with decimal point	PV2	
	002400 ~ 002415	0024	Output state monitor	OM1	
_____	0025	Data store	STR	<input type="checkbox"/>	

■ TTM-100B Series

Device	Bit Address	Word Address	Controller Setting Item	PV	Other
100_	000000 ~ 000015	0000	Process value (PV)	PV1	
	000100 ~ 000115	0001	Control set value (SV)	<input type="checkbox"/> SV	
	000200 ~ 000215	0002	Main control MV (OUT1)	MV1	
	000300 ~ 000315	0003	Main control MV (OUT2)	MV2	
	000400 ~ 000415	0004	Auto-tuning start/release	<input type="checkbox"/> AT	
	000500 ~ 000515	0005	Alarm 1 L limit set	1L1	
	000600 ~ 000615	0006	Alarm 1 H limit set	1H1	
	000700 ~ 000715	0007	Main control P-band	<input type="checkbox"/> P1	
	000800 ~ 000815	0008	Integral time	<input type="checkbox"/> I1	
	000900 ~ 000915	0009	Derivative time	<input type="checkbox"/> D1	
	001000 ~ 001015	0010	Output 1 P-cycle time	<input type="checkbox"/> T1	
	001100 ~ 001115	0011	Output 1 sensitivity	<input type="checkbox"/> C1	
	001200 ~ 001215	0012	Output 2 P-band	PC1	
	001300 ~ 001315	0013	Output 2 P-cycle time	TC1	
	001400 ~ 001415	0014	Output 2 sensitivity	CC1	
	001500 ~ 001515	0015	Dead Band	DB1	
	001600 ~ 001615	0016	Cooling Point of Contact Compensation	<input type="checkbox"/> CJ	
	001700 ~ 001715	0017	Set/Select of Input/Output	<input type="checkbox"/> IO	
	001800 ~ 001815	0018	Setting of L limit for OUT1 MV Limiter	MLL	
	001900 ~ 001915	0019	Setting of H limit for OUT1 MV Limiter	MLH	
	002000 ~ 002015	0020	Setting of L limit of SV Limiter	SLL	
	002100 ~ 002115	0021	Setting of H limit of SV Limiter	SLH	
	002200 ~ 002215	0022	Control action select	CNT	
	002300 ~ 002315	0023	Setting of sensor value correction	PVS	
	002400 ~ 002415	0024	Manual reset value	PBB	
	002500 ~ 002515	0025	Alarm 1 function	A1F	
	002600 ~ 002615	0026	AL output sensitivity	ALC	
	002700 ~ 002715	0027	Heater abnormal current	<input type="checkbox"/> CT	
	002800 ~ 002815	0028	Selection of data transmission function	TR1	
	002900 ~ 002915	0029	Selection of C/F	<input type="checkbox"/> CF	
	003000 ~ 003015	0030	Output state monitor	OM1	
	003100 ~ 003115	0031	Response Delay Speed	AWT	
_____	0032	Data store	STR	<input type="checkbox"/>	

■ TTM-110 Series(TTM-114, 115, 117, 119)/110B

Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
110_	000000 ~ 000015	0000	Process Value (PV)	PV1	
	000100 ~ 000115	0001	Control Set Value (SV)	<input type="checkbox"/> SV	
	000200 ~ 000215	0002	Main Control MV (OUT 1)	MV1	
	000300 ~ 000315	0003	Sub-Control MV (OUT 2)	MV2	
	000400 ~ 000415	0004	Timer Remainder Time	TIA	
	000500 ~ 000515	0005	Auto-Tuning Start/Release	<input type="checkbox"/> AT	
	000600 ~ 000615	0006	Time Setting On Timer	TIM	
	000700 ~ 000715	0007	Alarm 1 L. Limit Set	1L1	
	000800 ~ 000815	0008	Alarm 1 H. Limit Set	1H1	
	000900 ~ 000915	0009	Alarm 2 L. Limit Set	2L1	
	001000 ~ 001015	0010	Alarm 2 H. Limit Set	2H1	
	001100 ~ 001115	0011	Main Control P-band	<input type="checkbox"/> P1	
	001200 ~ 001215	0012	Integral Time	<input type="checkbox"/> I1	
	001300 ~ 001315	0013	Derivative Time	<input type="checkbox"/> D1	
	001400 ~ 001415	0014	Output 1 P-cycle Time	<input type="checkbox"/> T1	
	001500 ~ 001515	0015	Output 1 Sensitivity	<input type="checkbox"/> C1	
	001600 ~ 001615	0016	Output 2 P-band	PC1	
	001700 ~ 001715	0017	Output 2 P-cycle Time	TC1	
	001800 ~ 001815	0018	Output 2 Sensitivity	CC1	
	001900 ~ 001915	0019	Dead Band	DB1	
	002000 ~ 002015	0020	Set/Select of Input/Output Type	<input type="checkbox"/> IO	
	002100 ~ 002115	0021	Setting of L. Limit For Out 1 MV Limiter	MLL	
	002200 ~ 002215	0022	Setting of H. Limit For Out 1 MV Limiter	MLH	
	002300 ~ 002315	0023	Setting of H. Limit of SV Limiter	SLL	
	002400 ~ 002415	0024	Setting of L. Limit of SV Limiter	SLH	
	002500 ~ 002515	0025	Control Action Select	CNT	
	002600 ~ 002615	0026	Setting of Sensor Value Correction	PVS	
	002700 ~ 002715	0027	Manual Reset Value	PBB	
	002800 ~ 002815	0028	Timer Operation Mode	TMM	
	002900 ~ 002915	0029	Alarm 1 Function	A1F	
	003000 ~ 003015	0030	Alarm 2 Function	A2F	
	003100 ~ 003115	0031	AL Output Sensitivity	ALC	
	003200 ~ 003215	0032	Heater Abnormal Current	<input type="checkbox"/> CT	
	003300 ~ 003315	0033	Selection of Data Transmission Function	TR1	
	003400 ~ 003415	0034	Decimal Point Position	<input type="checkbox"/> DP	
	003500 ~ 003515	0035	Selection of C/F	<input type="checkbox"/> CF	
	003600 ~ 003615	0036	Buzzer Sound Setting	<input type="checkbox"/> BU	
	003700 ~ 003715	0037	Setting of Lock Function	LOC	
	003800 ~ 003815	0038	Output State Monitor	OM1	
	—————	0039	Timer Reset	TMS	<input type="checkbox"/> L5
	004000 ~ 004015	0040	Run/Ready Status	RUN	
—————	0041	Data Store	STR	<input type="checkbox"/> L5	

■ TTM-120 Series (TTM-124, 125, 127, 129)

Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
120_	000000 ~ 000015	0000	Process Value (PV)	PV1	
	000100 ~ 000115	0001	Control Set Value (SV)	<input type="checkbox"/> AV	
	000200 ~ 000215	0002	Control Mode	MD1	
	000300 ~ 000315	0003	Main Control MV (OUT1)	MV1	
	000400 ~ 000415	0004	Sub-Control MV (OUT2)	MV2	
	000500 ~ 000515	0005	Auto-Tuning Start/Release	<input type="checkbox"/> AT	
	000600 ~ 000615	0006	Alarm 1L Limit Set	1L1	
	000700 ~ 000715	0007	Alarm 1H Limit Set	1H1	
	000800 ~ 000815	0008	Alarm 2L Limit Set	2L1	
	000900 ~ 000915	0009	Alarm 2H Limit Set	2H1	
	001000 ~ 001015	0010	Output 1 P-band	<input type="checkbox"/> P1	
	001100 ~ 001115	0011	Integral Time	<input type="checkbox"/> I1	
	001200 ~ 001215	0012	Derivative Time	<input type="checkbox"/> D1	
	001300 ~ 001315	0013	Output 1 P-cycle Time	<input type="checkbox"/> T1	
	001400 ~ 001415	0014	Output 1 Sensivity	<input type="checkbox"/> C1	
	001500 ~ 001515	0015	Main Control OFF Position	<input type="checkbox"/> CP	
	001600 ~ 001615	0016	Output 2 P-band	PC1	
	001700 ~ 001715	0017	Output 2 P-cycle Time	TC1	
	001800 ~ 001815	0018	Output 2 Sensitivity	CC1	
	001900 ~ 001915	0019	Output 2 OFF Position	CCP	
	002000 ~ 002015	0020	Dead Band	DB1	
	002100 ~ 002115	0021	Set/Select of Input/Output Type	<input type="checkbox"/> IO	
	002200 ~ 002215	0022	Setting of L. Limit for Out1 MV Limiter	MLL	
	002300 ~ 002315	0023	Setting of H. Limit for Out1 MV Limiter	MLH	
	002400 ~ 002415	0024	Setting of L. Limit of SV Limiter	SLL	
	002500 ~ 002515	0025	Setting of H. Limit of SV Limiter	SLH	
	002600 ~ 002615	0026	Control Action Select	CNT	
	002700 ~ 002715	0027	Rump Time of SV1	RP1	
	002800 ~ 002815	0028	Setting of Sensor Value correction	PVS	
	002900 ~ 002915	0029	Digital PV Filter	PDF	
	003000 ~ 003015	0030	Manual Reset Value	PBB	
	003100 ~ 003115	0031	Swiching for Balanceless Bumpless	<input type="checkbox"/> BB	
	003200 ~ 003215	0032	Alarm 1 Function	A1F	
	003300 ~ 003315	0033	Alarm 2 Function	A2F	
	003400 ~ 003415	0034	AL Output Sensitivity	ALC	
	003500 ~ 003515	0035	Heater Abnormal Current	<input type="checkbox"/> CT	
	003600 ~ 003615	0036	Selection of Data Transmission Function	TR1	
	003700 ~ 003715	0037	DI Function	<input type="checkbox"/> DI	
	003800 ~ 003815	0038	Decimal Point Position	<input type="checkbox"/> DP	
	003900 ~ 003915	0039	Selection of C/F	<input type="checkbox"/> CF	
	004000 ~ 004015	0040	Buzzer Sound Setting	<input type="checkbox"/> BU	
	004100 ~ 004115	0041	Setting of Lock	LOC	
	004200 ~ 004215	0042	Output State Monitor	OM1	
		0043	Data Store	STR	

■ TTM-300 Series (TTM-304, 305, 309)/300B

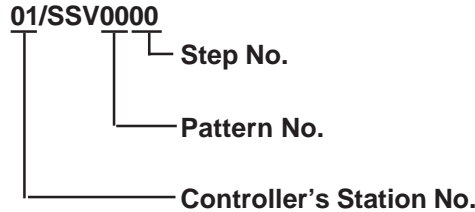
Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
300_	000000 ~ 000015	0000	Process Value (PV)	PV1	
	000100 ~ 000115	0001	Mode change	<input type="checkbox"/> MD	
	000200 ~ 000215	0002	Control Setting Value (SV)	<input type="checkbox"/> SV	
	000300 ~ 000315	0003	Run Step Setting Value (SV)	OSV	
	000400 ~ 000415	0004	The time elapsed	<input type="checkbox"/> TI	
	000500 ~ 000515	0005	Run step setting time	OTI	
	000600 ~ 000615	0006	Count numbers of time executed	SRR	
	_____	0007	Step forward function execution	ADV	<small>[Bit 5]</small>
	000800 ~ 000815	0008	Pattern number	<input type="checkbox"/> PT	
	000900 ~ 000915	0009	Step number	<input type="checkbox"/> ST	
SSV	000000 ~ 204715	0000 ~ 2047 ^{*1}	Step temperature setting	SSV	
END	000000 ~ 204715	0000 ~ 2047 ^{*1}	Final step setting	END	
STI	000000 ~ 204715	0000 ~ 2047 ^{*1}	Step time setting	STI	
SOK	000000 ~ 204715	0000 ~ 2047 ^{*1}	Final step finish condition setting	SOK	
SWZ	000000 ~ 204715	0000 ~ 2047 ^{*1}	Step wait zone	SWZ	
SWT	000000 ~ 204715	0000 ~ 2047 ^{*1}	Step wait time	SWT	
SON	000000 ~ 204715	0000 ~ 2047 ^{*1}	Time signal ON time	SON	
SOF	000000 ~ 204715	0000 ~ 2047 ^{*1}	Time signal OFF time	SOF	
SRN	000000 ~ 200015	0000 ~ 2000 ^{*2}	Execution time	SRN	
SEO	000000 ~ 200015	0000 ~ 2000 ^{*2}	End signal ON time	SEO	
300_	001000 ~ 001015	0010	Pattern numbers	PAT	
	001100 ~ 001115	0011	Step numbers	STP	
	001200 ~ 001215	0012	PV correction	PVS	
	001300 ~ 001315	0013	Change C/ F	<input type="checkbox"/> CF	
	001400 ~ 001415	0014	Type of Control	CNT	
	001500 ~ 001515	0015	Type of Input/Output	<input type="checkbox"/> IO	
	001600 ~ 001615	0016	Select decimal position	<input type="checkbox"/> DP	
	001700 ~ 001715	0017	Mainipulated value limiter Low	MLL	
	001800 ~ 001815	0018	Manipulated value limiter High	MLH	
	001900 ~ 001915	0019	Setting of L. limit of SV limiter	SLL	
	002000 ~ 002015	0020	Setting of H. limit of SV limiter	SLH	
	002100 ~ 002115	0021	Select PV start or SV start	PSV	
	002200 ~ 002215	0022	SV start setting value	SVS	
	002300 ~ 002315	0023	Select Start at Power ON	PON	
	002400 ~ 002415	0024	Event Output 1 function	DO1	
	002500 ~ 002515	0025	PV Event Output 1 function	A1F	
	002600 ~ 002615	0026	Event Output 1 Low limit	A1L	
	002700 ~ 002715	0027	Event Output 1 High limit	A1H	
	002800 ~ 002815	0028	Event Output 1 sensitivity	A1C	
	002900 ~ 002915	0029	Time signal 1 Output mode	TF1	
	003000 ~ 003015	0030	Time signal 1 ON time	ON1	
	003100 ~ 003115	0031	Time signal 1 OFF time	OF1	
	003200 ~ 003215	0032	Event output 1 unusual looping time	LT1	
003300 ~ 003315	0033	Event Output 2 function	DO2		
003400 ~ 003415	0034	PV Event Output 2 function	A2F		
003500 ~ 003515	0035	Event Output 2 Low limit	A2L		

Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
300-	003600 ~ 003615	0036	Event Output 2 High limit	A2H	
	003700 ~ 003715	0037	Event Output 2 sensitivity	A2C	
	003800 ~ 003815	0038	Time signal 2 Output mode	TF2	
	003900 ~ 003915	0039	Time signal 2 ON time	ON2	
	004000 ~ 004015	0040	Time signal 2 OFF time	OF2	
	004100 ~ 004115	0041	Event output 2 unusual looping time	LT2	
	004200 ~ 004215	0042	Key lock function	LOC	
	004300 ~ 004315	0043	Output condition monitor	OM1	
	004400 ~ 004415	0044	[Low temperature] Proportional	<input type="checkbox"/> P1	
	004500 ~ 004515	0045	[Low temperature] Integrated time	<input type="checkbox"/> I1	
	004600 ~ 004615	0046	[Low temperature] Differential time	<input type="checkbox"/> D1	
	004700 ~ 004715	0047	Middle point 1 setting	PM1	
	004800 ~ 004815	0048	[Middle temperature] Proportional	<input type="checkbox"/> P2	
	004900 ~ 004915	0049	[Middle temperature] Integrated	<input type="checkbox"/> I2	
	005000 ~ 005015	0050	[Middle temperature] Differential	<input type="checkbox"/> D2	
	005100 ~ 005115	0051	Middle point 2 setting	PM2	
	005200 ~ 005215	0052	[High temperature] Proportional	<input type="checkbox"/> P3	
	005300 ~ 005315	0053	[High temperature] Integrated time	<input type="checkbox"/> I3	
	005400 ~ 005415	0054	[High temperature] Differential time	<input type="checkbox"/> D3	
	005500 ~ 005515	0055	Proportional Cycle	<input type="checkbox"/> <input type="checkbox"/> T	
	005600 ~ 005615	0056	Fuzzy constant	FUZ	
	005700 ~ 005715	0057	Control sensitivity to [Low temperature]	<input type="checkbox"/> C1	
	005800 ~ 005815	0058	Control sensitivity to [Middle temperature]	<input type="checkbox"/> C2	
	005900 ~ 005915	0059	Control sensitivity to [High temperature]	<input type="checkbox"/> C3	
	006000 ~ 006015	0060	Auto-tuning setting value of [High temperature]	AT1	
	006100 ~ 006115	0061	Auto-tuning setting value of [Middle temperature]	AT2	
	006200 ~ 006215	0062	Auto-tuning setting value of [High temperature]	AT3	
	_____	0063	Auto-tuning execution of [Low temperature]	AP1	<input type="checkbox"/>
_____	0064	Auto-tuning execution of [Middle temperature]	AP2	<input type="checkbox"/>	
_____	0065	Auto-tuning execution of [High temperature]	AP3	<input type="checkbox"/>	
_____	0066	Auto-tuning execution of [Low]->[Middle]->[High] temperature	AP4	<input type="checkbox"/>	
006700 ~ 006715	0067	Auto-tuning under execution	ATR		

*1 When using identifiers from SSV to SOF with a TTM-300 series unit, use the Device Name as the identifier, and the Step No. and Pattern No. as the address. The maximum values available for the pattern number and the step number that can be set on a LT are 20 and 47, respectively. Specify them as shown below.

Ex.

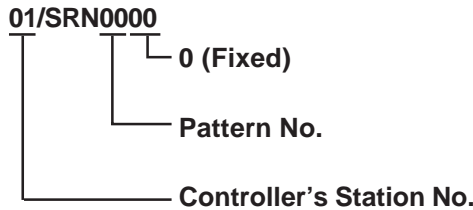
Device	Bit Address	Word Address	Control Setting Item	Identifier
SSV	000000 ~ 204715	0000 ~ 2047	Step Temperature Setting	SSV



*2 When using identifier SRN or SEO with the TTM-300 series unit, use the Device Name as the identifier, and the Step No. and Pattern No. as the address. The maximum values available for the pattern number and the step number that can be set on a LT is 20, respectively. Specify them as shown below.

Ex.

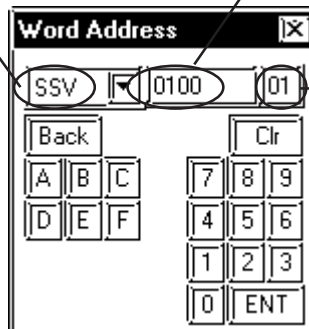
Device	Bit Address	Word Address	Controller Setting Item	Identifier
SRN	000000 ~ 200015	0000 ~ 2000	Execution Time	SRN



When entering addresses for identifiers SSV to SEO with a TTM-300 series unit, be sure to refer *1 or *2 above.

Device Selection
(Select from SSV, END, STI, SOK, SWZ, SWT, SON, SOF, SRN or SEO)

Address Selection
(Step No. or Pattern No.)



Enter the Controller's Station No.

■ **TTM-1020 Series(TTM-1520, 1521, 1522, 1523, 1524, 1525, 1920, 1921, 1922, 1923, 1924, 1925)**

Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
1020_	000000 - 000015	0000	Process Value (PV)	PV1	
	000100 - 000115	0001	CH No.	<input type="checkbox"/> CH	
	000200 - 000215	0002	Control Setting Value (SV)	<input type="checkbox"/> SV	
	000300 - 000315	0003	SV1	SV1	
	000400 - 000415	0004	Set/Select of Auto/Manual	MD1	
	000500 - 000515	0005	Set/Select of Remote/Local	REM	
	000600 - 000615	0006	Main Control MV (Out 1)	MV1	
	000700 - 000715	0007	Main Control MV (Out 2)	MV2	
	000800 - 000815	0008	Auto-Tuning Start/Release	<input type="checkbox"/> AT	
	000900 - 000915	0009	SV2	SV2	
	001000 - 001015	0010	SV3	SV3	
	001100 - 001115	0011	SV4	SV4	
	001200 - 001215	0012	SV5	SV5	
	001300 - 001315	0013	SV6	SV6	
	001400 - 001415	0014	SV7	SV7	
	001500 - 001515	0015	SV8	SV8	
	001600 - 001615	0016	Set/Select of Input/Output Type	<input type="checkbox"/> IO	
	001700 - 001715	0017	Setting of Sensor Value Correction	PVS	
	001800 - 001815	0018	Decimal Point Position	<input type="checkbox"/> DP	
	001900 - 001915	0019	Selection of C/F	<input type="checkbox"/> CF	
	002000 - 002015	0020	Setting of L. Limit of SV Limiter	SLL	
	002100 - 002115	0021	Setting of H. Limit of SV Limiter	SLH	
	002200 - 002215	0022	Setting of Lock Function	LOC	
	002300 - 002315	0023	Control Action Select	CNT	
	002400 - 002415	0024	Proportional band	<input type="checkbox"/> P1	
	002500 - 002515	0025	Integrated time	<input type="checkbox"/> I1	
	002600 - 002615	0026	Differential time	<input type="checkbox"/> D1	
	002700 - 002715	0027	Output 1 P-cycle Time	<input type="checkbox"/> T1	
	002800 - 002815	0028	Control sensitivity	<input type="checkbox"/> C1	
	002900 - 002915	0029	Manual Reset Value	PBB	
	003000 - 003015	0030	Setting of L. Limit for Out 1 MV Limiter	MLL	
	003100 - 003115	0031	Setting of H. Limit for Out 1 MV Limiter	MLH	
	003200 - 003215	0032	Setting for unusual	FAL	
	003300 - 003315	0033	Cooling P-band	PC1	
	003400 - 003415	0034	Cooling P-cycle time	TC1	
	003500 - 003515	0035	Cooling Sensitivity	CC1	
	003600 - 003615	0036	Dead Band	DB1	
	003700 - 003715	0037	Setting of L limit of cooling output	MCL	
	003800 - 003815	0038	Setting of H limit of cooling output	MCH	
003900 - 003915	0039	L limit of cascade scaling	CSL		

Device	Bit Address	Word Address	Controller Setting Item	Identifier	Other
1020_	004000 ~ 004015	0040	H limit of cascade scalling	CSH	
	004100 ~ 004115	0041	Event 1 Function	EV1	
	004200 ~ 004215	0042	PV Event 1 Function	P1F	
	004300 ~ 004315	0043	PV Event 1 Low Limit	P1L	
	004400 ~ 004415	0044	PV Event 1 High Limit	P1H	
	004500 ~ 004500	0045	DI 1 Function	D1F	
	004600 ~ 004615	0046	Event 2 Function	EV2	
	004700 ~ 004715	0047	PV Event 2 Function	P2F	
	004800 ~ 004815	0048	PV Event 2 Low Limit	P2L	
	004900 ~ 004915	0049	PV Event 2 High Limit	P2H	
	005000 ~ 005015	0050	DI2 Function	D2F	
	005100 ~ 005115	0051	Event 3 Function	EV3	
	005200 ~ 005215	0052	PV Event 3 function	P3F	
	005300 ~ 005315	0053	PV Event 3 Low Limit	P3L	
	005400 ~ 005415	0054	PV Event 3 High Limit	P3H	
	005500 ~ 005515	0055	DI3 Function	D3F	
	005600 ~ 005615	0056	Event 4 Function	EV4	
	005700 ~ 005715	0057	PV Event 4 Function	P4F	
	005800 ~ 005815	0058	PV Event 4 Low Limit	P4L	
	005900 ~ 005915	0059	PV Event 4 High Limit	P4H	
	006000 ~ 006015	0060	DI4 Function	D4F	
	006100 ~ 006115	0061	Event 5 Function	EV5	
	006200 ~ 006215	0062	PV Event 5 Function	P5F	
	006300 ~ 006315	0063	PV Event 5 Low Limit	P5L	
	006400 ~ 006415	0064	PV Event 5 High Limit	P5H	
	006500 ~ 006515	0065	DI5 Function	D5F	
	006600 ~ 006615	0066	Selection of Data Transmission 1 Function	TR1	
	006700 ~ 006715	0067	L limit of transmission 1 scaling	T1L	
	006800 ~ 006815	0068	H limit of transmission 2 scaling	T1H	
	006900 ~ 006915	0069	Selection of Data Transmission 2 Function	TR2	
	007000 ~ 007015	0070	L limit of transmission 2 scaling	T2L	
007100 ~ 007115	0071	H limit of transmission 2 scaling	T2H		
007200 ~ 007215	0072	Close feedback resistance control	CLS		
007300 ~ 007315	0073	Open feedback resistance control	OPN		
007400 ~ 007415	0074	quota of function	FNC		
007500 ~ 007515	0075	Output State Monitor	OM1		
007600 ~ 007615	0076	Event condition monitor	EM1		
		0077	Data Store	STR	Bit 5

2.8.4 Environment Setup

The following table lists the recommended Controller and LT communication settings.

LT Settings		Controller Settings	
Baud Rate	9600 bps	Baud Rate	9600 bps
Data Length	8 bit	Data Length	8 bit
Stop Bit	2 bit	Stop Bit	2 bit
Parity Bit	None	Parity Bit	None
Data Flow Control	ER	_____	_____
Communication Format (using RS-422) *1	RS-422 (2-wire)	_____	_____
Communication Format (using RS-232C) *1	RS-232C	_____	_____
Unit No. *2	1 to 32	Communication Unit No.	1 to 32
_____	_____	Mode Setting *3	Communication Mode
_____	_____	Mode Setting *4	Read/Write

*1 Controller cannot switch the Communication Format. When purchasing the Controller, select either an RS-422 or RS-232C.

*2 Although the settable range for a machine number on the temperature controllers is 1 to 99, the range for the LT is 1 to 32.

*3 This setting is required for models other than the TTM-004/X04 series. When you perform communication between the Controller and the LT, be sure to set your Controller to Data Transfer mode.

*4 This setting is required only for the TTM-004/X04 series. When the Controller is set to read-only, rewritable devices will become read-only.

2.8.5 Error Code

Controller error codes are displayed by the “Host Communication Error (02:**:##)”, and indicated in the left lower corner of the LT screen ** indicates the Controller’s error code, and ## indicates the number of the Controller unit.

Error Code	Error Message	Meaning
00	Flat of the instrument (Memory error or A/D conversion error)	_____
01	Numeric data out of "the setting range respectively specified in each of setting items".	Data written to an arbitrary device is out of the range for writing.
02	Change of an item prohibited, or no item to be read out.	No device exists in the address specified for the temperature controller connected to LT. Or, data was written to the specified device, even though that device is write protected.
03	An ASCII code other than the numeric data is specified in the place. Or, an ASCII code other than "0" or "-" is specified in the place for the sign.	_____
04	Format error	The format of the command from the LT is incorrect due to noise, etc.
05	BCC error	The format of commands sent from LT is erroneous due to noise or the like.
06	Overrun error	_____
07	Framing error	Machine Numbers for temperature controllers are overlapping. Or, the format of commands sent from LT is erroneous due to noise or the like.
08	Parity error	The current Data Transfer Parity setting is incorrect. Or, the format of commands sent from LT is erroneous due to noise or the like.
09	Trouble has happened on PV in process of AT. Or, AT does not be finalized in 3 hours.	_____



Depending on the specification of the Controller, if two errors occur at the same time, the larger error number will be displayed.

Reference *For more details about error codes, refer to the TOHO ELECTRONICS INC.'s COMMUNICATIONS FUNCTION Instructor Manual.*



2.9 Fenwal Controllers

2.9.1 System Structure

This section describes the system structure in which the temperature controller made by Fenwal and the LT are connected.



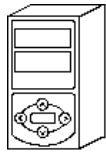


- **The LT data area ranging from LS0 through LS19 (20 words) cannot be allocated to the data area available for control and measurement. Even if the system area is set for this using LT Editor or when the LT is offline, this allocation is not possible.**

- **Read Area Information:**

The GC, GA, and GP devices specified at the first address of the system area are exclusively for reads. When they are used as read areas, take care not to write data to those areas. Otherwise, a host communication error (02:FA) will be generated.

■ AL series

◆ 1:1 connection

Temperature controller	Cable Diagram	Unit Type
		
AL24R-□□□-□□□-□□□ ^{*1*2}	RS-422 <Cable Diagram1 >	LT Type C
	RS-422 (1:n communication) <Cable Diagram2 >	

*1 The “□” indicates that that temperature controller model number varies depending upon the options specified. For further model information, refer to the AL series catalog.

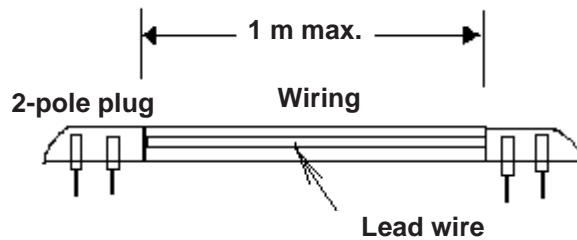
*2 The production number of the temperature controller should be 02010023 or later and the serial number 0204 or later.

2.9.2 Cable Diagram

The following cable diagram may differ from the one recommended by Fenwal. However, using this cable diagram will not cause any problems.



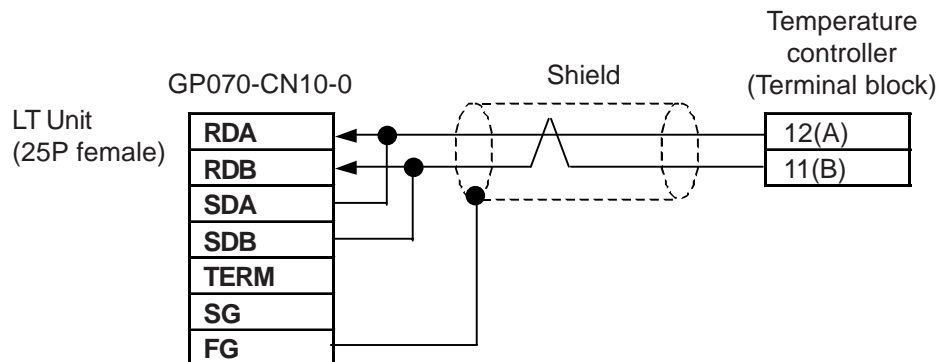
- **Use a communication cable conforming to IEEE485.**
- **For multi-drop connections, the wiring unit (model AL-W) made by Fenwal can be used for the transition wiring for RS-485 communication. The length of the wiring can be from 57 mm to 1 m.**



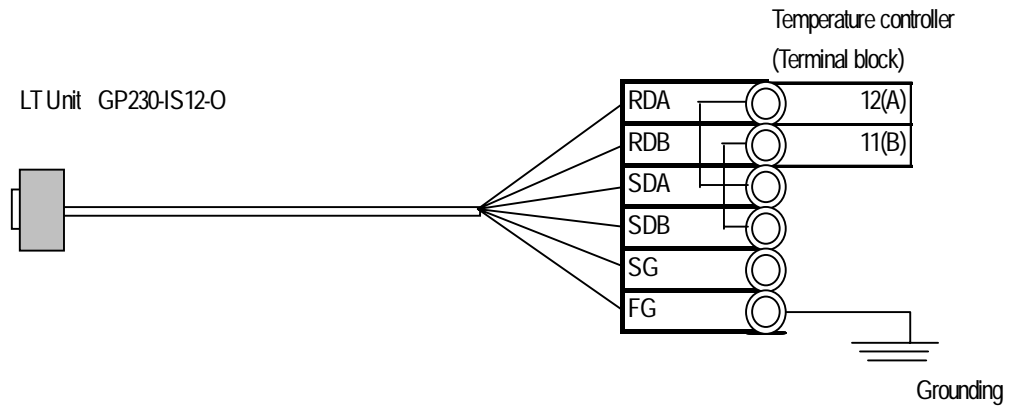
- **The maximum transmission distance is 600 m.**
- **The FG of the LT should be grounded according to your country's specifications.**
- **No terminating resistor is required for a temperature controller connected to a terminator.**

Cable Diagram 1 1:1 RS-422 2-wire type

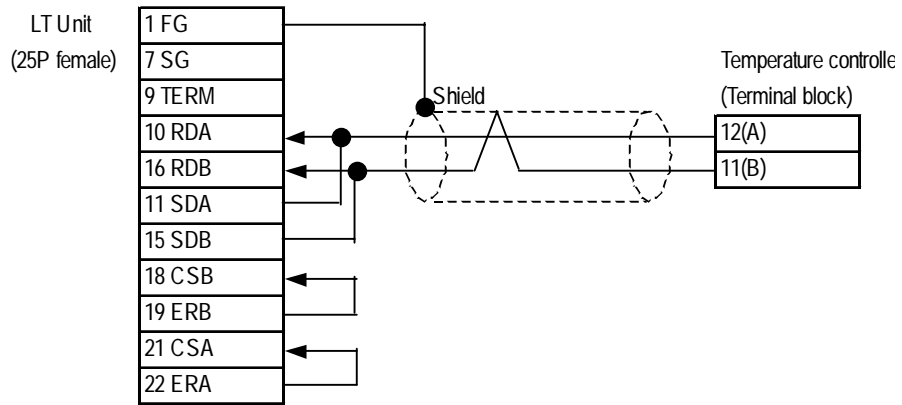
- When using Digital's RS-422 connector terminal adapter, GP070-CN10-O



- When using Digital's RS-422 cable, GP230-IS12-O

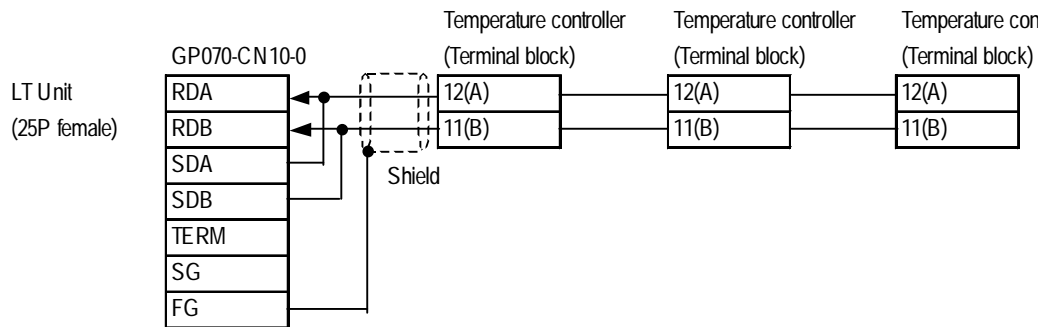


- When making your own cable connections

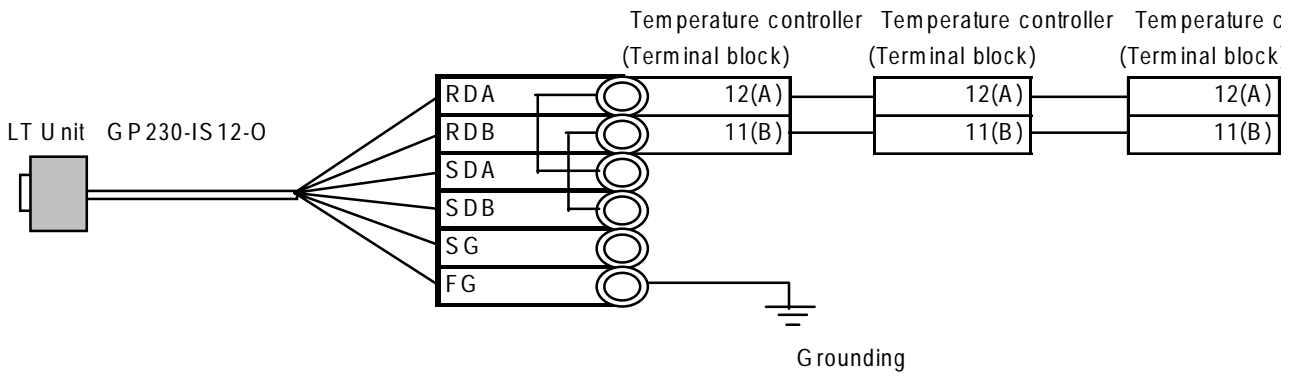


Cable Diagram 2 1:n RS-422 2-wire type

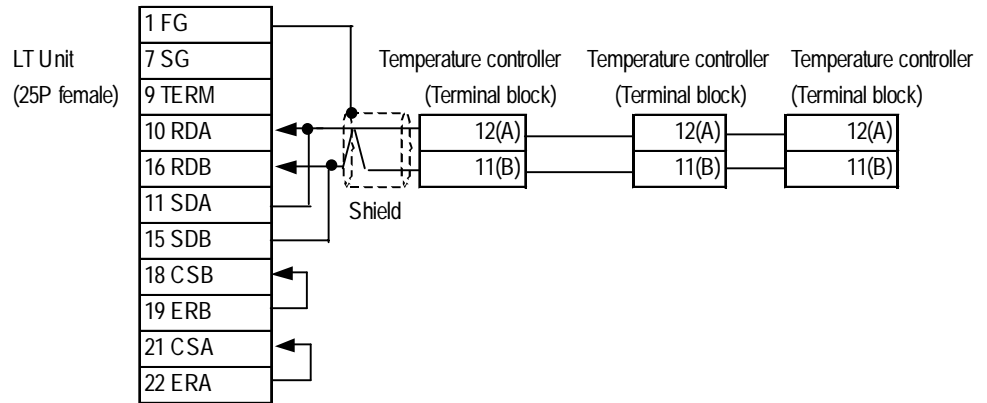
- When using Digital's RS-422 connector terminal adapter, GP070-CN10-O



- When using Digital's RS-422 cable, GP230-IS12-0



- When making your own cable connections

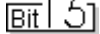
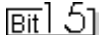
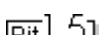
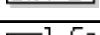
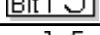
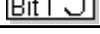
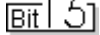
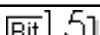
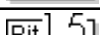
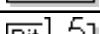
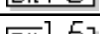
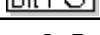
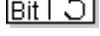
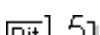

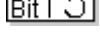
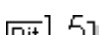
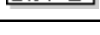
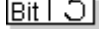
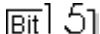
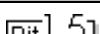
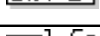
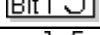
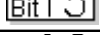

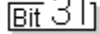
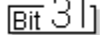


2.9.3 Supported Devices

The following table describes the range of devices supported by the LT.

■ **AL series**

 Setup System Area here.

Device	Bit Address	Word Address	Particulars
Input signal	—	IN1	 5
Decimal place in linear input	—	UN1	 5
With or without IRr/c 2-point correction	—	IR1	 5
Control mode	—	CM1	 5
Filter constant	—	FS1	 5
Control LED illumination direction	—	OD1	 5
Control output direction	—	OA1	 5
Burnout direction	—	BO1	 5
Output limit method	—	LT1	 5
Warning type	—	AK1	 5
Warning 1: Alarm warning code	—	HA1	 5
Warning 1: Temperature warning code	—	A11	 5
Warning 2: Temperature warning code	—	A21	 5
Warning 3: Temperature warning code	—	A31	 5
Warning LED illumination direction	—	LE1	 5
CT type	—	CT1	 5
Upper and lower limits of setting range	—	HL1 ~ HL2	 5 *3
Linear input scaling H and L	—	L1 ~ L2	 5 *3
Upper and lower output limits	—	OL1 ~ OL2	 5 *3
Proportional time	—	PT1	 5
Proportional band	—	PB1	 3 *1
Integral action time	—	IT1	 3 *1
Derivative action time	—	DT1	 3 *1
ARW	—	AR1	 5
ON/OFF sensitivity	—	DI1	 5
Manual reset	—	RT1	 5
Sensor error correction	—	SA1	 5

H/L

Setup System Area here.

Device	Bit Address	Word Address	Particulars	
Temperature value before high-point correction for IRr/c 2-point correction value	—	IA1	Bit 1 5	
Temperature value after high-point correction for IRr/c 2-point correction value	—	IB1	Bit 1 5	
Temperature value after low-point correction for IRr/c 2-point correction value	—	IC1	Bit 1 5	
Temperature value after low-point correction for IRr/c 2-point correction value	—	ID1	Bit 1 5	
Transmission output scaling H and L	—	DS1 ~ DS2	Bit 1 5	*3
Setting value for heater breakage current	—	CA1	Bit 1 5	
Warning sensitivity	—	AD1	Bit 1 5	
Main temperature setting	—	S1	Bit 1 5	
Warning 1: 1 point	—	SP1	Bit 3 1	*1
Warning 1: Bands H and L	—	SB1 ~ SB2	Bit 3 1	*1*3
Warning 2: 1 point	—	DP1	Bit 3 1	*1
Warning 2: Bands H and L	—	DB1 ~ DB2	Bit 3 1	*1*3
Warning 3: 1 point	—	TP1	Bit 3 1	*1
Warning 3: Bands H and L	—	TB1 ~ TB2	Bit 3 1	*1*3
Output method	—	OU1	Bit 1 5	*2
Number of warnings	—	AN1	Bit 1 5	*2
RUN/STOP	—	RS1	Bit 1 5	
Auto tuning	—	AT1	Bit 1 5	
Key locking	—	KY1	Bit 1 5	
Mode locking	—	ML1	Bit 1 5	
POWER ON/OFF	—	ON1	Bit 1 5	
Current temperature	—	PV1	Bit 1 5	*2
Operation panel	—	MV1	Bit 1 5	*2
Temperature control	—	GC1 ~ GC8	Bit 1 5	*2*3
Warning	—	GA1 ~ GA8	Bit 1 5	*2*3
Panel data	—	GP1 ~ GP8	Bit 1 5	*2*3

H/L

*1 This indicates a double-word device (all others without this mark are word devices)

*2 No writes are possible.

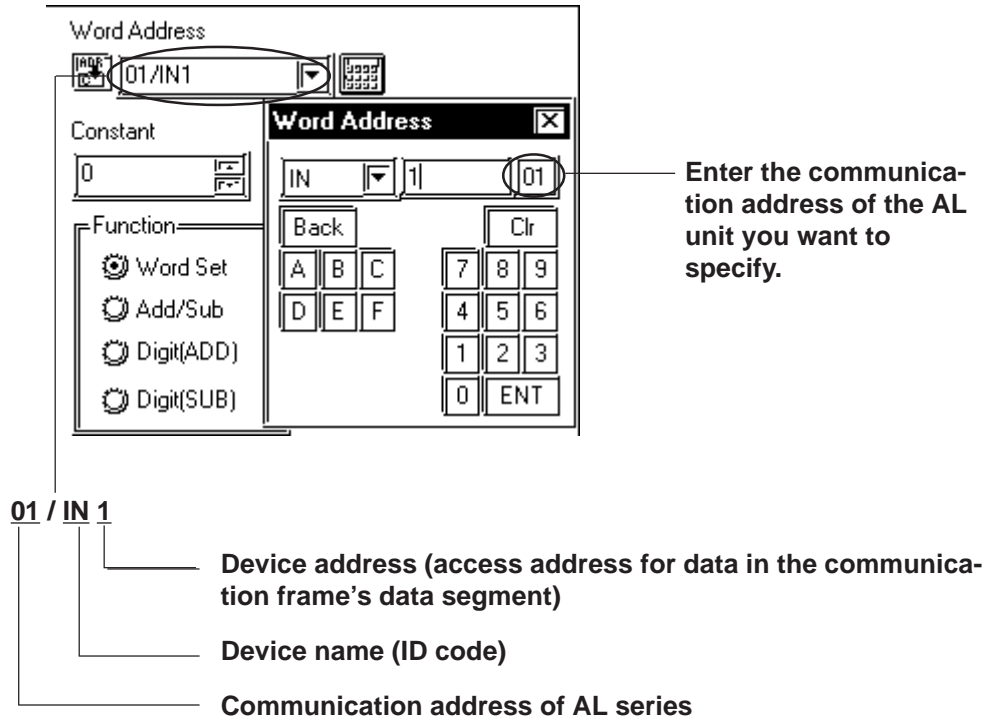
*3 If there are two device address ranges or more, refer to “Detailed List of Data Types for AL series ID Codes” for the definition of each address.

Detailed List of Data Types for AL Series ID Codes

Item	ID code	Data type
Upper and lower limits of setting range	HL1	Lower limit of setting range
	HL2	Upper limit of setting range
Linear input scaling H and L	L1	Scaling L
	L2	Scaling H
Upper and lower output limits	OL1	Lower output limit
	OL2	Upper output limit
Transmission output scaling H and L	DS1	Scaling L
	DS2	Scaling H
Warning 1: Bands H and L	SB1	Band L
	SB2	Band H
Warning 2: Bands H and L	DB1	Band L
	DB2	Band H
Warning 3: Bands H and L	TB1	Band L
	TB2	Band H
Temperature control	GC1	Setting temperature
	GC2	Current temperature
	GC3	Operation amount
	GC4	Control output current value
	GC5	ON/OFF status of control LED
	GC6	ON/OFF status of control output
	GC7	Reserved
	GC8	Reserved
Warning	GA1	Error number
	GA2	Alarm list
	GA3	1, 2, and 3: ON/OFF status of LED
	GA4	Warnings 1, 2, and 3: ON/OFF status of output
	GA5	Setting value for heater breakage current
	GA6	Heater current value
	GA7	Reserved
	GA8	Reserved
Panel data	GP1	Setting temperature
	GP2	Current temperature
	GP3	ON/OFF status of control LED
	GP4	1, 2, and 3: ON/OFF status of LED
	GP5	Error number
	GP6	Reserved
	GP7	Reserved
	GP8	Reserved



- To set up Parts in LT Editor, specify the unit number of the AL series unit when entering addresses. If no unit number is specified, the last unit number entered is assumed (the default value is 01). See the following:



- **About the LT system data area**

The LT system data area from LS0 to LS19 (20 words) cannot be allocated to the data area available for the temperature controller. Even if this system area is set up using LT Editor or when the LT is offline, this allocation is not possible.

- **About the read area:**

The GC, GA, and GP devices that may be specified at the first address of the system area are exclusively for reads. When they are used as read areas, take care not to write data to those areas. Otherwise, a host communication error (02:FA) will be generated.

2.9.4 Environment Setup

The following table lists Digital’s recommended temperature controller and LT communication setup.

■ **AL series**

LT Setup		Temperature Controller Setup	
Baud Rate	19200 bps (fixed)	_____	
Data Length	8 bits (fixed)	_____	
Stop Bit	2 bits (fixed)	_____	
Parity Bit	Even (fixed)	_____	
Data Flow Control	ER Control (fixed)	_____	
Communication Format	2-wire type	_____	
Unit No.	1	Communication Address	01 *1

*1 Specify the communication address of the temperature controller in from 01 to 31.

Procedure: Select AdrS from Setup Parameter Display and then enter the desired 2-digit number (e.g., 01 for number 1).

2.9.5 Error Code

<Temperature controller error code>

The following lists error codes supported by the temperature controllers.

Each error message will appear “host communication error (02:**:##)” at the lower left part of the screen of the LT. “**” stands for an error code specific to the temperature controller and “##” the temperature controller number where the error has occurred.

Error code	Description	Details
01	The specified value is out of the range.	The data written with a write tag is out of the range specified for the temperature controller.
02	The setting is invalid.	The LT has tried to read or write when the specified device is invalid. Example: When the ON/OFF control is selected, the devices related to the PID control become invalid.
03	The execution is not possible.	When the temperature control is under special processing, any write for status change is not possible. This error code appears if the LT tries any write in the above state. Example: During the auto tuning of the PID control, any write for status change is not possible.

For the details of error codes, refer to the Communication Production Specification of Temperature Controller for AL Users by Fenwal.



2.10 Shimaden Co., Ltd. Controllers

2.10.1 System Structure

The following describes the system configuration used when connecting the LT to a Shimaden Controller.



• **LT's System Area (LS0 to LS19) Settings**

The LT's system area (20 words) cannot be allocated to the Controller's own data area. When you are entering the system area settings via the screen editor software or via the LT's OFFLINE screen, be careful that you do not use the Controller's own data area.

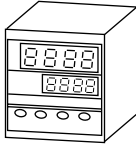


■ **SR253 Series**

Controller *1	Cable Diagram	Unit Type
SR253-□□-□-□□□□□□7□	RS-232C (Cable Diagram 1)	LT Type C
SR253-□□-□-□□□□□□6□	RS-422 4-wire (Cable Diagram 3)	
	RS-422 4-wire 1:n Connection (Cable Diagram 4)	
SR253-□□-□-□□□□□□5□	RS-422 2-wire (Cable Diagram 5)	
	RS-422 2-wire 1:n Connection (Cable Diagram 6)	

*1 The model data "□" will vary depending on the type of option.

For detailed temperature Controller information, refer to that unit's catalog. Serial data transfer option types use a "7" for RS-232C, "6" for RS-422 - 4 wire, and "5" for RS-422 - 2 wire.

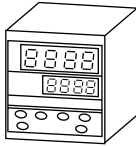


■ SR90 Series

Controller ^{*1}	Cable Diagram	Unit Type
		
SR92-□□-□-□□-□□7□ SR93-□□-□-□□-□07□ SR94-□□-□-□□-□07□	RS-232C (Cable Diagram 2)	LT Type C
SR91-□□-□□-□5□ SR92-□□-□-□□-□□5□ SR93-□□-□-□□-□05□ SR94-□□-□-□□-□05□	RS-422 2-wire (Cable Diagram 7)	
	RS-422 2-wire 1:n Connection (Cable Diagram 8)	

*1 The model data "□" will vary depending on the type of option.

For detailed temperature Controller information, refer to that unit's catalog.
 Serial data transfer option types use a "7" or "07" for RS-232C, and "5" or "05" for RS-422 - 2 wire.

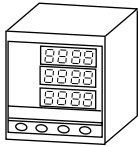


■ SR80 Series

Controller ^{*1}	Cable Diagram	Unit Type
		
SR82-□□-□-□□-□□□□7□□ SR83-□□-□-□□-□□□□7□□ SR84-□□-□-□□-□□□□7□□	RS-232C (Cable Diagram 2)	LT Type C
SR82-□□-□-□□-□□□□5□□ SR83-□□-□-□□-□□□□5□□ SR84-□□-□-□□-□□□□5□□	RS-422 2-wire (Cable Diagram 7)	
	RS-422 2-wire 1:n Connection (Cable Diagram 8)	

*1 The model data "□" will vary depending on the type of option.

For detailed temperature Controller information, refer to that unit's catalog.
 Serial data transfer option types use a "7" for RS-232C, and "5" for RS-422 - 2 wire.

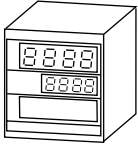


■ MR13 Series

Controller ^{*1}	Cable Diagram	Unit Type
		
MR13-□□-□-□□-□□□□17□	RS-232C (Cable Diagram 2)	LT Type C
MR13-□□-□-□□-□□□□15□	RS-422 2-wire (Cable Diagram 7)	
	RS-422 2-wire 1:n Connection (Cable Diagram 8)	

**1 The model data "□" will vary depending on the type of option.*

For detailed temperature Controller information, refer to that unit's catalog. Serial data transfer option types use a "17" for RS-232C, and "15" for RS-422 - 2 wire..

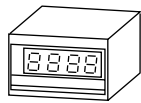


■ FP93 Series

Controller ^{*1}	Cable Diagram	Unit Type
		
FP93-□□-□□-□□7□	RS-232C (Cable Diagram 2)	LT Type C
FP93-□□-□□-□□5□	RS-422 2-wire (Cable Diagram 7)	
	RS-422 2-wire 1:n Connection (Cable Diagram 8)	

**1 The model data "□" will vary depending on the type of option.*

For detailed temperature Controller information, refer to that unit's catalog. Serial data transfer option types use a "7" for RS-232C, and "5" for RS-422 - 2 wire.

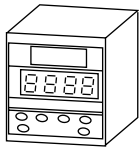

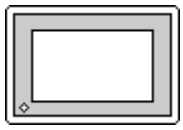
■ SD16 Series

Controller ^{*1}	Cable Diagram	Unit Type
		
SD16-□□□-□□7□	RS-232C (Cable Diagram 2)	LT Type C
SD16-□□□-□□5□	RS-422 2-wire (Cable Diagram 7)	
	RS-422 2-wire 1:n Connection (Cable Diagram 8)	

**1 The model data "□" will vary depending on the type of option.*

*For detailed temperature Indicator information, refer to that unit's catalog.
Serial data transfer option types use a "7" for RS-232C, and "5" for RS-422 - 2 wire.*

■ EM70 Series

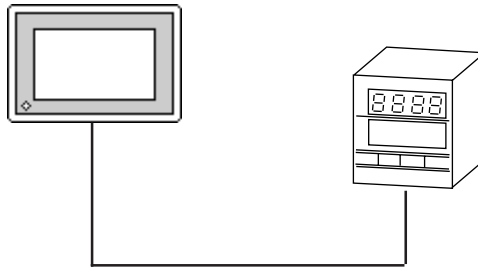
Controller ^{*1}	Cable Diagram	Unit Type
		
EM70-□□-□□□7□	RS-232C (Cable Diagram 2)	LT Type C
EM70-□□-□□□5□	RS-422 2-wire (Cable Diagram 7)	
	RS-422 2-wire 1:n Connection (Cable Diagram 8)	

**1 The model data "□" will vary depending on the type of option.*

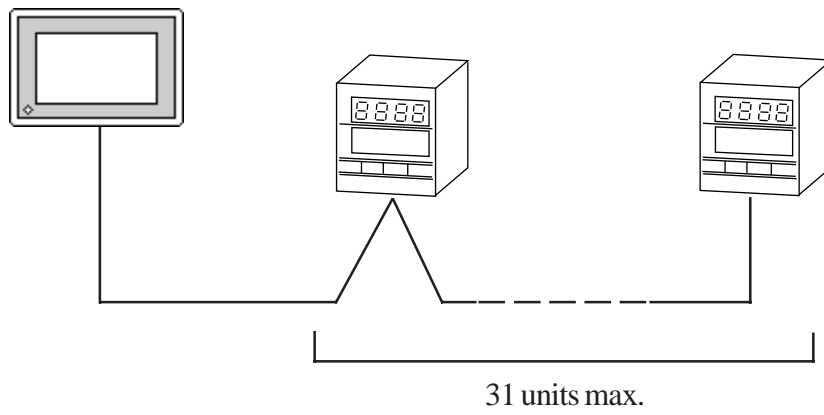
*For detailed temperature Controller information, refer to that unit's catalog.
Serial data transfer option types use a "7" for RS-232C, and "5" for RS-422 - 2 wire.*

◆ Connections

•1:1 connection



•1:n connection



2.10.2 Cable Diagrams

The cable diagrams shown below and the cable diagrams recommended by Shimaden Co., Ltd. may differ, however, using these cables for your Controller's operations will not cause any problems.



- **Ground your Controller's FG terminal according to your country's applicable standard. For details, refer to your Controller's manual.**
- **When connecting a cable's Shield line to an FG terminal, consider the needs of your system when deciding which side of the cable (LT or Controller) to connect. (The example below connects to the Controller's FG terminal.)**
- **If a communications cable is used, be sure to connect its SG (signal ground) terminal.**
- **RS-232C cables should be 15 meters or less.**
- **RS-422 (2-wire) cables should be 500 meters or less.**
- **RS-422 (4-wire) cables should be 600 meters or less.**
- **When using an RS-422 connection, be sure to use the following method to insert termination resistance.**

SR253 Series Units (4-wire)

Internally 270Ω of resistance is available. Turn the Controller's internal SW1a and SW1b switches ON.

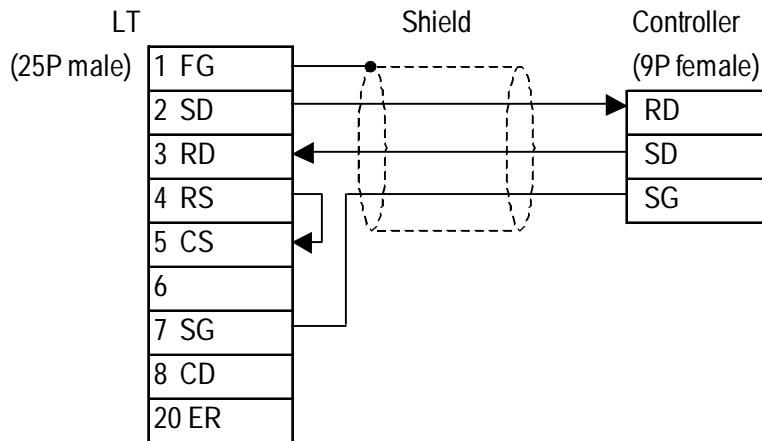
SR253 Series Units (2-wire)

Internally 135Ω of resistance is available. Turn the Controller's internal switch ON.

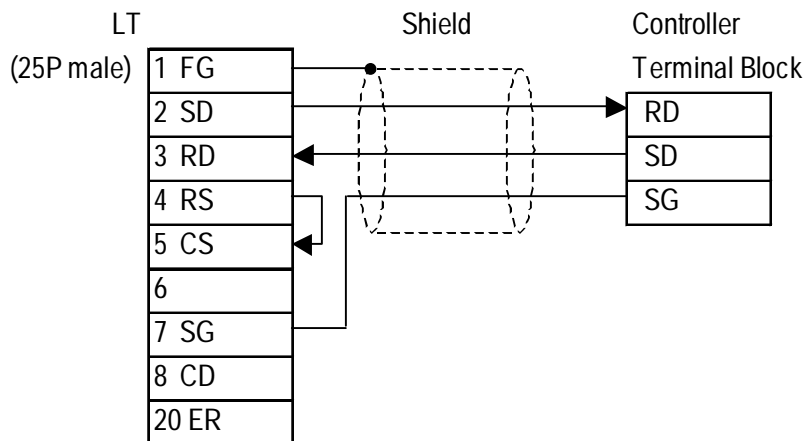
SR90/SR80/MR13/FP93/SD16/EM70 Series Units

On the final node's terminal block, between the "+" and "-" terminals, attach 1/2W 120Ω of termination resistance.

Cable Diagram 1 (1:1) RS-232C



Cable Diagram 2 (1:1) RS-232C

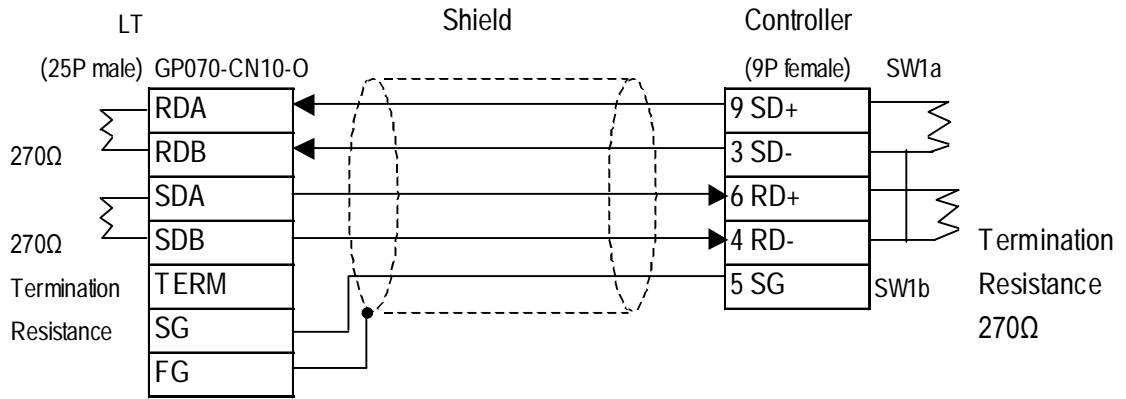


Controller Terminal Block Numbers

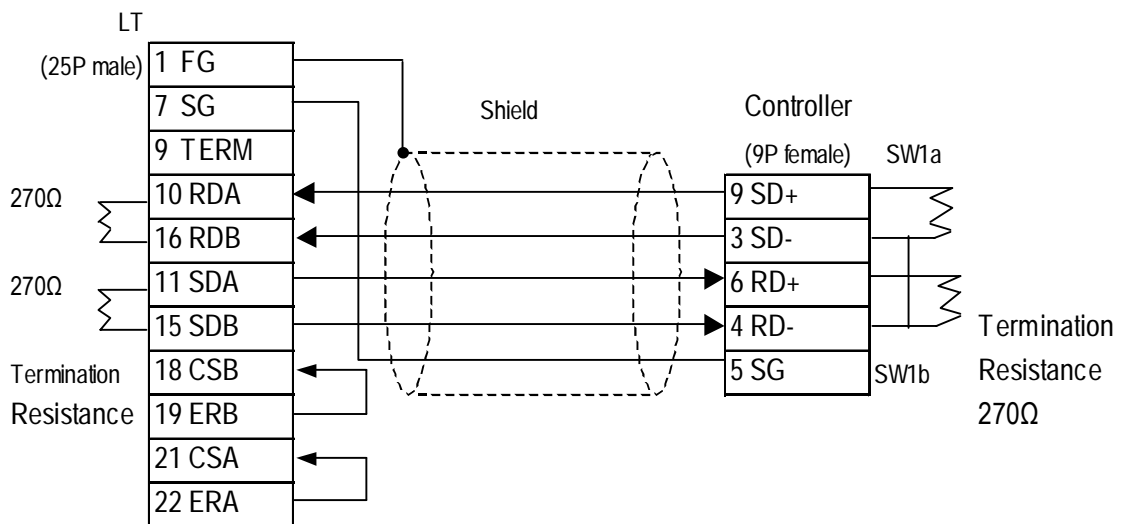
	SR92	SR82	SR83	SR84	SD16	EM70
	SR93		MR13			
	SR94		FP93			
RD	3	18	25	22	17	28
SD	2	17	24	21	16	27
SG	1	16	23	1	15	26

Cable Diagram 3 (1:1) RS-422 4-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

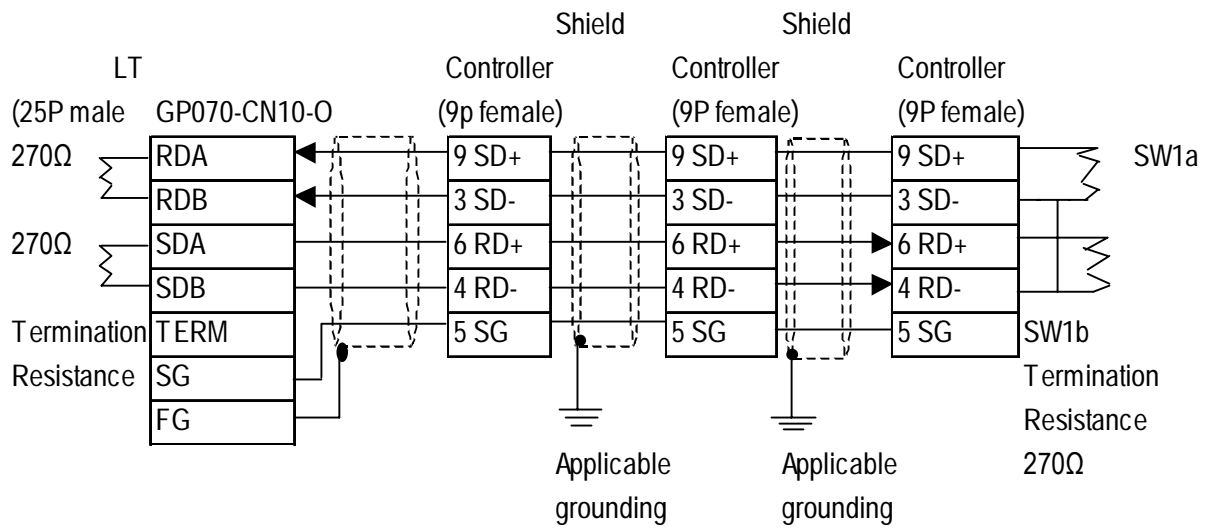


<When making your own cable>

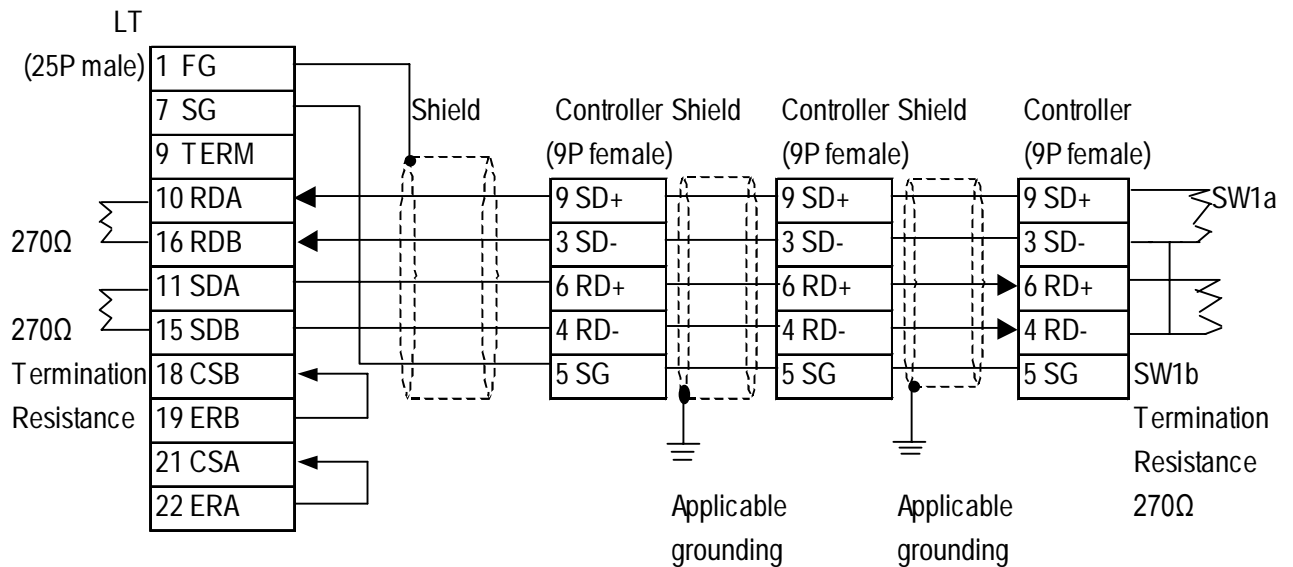


Cable Diagram 4 (1:n) RS-422 4-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

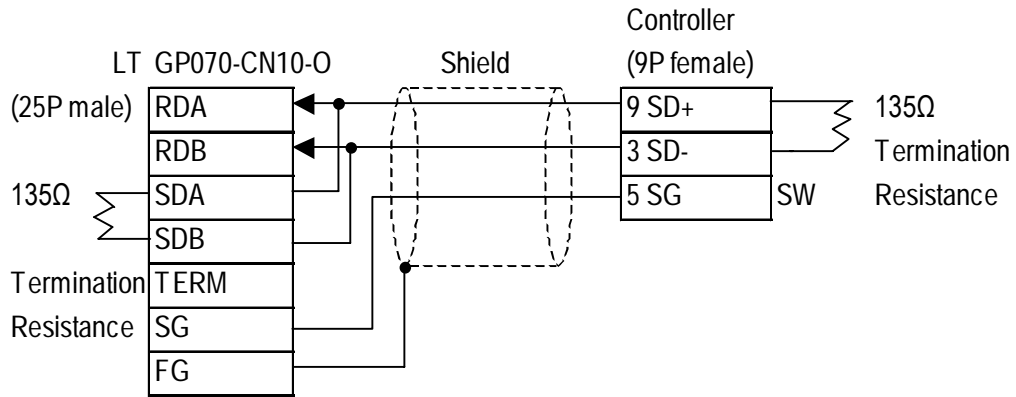


<When making your own cable>

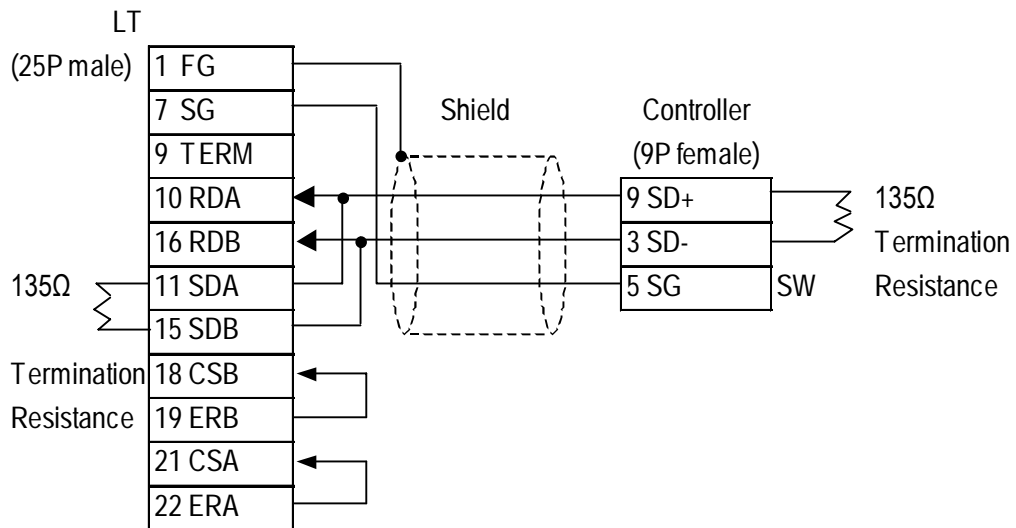


Cable Diagram 5 (1:1) RS-422 2-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

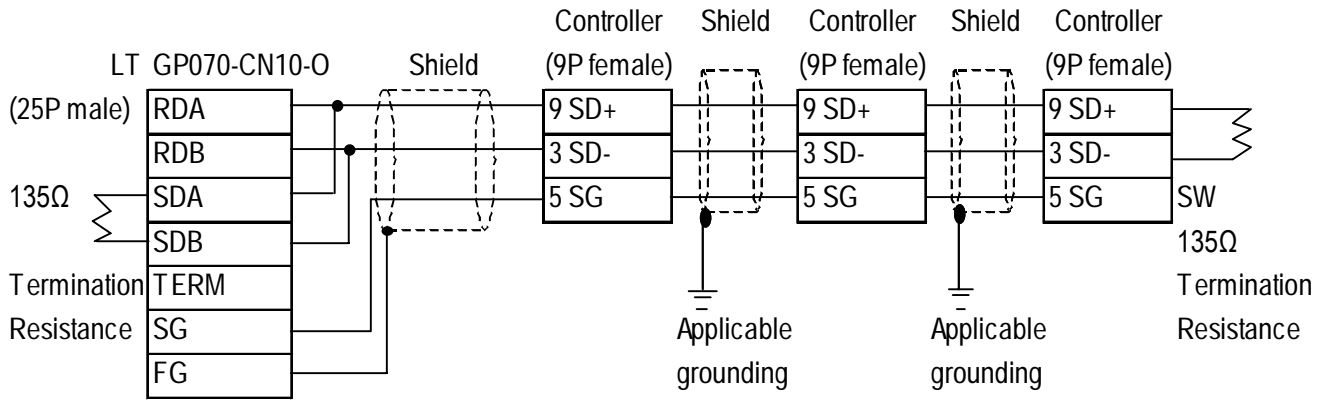


<When making your own cable>

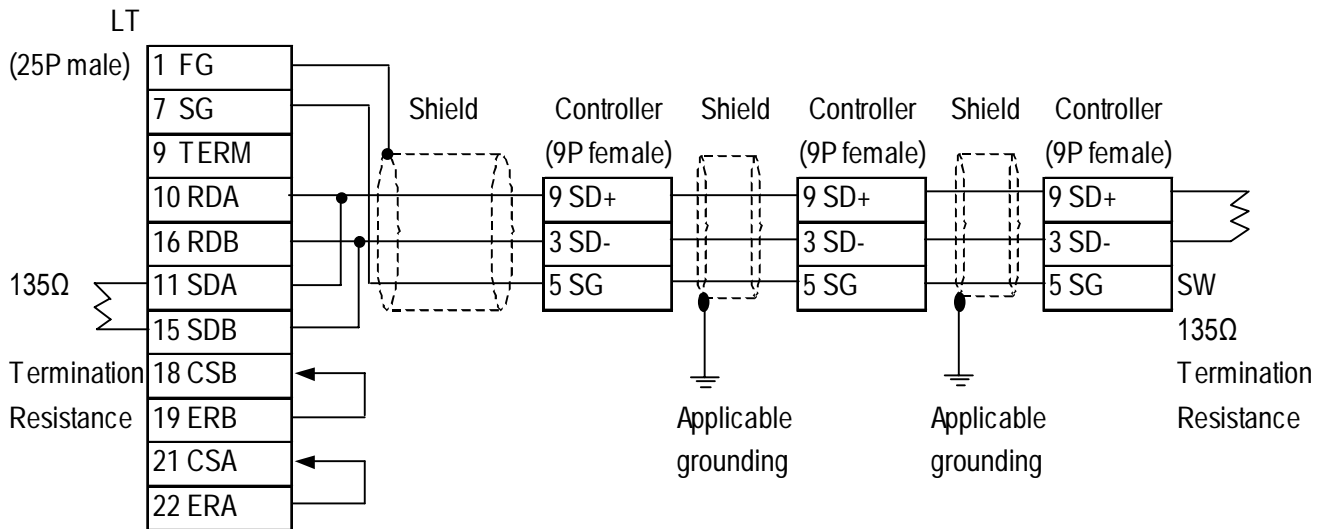


Cable Diagram 6 (1:n) RS-422 2-Wire

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

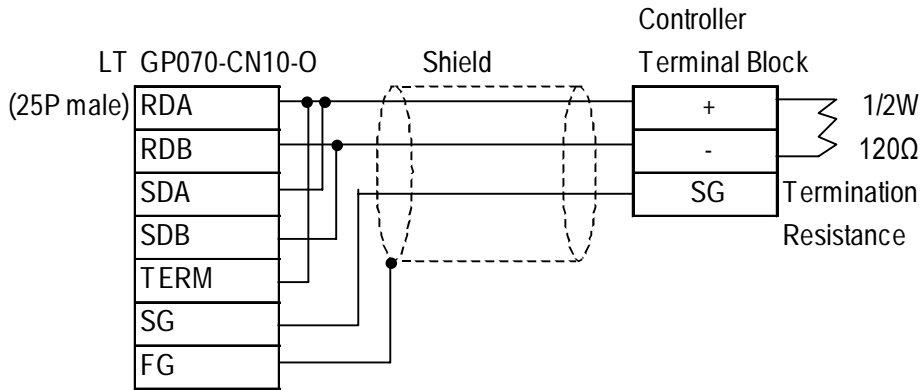


<When making your own cable>

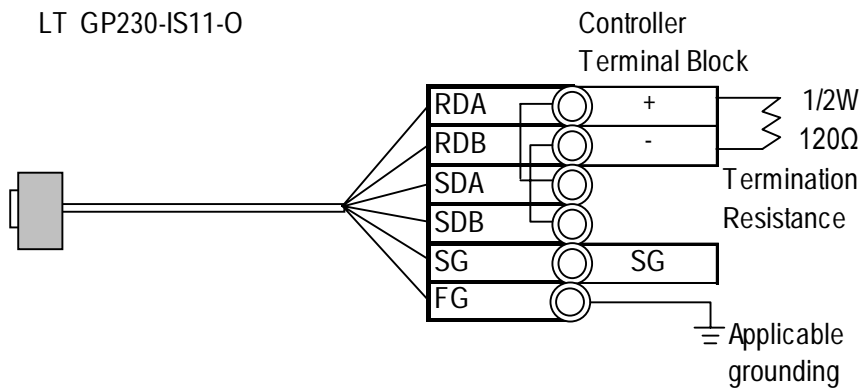


Cable Diagram 7 (1:1) RS-422 2-Wire

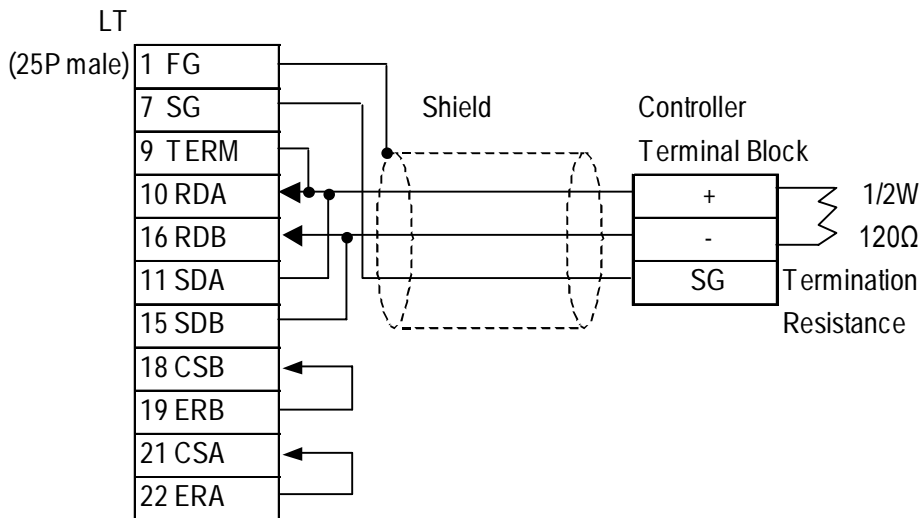
<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When using Digital's RS-422 cable GP230-IS11-0>



<When making your own cable>

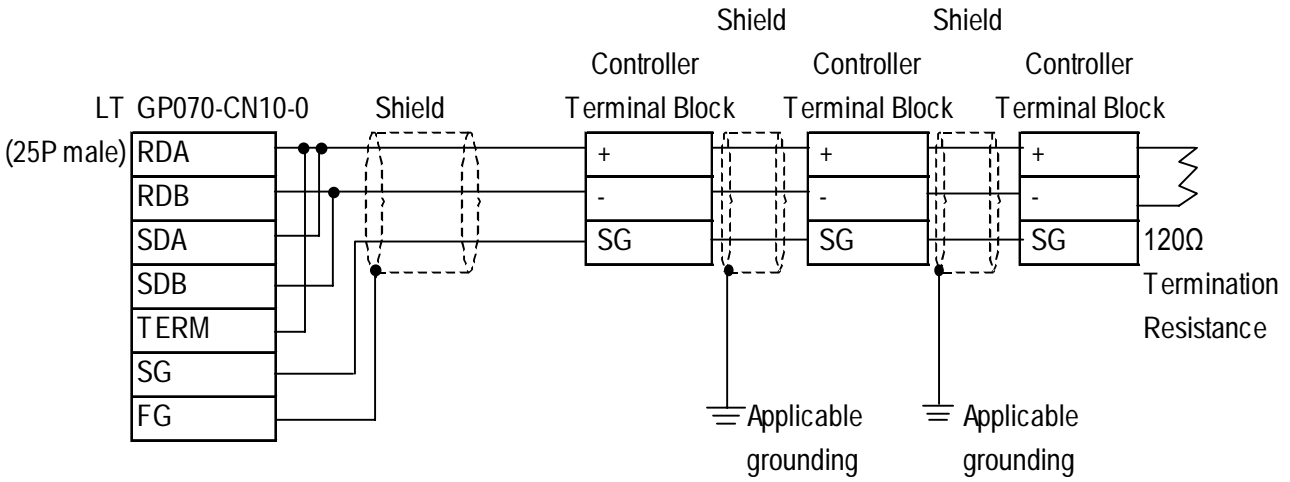


Controller Terminal Block Numbers

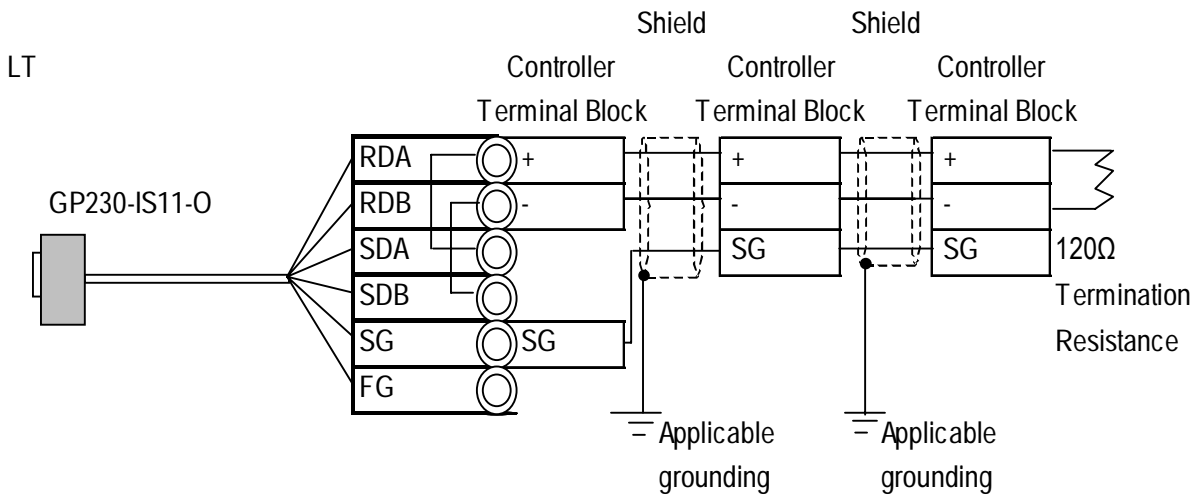
	SR91	SR92 SR93 SR94	SR82	SR83 MR13 FP93	SR84	SD16	EM70
+	11	2	17	24	21	16	27
-	12	3	18	25	22	17	28
SG	1	1	16	23	1	15	26

Cable Diagram 8 (1:n) RS-422 2-Wire

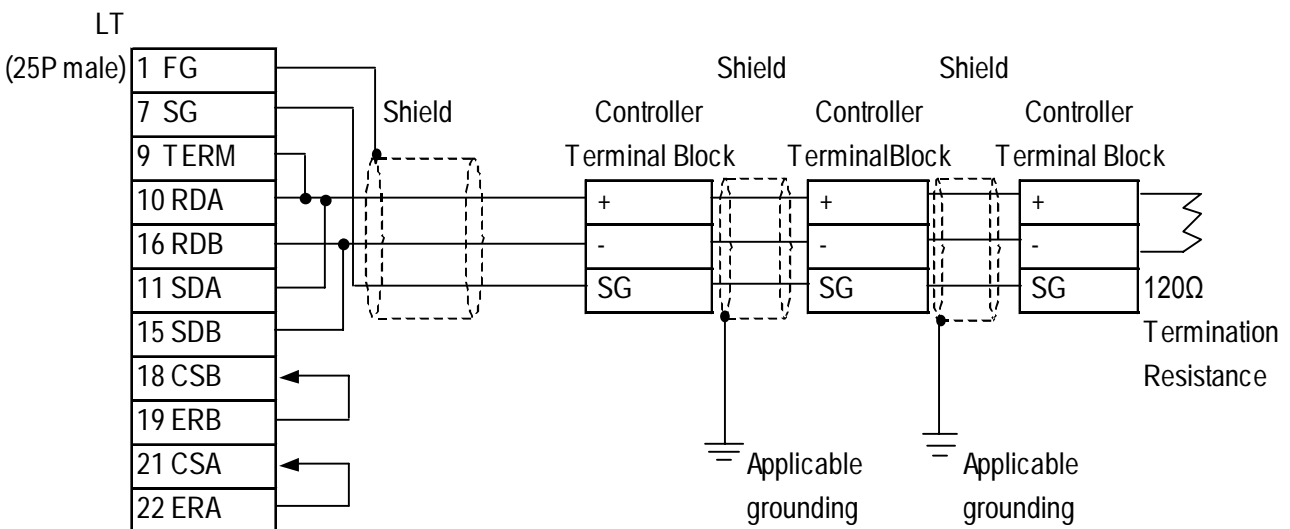
<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When using Digital's RS-422 cable GP230-IS11-0>



<When making your own cable>



Controller Terminal Block Numbers

	SR91	SR92 SR93 SR94	SR82	SR83 MR13 FP93	SR84	SD16	EM70
+	11	2	17	24	21	16	27
-	12	3	18	25	22	17	28
SG	1	1	16	23	1	15	26

2.10.3 Supported Devices

The following list shows the range of devices supported by the LT.

■ SR253/SR90/SR80/MR13/FP93/SD16/EM70 Series

Device	Bit Address	Word Address	Comments	
Data Address	_____	0020-03FF	<input type="checkbox"/> Bit F	*1*2*3 H/L
	_____	0400-07FF		
	_____	0800-0BFF		
	_____	0C00-0D7F		

*1 Depending on the series model used, certain addresses do not exist and/or devices may not be able to be read from or written to. For details, please refer to your Temperature Controller's Installation Guide.

*2 Data addresses 0200H to 021FH are double word addresses. If they are not used according to the conditions given below, Host Communication Error 08 will occur.

-All data addresses used must be even. (Ex. 0200, 0202, etc.)

-All data to be read out must be designated using even numbers. (Ex. 2, 4, etc.)

Usage Example: When using the "Numeric Display Settings" Part to display data and reading from data address 0X200, be sure to set "Data Display Format" to 32-bit. If the data is designated as 16-bit, Host Communication Error 08 will occur.

*3 File registers are each 1,024 words on your LT application.

You cannot extend over more than a single data "block" when performing the following features.

Be sure to set these features' settings so they are within a single data block.

- 1) "a-tag " settings
- 2) Performing Block read/write from Pro-Server
- 3) Designating the "Convert from" and "Convert to" address for the "Address Conversion" features



• **LT's System Area (LS0 to LS19) Settings**

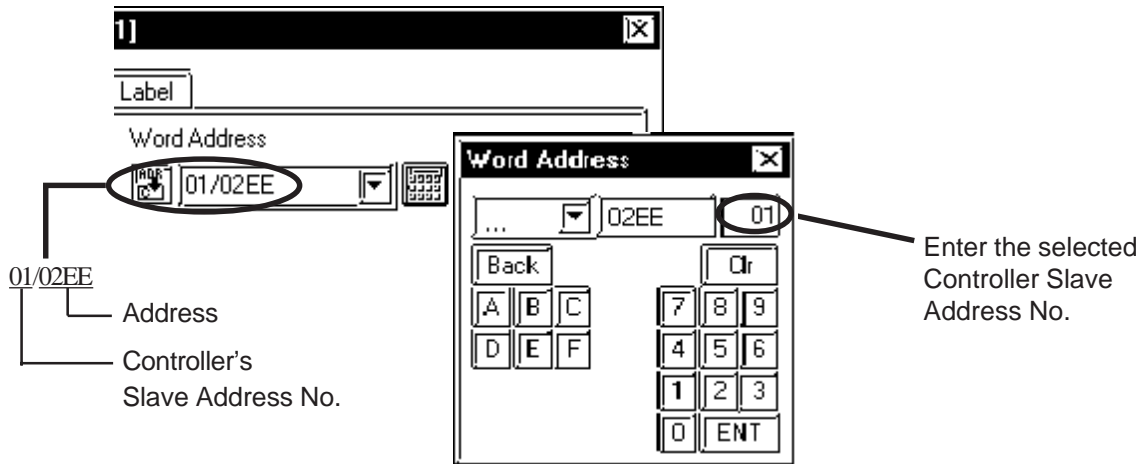
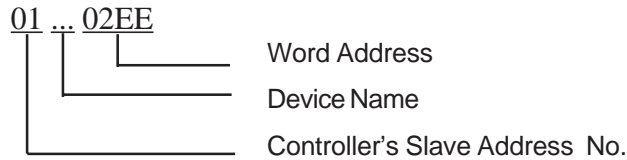
The LT's system area (20 words) cannot be allocated to the Controller's own data area. When you are entering the system area settings via the screen editor software or via the LT's OFFLINE screen, be careful that you do not use the Controller's own data area.



- **Indicating Controller Slave Address settings can be entered in your screen editor software. If a unit number is not indicated, the previously entered station number is automatically used. (The default value is 1.)**

E.g. When entering Device Address 02EE

Enter the Device Name "...", and the Word Address "02EE".



2.10.4 Environment Setup

The following table lists Digital's recommended Shimaden Co., Ltd. Controller and LT communication settings.



- ***The Temperature Controller's default data transfer speed is 1200bps. When using this unit, speeds from 2400bps to 19,200bps can be used.***
- ***The Temperature Controller's Memory Mode default setting is EEP(EEPROM). Since the number of times the EEPROM can be overwritten is fixed, try to reduce the number of times you write/overwrite data to the EEPROM.***
- ***The Temperature Controller's data transfer settings are set via the front face keys. For details, refer to your Temperature Controller's Installation Guide.***
- ***When using RS232C or RS422 2-wire communication cables, a Send Wait of over 20ms is required. If a wait of less than this is used, a communication error (PLC not responding 02:FE:** or Error in received data 02:FD:**) may occur. Be sure the Send Wait setting is 20ms or longer in your screen editor program. The default value of "0" means the program will internally insert a Send Wait of 20ms.***

■ SR253 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Rate (BPS)	19200bps
Data Length	7bits	Communication Data Format (DATA)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
Communication Format When using RS-422	RS-422 4-wire	Communication Format	RS-422A
_____	_____	Communication Protocol Mode (Mode)	Standard
_____	_____	CONTROL (Operation)	LOCAL
_____	_____	Control Codes (CTRL)	STX_ETX_CR
_____	_____	Check Sum (BCC)	Add
_____	_____	Delay Time (DELY)	0
_____	_____	Communication Memory Mode (MEM)	EEP
Unit No.	1~31	Machine Address (Add)	01~31



- **The [CONTROL Operation] feature is used to set whether the Controller's parameter setting changes are performed via the LT or via the Controller. These are indicated using the "LOCAL" (Controller) and "COMMU" (LT) selections.**
- **"Delay Time DELY" designates the time from when a command is received from the LT to when the Controller responds. Please set this value to "0". (Delay Time (ms) = setting value *0.25(ms))**
- **The Controller's machine address number range is from 0 to 99 for the SR253 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 SR253 Series units can be connected to a single LT.**

■ SR90 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Rate (bPS)	19200bps
Data Length	7bits	Communication Data Format (dAtA)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
_____	_____	Communication Mode (Comm)	Loc
_____	_____	Start Character (SchA)	Stx
_____	_____	BCC check (bcc)	1
_____	_____	Delay Time (dELY)	1
_____	_____	Memory Mode (mEm)	EEP
Unit No.	1-31	Communication Address (Addr)	01-31



- **The [Communication Mode] feature is used to set whether the Controller's parameter setting changes are performed via the LT or via the Controller. These are indicated using the "LOCAL" (Controller) and "COMMU" (LT) selections.**
- **"Delay Time DELY" designates the time from when a command is received from the LT to when the Controller responds. Please set this value to "1". (Delay Time (ms) = setting value * 0.512(ms))**
- **The Controller's Communication address number range is from 0 to 255 for the SR90 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 SR90 Series units can be connected to a single LT.**

■ SR80 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Rate (bPS)	19200bps
Data Length	7bits	Communication Data Format (dAtA)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
_____	_____	Communication Mode (Comm)	Loc
_____	_____	Control Code (Ctrl)	1
_____	_____	BCC check (bcc)	1
_____	_____	Delay Time (dELY)	1
_____	_____	Memory Mode (mEm)	EEP
Unit No.	1~31	Communication Address (Adrs)	01~31



- **The [Communication Mode] feature is used to set whether the Controller’s parameter setting changes are performed via the LT or via the Controller. These are indicated using the “LOCAL” (Controller) and “COMMU” (LT) selections.**
- **“Delay Time DELY” designates the time from when a command is received from the LT to when the Controller responds. Please set this value to “1”. (Delay Time (ms) = setting value *0.512(ms))**
- **The Controller’s Communication address number range is from 0 to 99 for the SR80 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 SR80 Series units can be connected to a single LT.**

■ MR13 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Speed (bPS)	19200bps
Data Length	7bits	Communication Data Format (dEFm)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
_____	_____	Communication Mode (mod)	Loc
_____	_____	Control Code (Ctrl)	1
_____	_____	Check Sum (bCC)	1
_____	_____	Delay Time (dELY)	0
_____	_____	Memory Mode (mEm)	EEP
Unit No.	1~31	Communication Address (Addr)	01~31



- **The [Communication Mode] feature is used to set whether the Controller's parameter setting changes are performed via the LT or via the Controller. These are indicated using the "LOCAL" (Controller) and "COMMU" (LT) selections.**
- **"Delay Time DELY" designates the time from when a command is received from the LT to when the Controller responds. Please set this value to "0". (Delay Time (ms) = setting value *0.25(ms))**
- **The Controller's Communication address number range is from 0 to 99 for the MR13 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 MR13 Series units can be connected to a single LT.**

■ FP93 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Rate (bPS)	19200bps
Data Length	7bits	Communication Data Format (dEFm)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
_____	_____	Communication Mode (Comm)	Loc
_____	_____	Start Character (SchA)	Stx
_____	_____	Check Sum (bcc)	1
_____	_____	Delay Time (dELY)	1
_____	_____	Memory Mode (mEm)	EEP
Unit No.	1~31	Communication Address (Addr)	01~31



- **The [Communication Mode] feature is used to set whether the Controller’s parameter setting changes are performed via the LT or via the Controller. These are indicated using the “LOCAL” (Controller) and “COMMU” (LT) selections.**
- **“Delay Time DELY” designates the time from when a command is received from the LT to when the Controller responds. Please set this value to “1”. (Delay Time (ms) = setting value *0.512(ms))**
- **The Controller’s Communication address number range is from 0 to 255 for the FP93 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 FP93 Series units can be connected to a single LT.**

■ SD16 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Rate (bPS)	19200bps
Data Length	7bits	Communication Data Format (dAtA)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
_____	_____	Communication Mode (Comm)	Loc
_____	_____	Start Character (SchA)	Stx
_____	_____	Delay Time (dELY)	0
Unit No.	1~31	Machine Address (Addr)	01~31



- **The [Communication Mode] feature is used to set whether the Indicator's parameter setting changes are performed via the LT or via the Indicator. These are indicated using the "LOCAL" (Indicator) and "COMMU" (LT) selections.**
- **"Delay Time DELY" designates the time from when a command is received from the LT to when the Indicator responds. Please set this value to "0". (Delay Time (ms) = setting value * 0.1(ms))**
- **The Indicator's Communication address number range is from 0 to 255 for the SD16 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 SD16 Series units can be connected to a single LT.**

■ EM70 Series

LT Settings		Controller Settings	
Baud Rate	19200bps	Communication Rate (b.)	19200bps
Data Length	7bits	Communication Data Format (dt.)	7E1
Stop Bit	1bit		
Parity Bit	even		
Data Flow Control	ER	_____	_____
Communication Format When using RS-232C	RS-232C	Communication Format	RS-232C
Communication Format When using RS-422	RS-422 2-wire	Communication Format	RS-485
_____	_____	Communication Mode (Com)	L
_____	_____	Control Code (Ctl.)	1
_____	_____	Check Sum (bCC.)	1
_____	_____	Delay Time (dL.)	0
_____	_____	Memory Mode (m.)	EEP
Unit No.	1~31	Communication Address (Adr.)	01~31



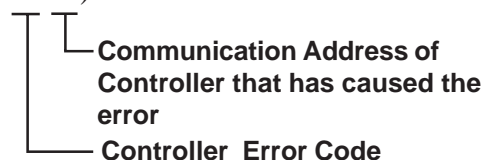
- **The [Communication Mode] feature is used to set whether the Controller’s parameter setting changes are performed via the LT or via the Controller. These are indicated using the “LOCAL” (Controller) and “COMMU” (LT) selections.**
- **“Delay Time DELY” designates the time from when a command is received from the LT to when the Controller responds. Please set this value to “0”. (Delay Time (ms) = setting value *0.25(ms))**
- **The Controller’s Communication address number range is from 0 to 99 for the EM70 Series units. Use only from 1 to 31 on the LT.**
- **With a 1:n connection, up to 31 EM70 Series units can be connected to a single LT.**

2.10.5 Error Codes

■ Controller Error Codes

Error messages (Ex. Host communication error (02:**:##)) are displayed in the lower left corner of the LT screen (** stands for an error code specific to the Controller).

Host Communication Error (02:**:##)



Error Code	Type of Code	Description
01 ^{*1}	Text section's hardware error	A " Framing overrun " , " Parity " or other type of hardware error has been detected in the text section.
07	Text section's format error	Format of this section's data does not agree with the defined format.
08	Text section's data format, data address or data amount error	Format of this section's data does not agree with the defined format, or the data address or amount exceeds the designated value(s).
09	Data error	The write data exceeds the set range for that data.
0A	RUN (Execute) Command Error	An execute command (MAN command, etc.) was received while execute commands were not being accepted.
0B	Write Mode Error	When the data overwrite command is issued, this error will occur if LOCAL mode is selected and the Text section contains a type of data that cannot be accepted.
0C	Specification, Option Error	When a write command is received that contains no specification or option data, this error will occur.

**1 MR13 Series and SD16 Series units do not have this error code.*

Refer to the Controller's manual for error code details.

3 Inverters

This chapter shows examples of system configuration, supported devices and environment setup used when connecting the inverters to the LT.



If communication is halted due to signal cable breakage, LT fault etc., the inverter does not detect such a fault.

3.1 Connectable Inverters

The following inverters can be connected to the LT.

Company	Series	Inverter *1	Link I/F or CPU direct connection	Device name in LT Editor
Mitsubishi Electric Corp.	FREQROL-A500	FR-A520-□K FR-A540-□K		MITSUBISHI FREQROL SERIES
	FREQROL-A500L	FR-A520L-□K FR-A540L-□K		
	FREQROL-E500	FR-E520-□K FR-E540-□K FR-E520S-□K FR-E510W-□K		
	FREQROL-F500	FR-F520-□K FR-F540-□K		
	FREQROL-F500L	FR-F520L-□K FR-F540L-□K		
	FREQROL-S500	FR-S510W-□K-R FR-S520-□K-R FR-S520S-□K-R		
	FREQROL-B,B3	FR-B-□K FR-B3-□□□K		
Fuji Electric Co., Ltd.	FRENICS5000G11S	FRN□□G11S-2		FUJI INVERTER
		FRN□□G11S-4		
	FRENICS5000P11S	FRN□□P11S-2		
		FRN□□P11S-4		
	FVR-E11S	FVR□□□E11S-2		
		FVR□□□E11S-7		
	FVR-C11S	FVR□□□C11S-2	Option OPC-C11S-RS□ *2	
		FVR□□□C11S-6		
FVR□□□C11S-7				

*1 The “□□□” characters in the inverter model codes reflect available options.

*2 The “□” character in the option card model code reflects the classification of the card type (either A, B, or C) according to this series inverter capacities.

Company	Series	Inverter *1	Link I/F or CPU direct connection	Device name in LT Editor
Yaskawa	Varispeed G7/F7	CIMA-G7A□□□□ CIMA-F7A□□□□	Communication Connector on Inverter	Yaskawa Inverter
	VS mini V7/J7	CIMA-V7□A□□□□	Communication Connector on Inverter	
		CIMA-J7□A□□□□	RS-422/RS-485	

**1 The “□□□” characters in the inverter model codes reflect applicable standard generator capacities.*

3.2 Mitsubishi Electric Inverters



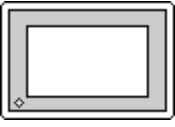
3.2.1 System Structure

The following table describes the system structure for connecting the Mitsubishi Electric inverters to the LT.





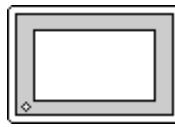
If communication is halted due to signal cable breakage, LT fault etc., the inverter will not recognize it. Use its Communication retry or Communication check to diagnose the problem and prevent an accident.

■ FREQROL-A500 Series

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-A520-□K FR-A540-□K	RS-422 (4-wire) (Cable Diagram 1)	LT Type C
	RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	




*1 “□” indicates the capacity of each inverter.

■ FREQROL-A500L Series

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-A520L-□K FR-A540L-□K	RS-422 (4-wire) (Cable Diagram 1)	LT Type C
	RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	

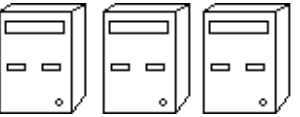


*1 “□” indicates the capacity of each inverter.

■ FREQROL-E500 Series

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-E520-□K FR-E540-□K FR-E520S-□K FR-E510W-□K	RS-422 (4-wire) (Cable Diagram 1) RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	LT Type C




*1 “□” indicates the capacity of each inverter.

■ FREQROL-F500 Series

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-F520-□K FR-F540-□K	RS-422 (4-wire) (Cable Diagram 1) RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	LT Type C




*1 “□” indicates the capacity of each inverter.

■ FREQROL-F500L Series

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-F520L-□K FR-F540L-□K	RS-422 (4-wire) (Cable Diagram 1) RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	LT Type C



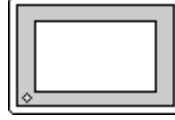
*1 “□” indicates the capacity of each inverter.

■ **FREQROL-S500 Series**

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-S520-□K FR-S520S-□K FR-S510W-□K	RS-422 (4-wire) (Cable Diagram 1) RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	LT Type C

*1 “□” indicates the capacity of each inverter.

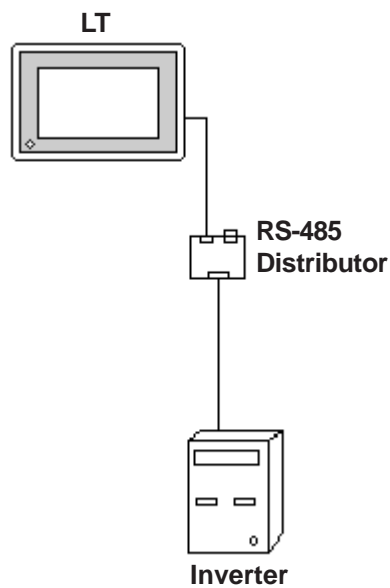
■ **FREQROL-B/B3 Series**

Inverter ^{*1}	Cable Diagram	Unit Type
		
FR-B-□K FR-B3-□□□K	RS-422 (4-wire) (Cable Diagram 1) RS-422 (4-wire, 1:n communication) (Cable Diagram 2)	LT Type C

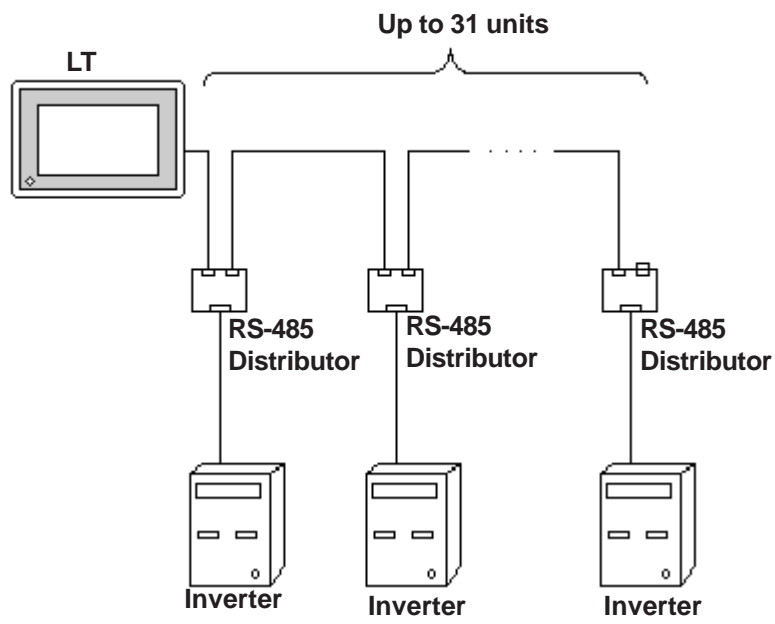
*1 “□” indicates the capacity of each inverter.

◆ **Connection Structure**

<1:1 Connection>



<1:n Connection>



3.2.2 Cable Diagrams

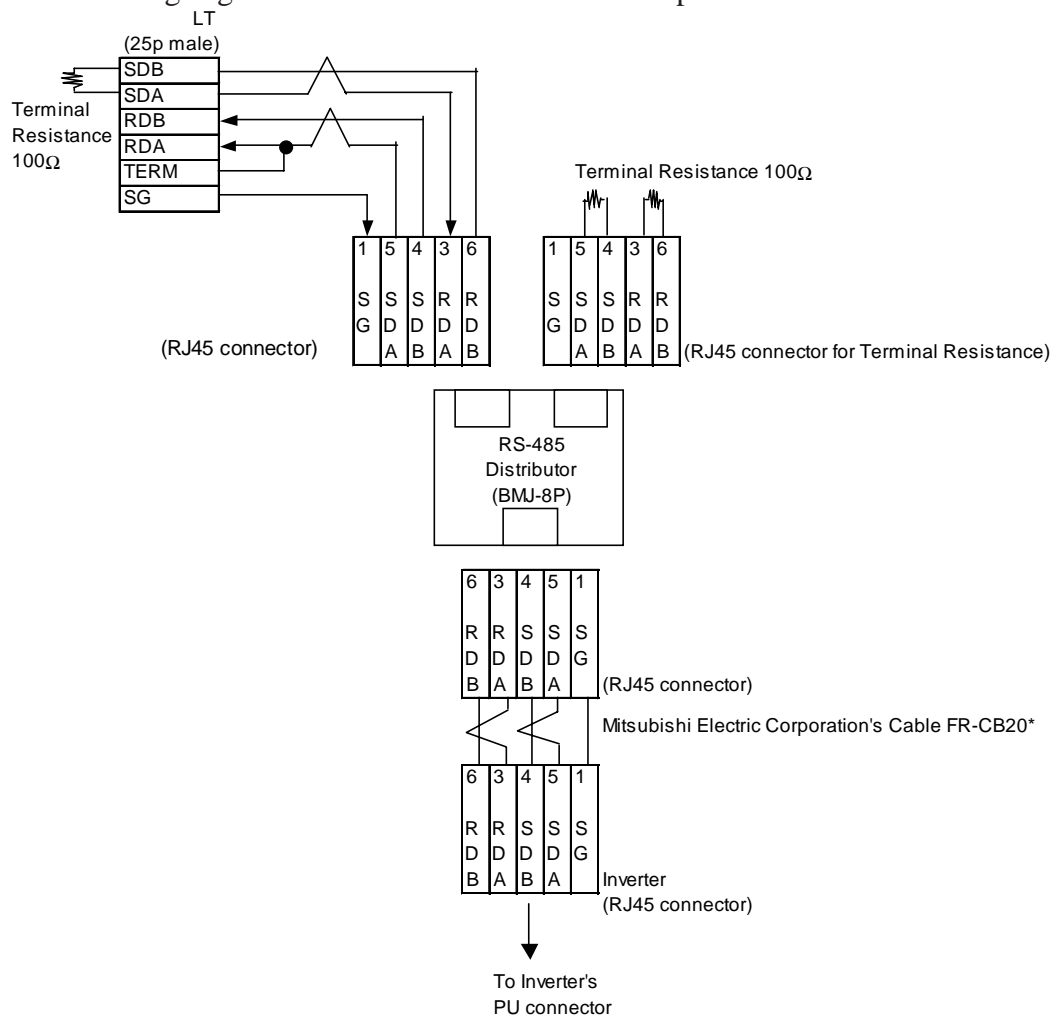
Recommended Cables

For connection of the LT and Mitsubishi Electric inverters, the following cables and cable manufacturers are recommended:

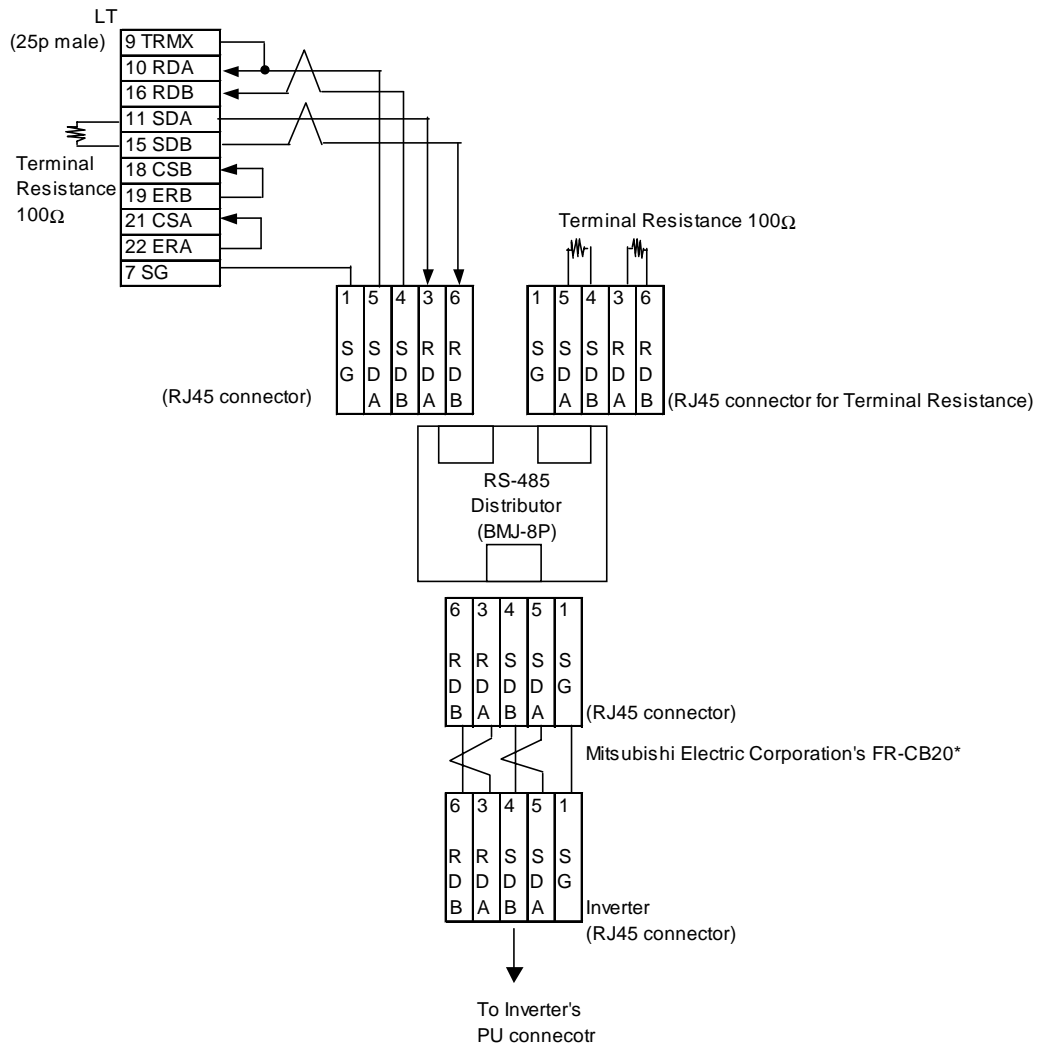
No.	Item	Model Code	Company	Remark
1	Cable (available on the market)	FR-CB201 (1m)	Mitsubishi Electric Corporation	Used for 1:n connection
2		FR-CB203 (3m)	Mitsubishi Electric Corporation	Used for 1:n connection
3		FR-CB205 (5m)	Mitsubishi Electric Corporation	Used for 1:n connection
4	Wires	SGLPEV 0.5mm×4P	Mitsubishi Electric Corporation	10BASE-T wires
5	RJ45 connector	5-554720-3	Tyco Electronics AMP K.K.	
6	RS-485 distributor (commercial type)	BMJ-8	Hakko Electric Machine Works Co., Ltd.	Used for 1:n connection End Terminal Resistance OFF
		BMJ-8P		Used for 1:n connection End Terminal Resistance ON

Cable Diagram 1

- When using Digital's RS-422 connector terminal adapter GP070-CN10-0

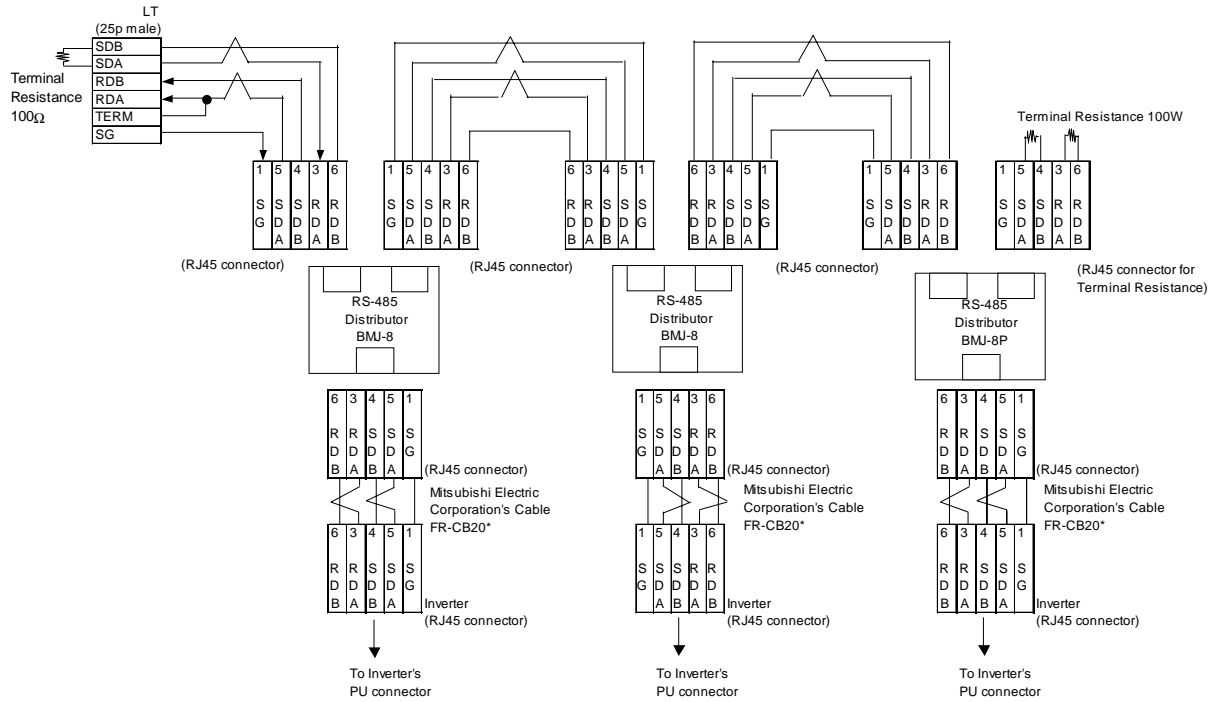


- When making your own cable

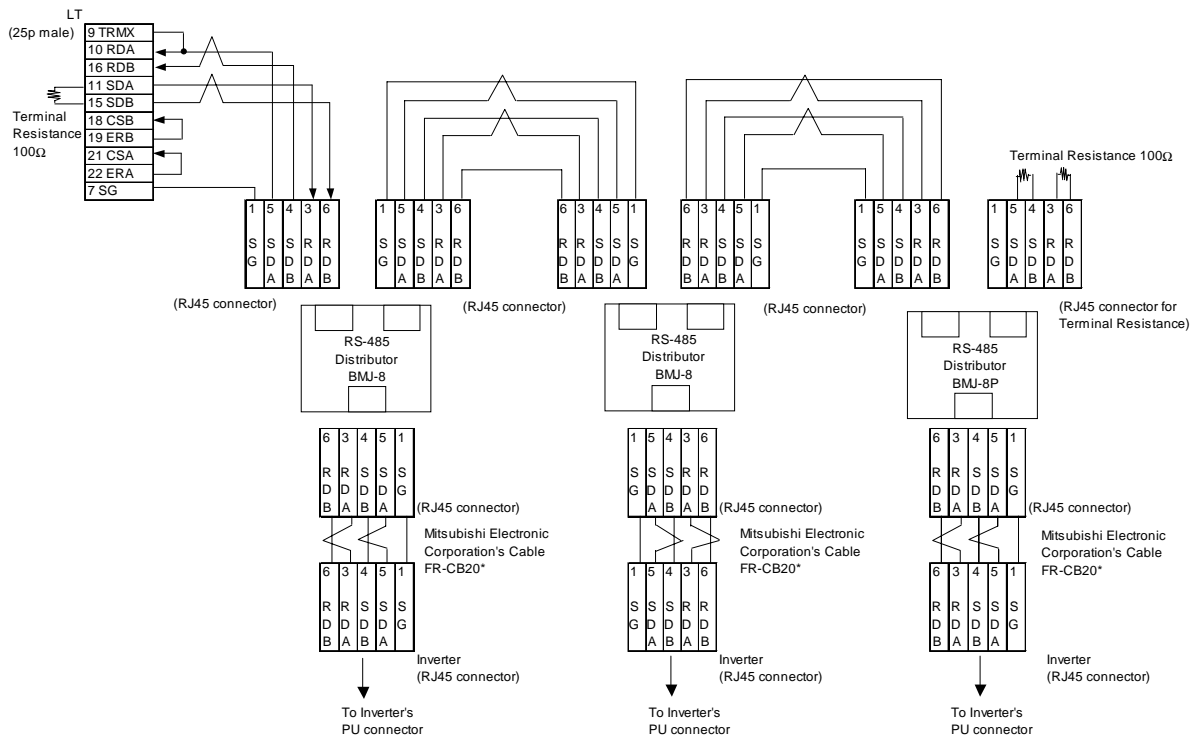


Cable Diagram 2

- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When making your own cable



3.2.3 Supported Devices

Device	Bit Addresses	Word Addresses	Remarks
Parameter (except for Pr.37 of FREQROL-S500 and FREQUROL-E500)	000000 ~ 99315	0000 ~ 0993	*1 *3
Parameter (Pr.37 of FREQROL-S500 and FREQUROL-E500)	P0037002 ~ P003731	P0037	*2 *4 H/L
Operation mode	OPE000 ~ OPE015	OPE0	*3
Output frequency (rpm)	OUTF000 ~ OUTF015	OUTF0	*5 H/L
Output current	OUTC000 ~ OUTC015	OUTC0	*5
Output voltage	OUTV000 ~ OUTV015	OUTV0	*5
Special monitor	SPM000 ~ SPM015	SPM0	*5
Special monitor selection no.	SSEL000 ~ SSEL015	SSEL	
Output frequency	SOF000 ~ SOF015	SOF0	*5
Output current	SOC000 ~ SOC015	SOC0	*5
Output voltage	SOV000 ~ SOV015	SOV0	*5
Set frequency value	FSET000 ~ FSET015	FSET0	*5
Run speed	RUNS000 ~ RUNS015	RUNS0	*5
Motor torque	MOT000 ~ MOT015	MOT0	*5
Regenerative brake	RBRK000 ~ RBRK015	RBRK0	*5
Electronic thermal load factor	ELOF000 ~ ELOF015	ELOF0	*5
Output current peak value	OCPV000 ~ OCPV015	OCPV0	*5
Converter output voltage peak value	COPK000 ~ COPK015	COPK0	*5
Input power	IPOW000 ~ IPOW015	IPOW0	*5
Output power	OPOW000 ~ OPOW015	OPOW0	*5
Alarm (latest Nos. 1 & 2)	A12D000 ~ A12D015	A12D0	*5 *3
Alarm (latest Nos. 3 & 4)	A34D000 ~ A34D015	A34D0	*5
Alarm (latest Nos. 5 & 6)	A56D000 ~ A56D015	A56D0	*5
Alarm (latest Nos. 7 & 8)	A78D000 ~ A78D015	A78D0	*5
Run command	RUNC000 ~ RUNC015	RUNC0	*6
Inverter status monitor	INVS000 ~ INVS015	INVS0	*5
Run frequency write (E ² PROM)	RWRT000 ~ RWRT015	RWRT0	*6
Set frequency write (RAM and E ² PROM)	SFWE000 ~ SFWE015	SFWE0	*6
Set frequency write (only RAM)	SFWR000 ~ SFWR015	SFWR0	*6
Set frequency read (E ² PROM)	SFRE000 ~ SFRE015	SFRE0	*5
Set frequency read (RAM)	SFRR000 ~ SFRR015	SFRR0	*5
Error all clear	ERCL000 ~ ERCL015	ERCL0	*6 *7
Inverter reset	RSET000 ~ RSET015	RSET0	*6 *7
Parameter all clear	ALLC000 ~ ALLC015	ALLC0	*6 *7
User clear	ALLC000 ~ ALLC015	ALLC0	*6 *7
Link parameter extended settings	LNKP000 ~ LNKP015	LNKP0	
No. 2 parameter change	SECP000 ~ SECP015	SECP0	

*1 For the detailed information about the parameters, refer to Mitsubishi Electric's multi-purpose inverter manuals.

*2 For the parameter 37 of FREQROL-S500 and E500, specify "P0037" has the device.

*3 This device cannot be used as 32-bit data.

*4 This is a 32-bit device.

*5 No data can be written. When performing data written, an Host Communication Error (02:F0) occurs.

*6 No data can be read out. When performing read out, an Host Communication Error (02:F0) occurs.

*7 For the data to be written, refer to the instruction manuals for various models of Mitsubishi general-purpose inverters (e.g., User Clear H9669).



- The following tables show the relations between data codes and settings as given in the instruction manuals for the above applicable devices and inverters.

[Parameter read/write]

Function	Parameter Number	Name	Data Code		
			Read	Write	Extended Set Value for Link Parameter (Data Code: 7F/FF)
Basic Functions	0	Torque boost	00	80	0
	1	Upper Frequency Limit	01	81	0
	2	Lower Frequency Limit	02	82	0
	3	Base Frequency	03	83	0

:

[Devices Other Than Parameters]

Select an applicable device from the supported device list.

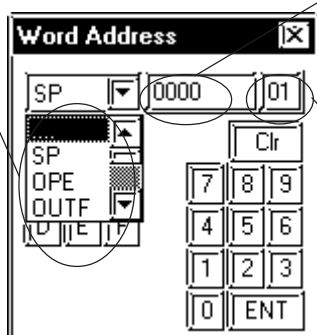
No.	Item		Command Code	Details of Data	Number of Data Digits
1	Run Mode	Read	H7B	H0000: Communication Option Operation H0001: External Operation H0002: Communication Operation (PU Connector)	4 digits
		Write	HFB	H0000: Communication Option Operation H0001: External Operation H0002: Communication Operation (PU Connector)	
2	Monitor	Output Frequency [rpm]	H6F	H0000 to HFFFF: Output Frequency (Hexadecimal) Unit: 0.01 Hz	4 digits

:

Device Input Method

The device address input method on the LT screen creation software is described below:

Device
To read/write parameters, select “....” or “SP”.



Address
For a parameter, enter the parameter number. For a P-device, the address is fixed to 0037. In other cases, the address is fixed to 0.

Inverter unit No.



- As shown in the following table, you may need to enter “9999” (meaning an invalid parameter setting or the like) depending upon the parameter types. In this case, the data written and read from the LT is as follows:

No.	Inverter Model	Inverter Setting	Written Data	Read Data
1	Other than FR-S500	9999	-1 (0xFFFF)	-1 (0xFFFF)
2		8888	-16 (0xFFFF0)	-16 (0xFFFF0)
3	FR-S500	— — —	-1 (0xFFFF)	-1 (0xFFFF)
4		888	-16 (0xFFFF0)	-16 (0xFFFF0)

- The system area (20 words) on the LT unit cannot be used. When the LT unit is offline, the system area select screen on the screen creation software looks and operates exactly like the case with the protocol that allows for using the system area. However, even if the system area is selected, it will remain deselected.

3.2.4 Environment Setup

The following tables show Pro-face’s recommended Mitsubishi Electric inverter communication settings and their corresponding settings on the LT.

LT Settings		Inverter Settings	
Baud Rate	19200bps	Baud Rate	19200bps
Data Length	8bit	Data Length	8bit
Stop Bit	2bit	Stop Bit	2bit
Parity Bit	Even	Parity Bit	Even
Data Flow Control	ER	_____	_____
Communication Format When using RS-422	RS-422 (4-wire)	_____	_____
Unit No.*1	0 ~ 31	Unit No.	0 ~ 31

◆ Setting Method

Use the inverter’s front keys to enter communication settings.

Use the following parameters 117 to 124 for the inverter communication settings.

No.	Parameter No.	Name	Setting Range
1	117	Station number	0 ~ 31
2	118	Communication Speed	48...4800bps 96...9600bps 192...19200bps
3	119	Stop bit length/Data length	0...8/1 1...8/2 10...7/1 11...7/2
4	120	Parity check Presence/Absence	0: OFF 1: Even 2: Odd
5	121	Number of communication retries	0 ~ 10,9999 or --- *1
6	122	Communication check time internal	except 0 *2
7	123	Waiting time settings	9999 or ---
8	124	CR, LF Presence/Absence selection	0: CR/LF OFF 1: CR ON 2: CR/LF ON

*1 Depending on the environment, change the setting range.

*2 Depending on the environment, set any number except 0.

3.2.5 Error Codes

■ Inverter Specific Error Codes

The following error numbers are supported by the inverters. Each error number (format = 02:00: ΔΔ) will be displayed on the left bottom of the LT screens. (The “00” characters reflect an error number displayed on the LT (shown in the table below) and the “ΔΔ” characters reflect an inverter unit number where the error occurs.)

Reference *Mitsubishi Electric Corporation; Each inverter series’ Operation Manual*

Error No.	Error Name	Causes
00	Computer NAK error	_____
01	Parity error	The LT parity settings are incorrect.
02	Sum check error	An error occurred on communication data due to noise, etc.
03	Protocol error	_____
04	Flaming error	An error occurred on communication data due to noise, etc., or the stop bit settings are incorrect.
05	Overrun error	_____
06	_____	_____
07	Character error	_____
08	_____	_____
09	_____	_____
0A	Mode error	Parameter write was attempted when the mode is not the computer link operation mode or while the inverter is operating.
0B	Instruction code error	A non-existent address has been designated during screen creation.
0C	Data range error	When parameter or operation frequency data was written, the designated data was exceeded the correct setting range.
0D	_____	_____
0E	_____	_____
0F	_____	_____

Depending on the inverter specifications, when multiple errors occurred simultaneously, the larger error number will be displayed.

3.3 Fuji Electric Inverters




3.3.1 System Structure

The following describes the system configuration used when connecting Fuji Electric inverters to the LT.






- **If a communication error occurs while the unit is operating, a stop command may not be recognized via RS-485. To prevent accidents, be sure to use the inverter external signal terminal's forced stop function so that emergency stop will always be enabled.**
- **If an alarm is reset with a run command sent via RS-485, the unit will suddenly restart. To prevent accidents, be sure to confirm that the run command is not being sent.**

■ FRENICS5000G11S Series



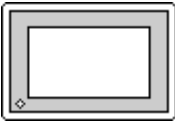
Inverter ^{*1}	Cable Diagram	Unit Type
		
FRN□□G11S-2 FRN□□G11S-4	RS-485 (1:1) (Cable Diagram 1) RS-485(1:n) (Cable Diagram 2)	LT Type C

■ FRENICS5000P11S Series




Inverter ^{*1}	Cable Diagram	Unit Type
		
FRN□□P11S-2 FRN□□P11S-4	RS-485 (1:1) (Cable Diagram 1) RS-485(1:n) (Cable Diagram 2)	LT Type C

*1 The “□□□” characters in the inverter model codes reflect standard applicable generator capacities.

■ FVR-E11S Series

Inverter ^{*1}	Cable Diagram	Unit Type
		
FVR□□□E11S-2 FVR□□□E11S-7	RS-485 (1:1) (Cable Diagram 3) RS-485(1:n) (Cable Diagram 4)	LT Type C

■ FVR-C11S Series (Optional for Communication)

Inverter ^{*1}	Communication I/F	Cable Diagram	Unit Type
			
FVR□□□C11S-2 FVR□□□C11S-6 FVR□□□C11S-7	Option: OPC-C11S-RS□ ^{*2}	RS-485 (1:1) (Cable Diagram 1) RS-485(1:n) (Cable Diagram 2)	LT Type C

*1 The “□□□” characters in the inverter model codes reflect standard applicable generator capacities.

*2 The “□” character in the option card model code reflects the classification of the card type (either A, B, or C) according to this series inverter capacities.

3.3.2 Cable Diagrams



- *The following cables are recommended:*

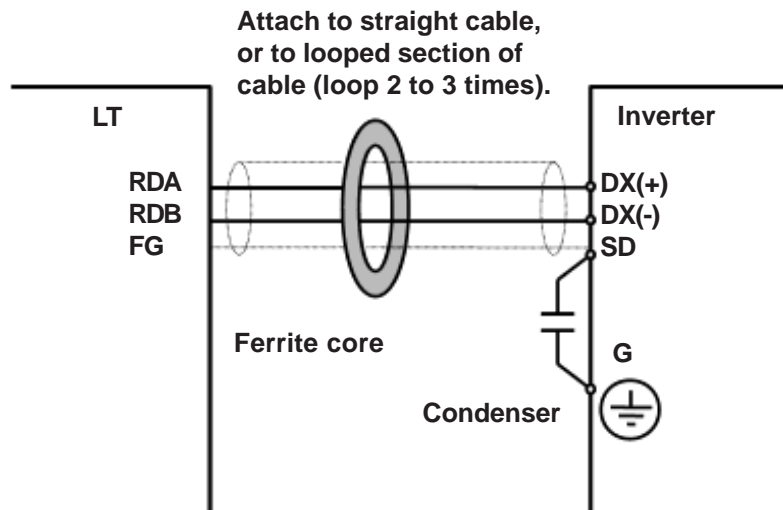
<For G11S, P11S, C11S>

Furukawa Electric UL AWM2789 1/0.65 mm² long distance braided shield cable

< For E11S>

Cable conforming to EIA568 standard (for 10BASE-T), as well as RJ45 connector

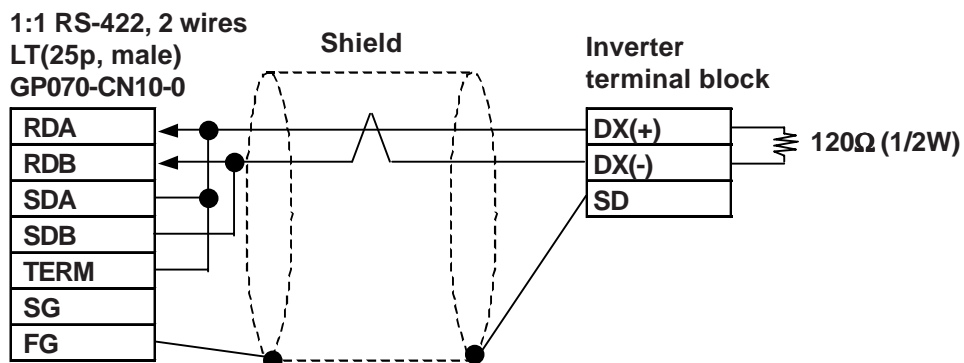
- *The maximum length of a cable (transmission distance) is 500m.*
- *Depending on the usage environment, a unit may malfunction due to noise generated from the inverter. In such a case, connect a ferrite core or condenser to the cable.*



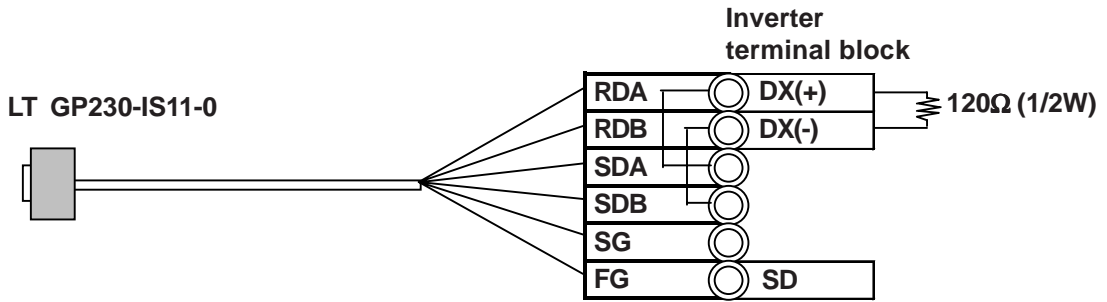
- *A terminating resistor (100W) has been embedded in the E11S. When connecting the inverter to the end of the cable, turn ON SW2 located below the connector.*

Cable Diagram 1 (1:1)

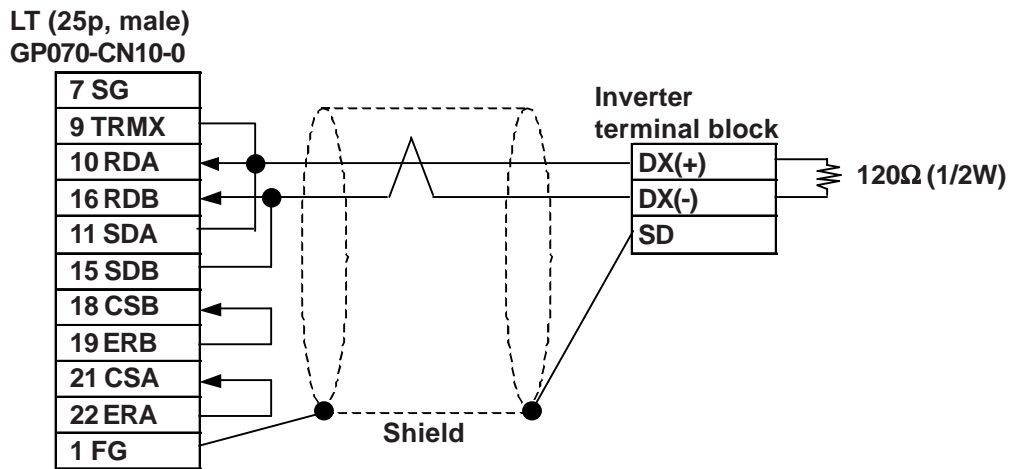
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When using Digital's RS-422 connector terminal adapter GP070-CN10-0

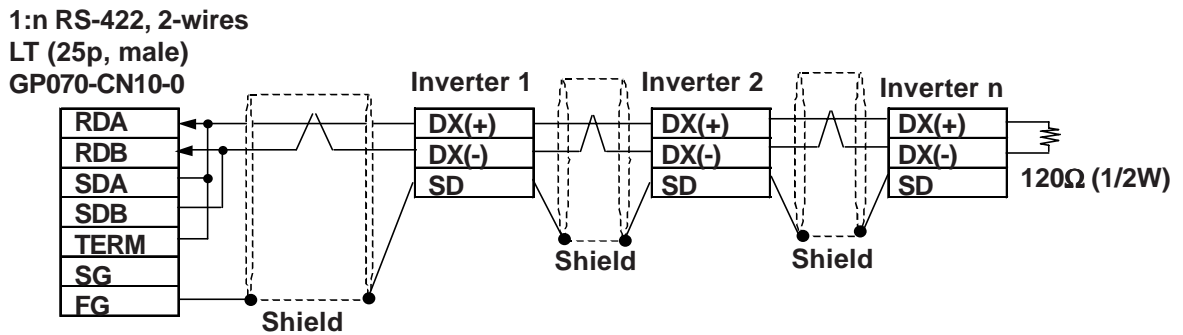


- When making your own cable

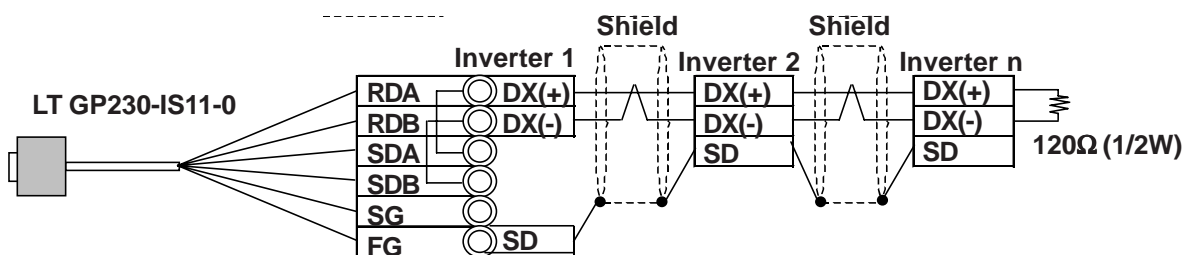


Cable Diagram 2 (1:n)

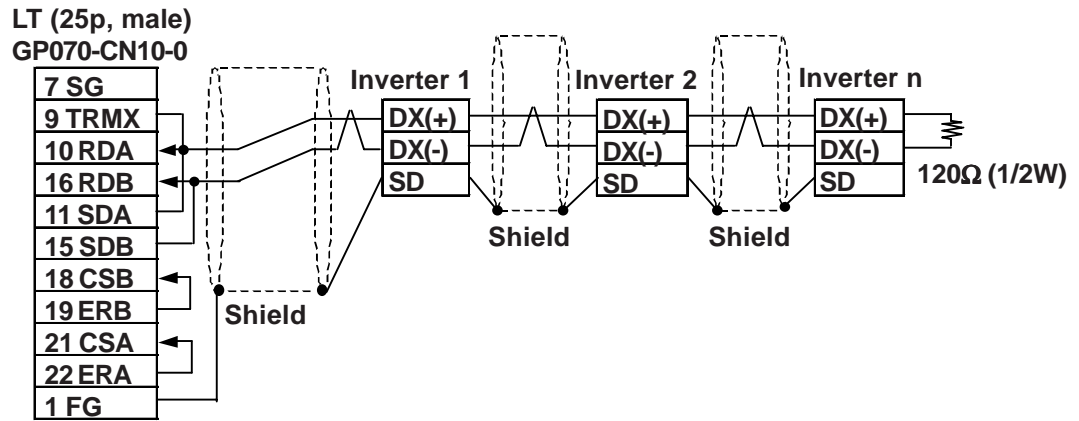
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0



- When making your own cable



- When making your own cable

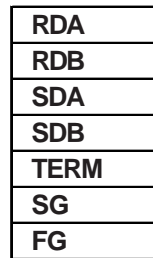


Cable Diagram 3 (1:1)

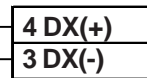
- When using Digital's RS-422 connector terminal adapter GP070-CN10-0

1:1 RS-422, 2-wire

LT (25p, male)
GP070-CN10-0

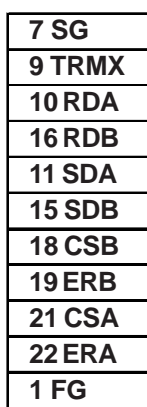


Inverter
RJ45 connector

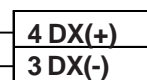


- When making your own cable

LT (25p, male)
GP070-CN10-0



Inverter
RJ45 connector



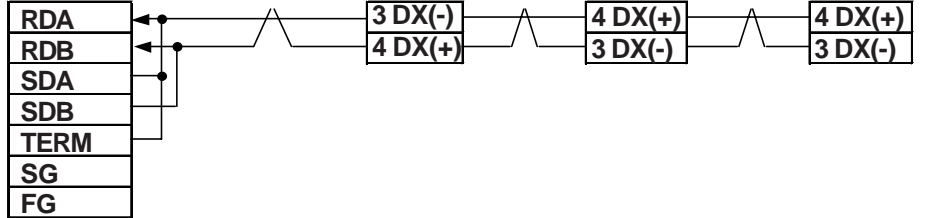
Cable Diagram 4 (1:n)

- When using Digital's RS-422 connector terminal adapter GP070-CN10-0

1:n RS-422, 2-wire

LT (25p, male)

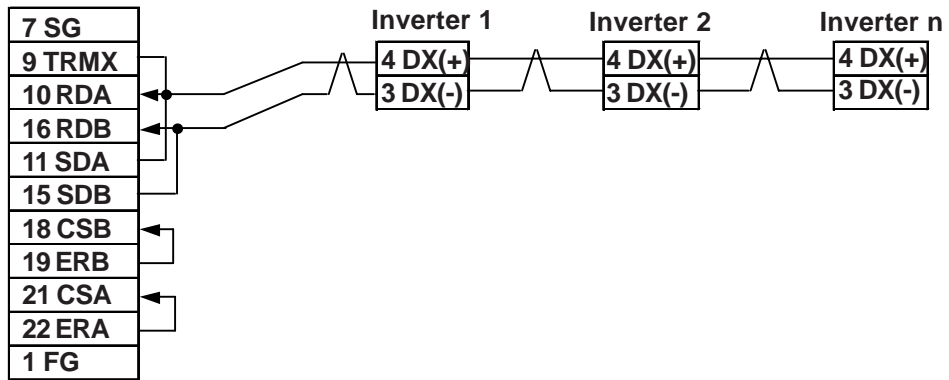
GP070-CN10-0



- When making your own cable

LT (25p, male)

GP070-CN10-0



3.3.3 Supported Devices

■ FRENICS5000G11S/FRENICS5000P11S Series

Device	Bit Addresses	Word Addresses	Remarks	
Basic function	F0000 ~ F4215	F00 ~ F42	L/H	
Terminal function	E0100 ~ E4715	E01 ~ E47		
Controlling function	C0100 ~ C3315	C01 ~ C33		
Motor 1	P0100 ~ P0915	P01 ~ P09		
High level function	H0300 ~ H3915	H03 ~ H39		
Motor 2	A0100 ~ A1815	A01 ~ A18		
Option	o0000 ~ o2915	o00 ~ o29		
Command data	S0100 ~ S1115	S01 ~ S11		
Monitor data	M0100 ~ M4815	M01 ~ M48		*1
Alarm reset	—————	m00		*2

*1 Data write cannot be performed.

*2 “m00” is a virtual device and is used to reset the history of alarms occurred on the inverter.

Writing any data to “m00” will reset the alarm. However, data read cannot be performed.

■ FRENICS5000E11S Series

Device	Bit Addresses	Word Addresses	Remarks	
Basic function	F0000 ~ F4215	F00 ~ F42	L/H	
Terminal function	E0100 ~ E4215	E01 ~ E42		
Controlling function	C0100 ~ C3315	C01 ~ C33		
Motor 1	P0100 ~ P1015	P01 ~ P10		
High level function	H0100 ~ H4615	H01 ~ H46		
Motor 2	A0100 ~ A1915	A01 ~ A19		
Command data	S0100 ~ S1115	S01 ~ S11		
Monitor data	M0100 ~ M4815	M01 ~ M48		*1
Alarm reset	—————	m00		*2

*1 Data write cannot be performed.

*2 “m00” is a virtual device and is used to reset the history of alarms occurred on the inverter.

Writing any data to “m00” will reset the alarm. However, data read cannot be performed.

■ FRENICS5000G11S/FRENICS5000P11S Series

Device	Bit Addresses	Word Addresses	Remarks	
Basic function	F0000 ~ F3615	F00 ~ F36	L/H	
Terminal function	E0100 ~ E0315	E01 ~ E03		
Controlling function	C0100 ~ C0715	C01 ~ C07		
Motor 1	P0000 ~ P0015	P00		
High level function	H0100 ~ H2515	H01 ~ H25		
Option	O0000 ~ O1115	o00 ~ o11		*1
Command data	S05 ~ S06	S05 ~ S06		
Monitor data	M0100 ~ M4815	M01 ~ M48		*1
Alarm reset	—————	m00		*2

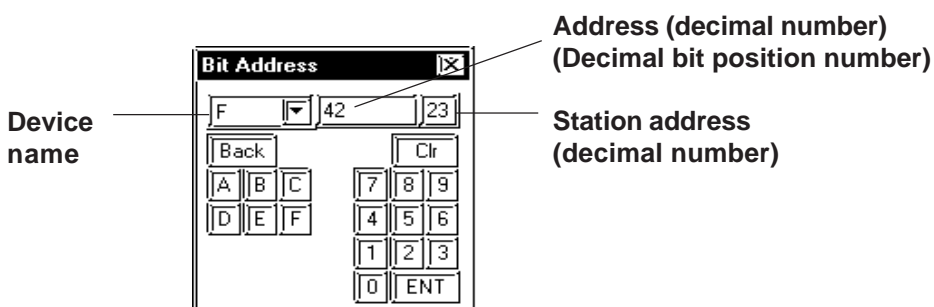
*1 Data write cannot be performed.

*2 “m00” is a virtual device and is used to reset the history of alarms occurred on the inverter.

Writing any data to “m00” will reset the alarm. However, data read cannot be performed.



- The system area (20 words) cannot be used. Also, on the LT OFFLINE mode, the protocol display and operation will be the same as that which appears when the system area can be used. Even if the system area is selected on these screens, however, it will automatically be designated as not selected.
- Depending on the inverter series, supported functions and ranges will vary. For more detailed information, refer to each inverter series’ operation manual.
- In the LT Editor, enter the device address and station address as follows:



3.3.4 Environment Setup

■ FRENICS5000G11S/FRENICS5000P11S Series

LT Settings		Inverter Settings		Setting Function
Baud Rate	9600bps	Baud rate	9600bps	H34
Data Length	8bit	Data Length	8bit	H35
Stop Bit	2bit	Stop Bit	2bit	H37
Parity Bit	None	Parity Bit	None	H36
Data Flow Control	ER	——	——	——
Communication Format	2-wire type	——	——	——
Station Address	1 ~ 31	Station Address	1 ~ 31	H31

■ FVR-E11S Series

LT Settings		Inverter Settings		Setting Function
Baud Rate	9600bps	Baud rate	9600bps	H34
Data Length	8bit	Data Length	8bit	H35
Stop Bit	1bit	Stop Bit	1bit	H37
Parity Bit	None	Parity Bit	None	H36
Data Flow Control	ER	——	——	——
Communication Format	2-wire type	——	——	——
Unit No.	1 ~ 31	Station Address	1 ~ 31	H31

■ FVR-C11S Series

LT Settings		Inverter Settings		Setting Function
Baud Rate	9600bps	Baud rate	9600bps	o04
Data Length	8bit	Data Length	8bit	o05
Stop Bit	2bit	Stop Bit	2bit	o07
Parity Bit	None	Parity Bit	None	o06
Data Flow Control	ER	——	——	——
Communication Format	2-wire type	——	——	——
Unit No.	1 ~ 31	Station Address	1 ~ 31	o01
——	——	Optional selection	1	o00



The FVR-C11S Series requires a communication card (Model: OPC-C11S-RS*). Be sure to set “o00” to 1 to enable the RS-485 communication option.

3.3.5 Error Codes

■ Inverter Specific Error Codes

The error codes specific to the inverters will appear on the LT screen's left bottom, as "Host Communication Error (02:**:##)". (The "**" characters indicate an error code specific to the inverter, and the "##" characters indicate the station address of the inverter on which an error occurred.)

Error Codes

Error Code	Error Name	Description
4AH	Format error	<ul style="list-style-type: none"> Data transmission request statement characters are incorrect. The last character of the request statement is not in the correct position.
4BH	Command error	<ul style="list-style-type: none"> A non-existent command has been sent.
4CH	Link priority error	<ul style="list-style-type: none"> It was attempted to write command or operation command data, with the link option installed. (When the link option has been installed, the command and operation command data cannot be written via RS-485.)
4DH	No write authorization error	<ul style="list-style-type: none"> It was attempted to write new function data during data write from the link option.
4EH	Function code error	<ul style="list-style-type: none"> A non-existent function code has been requested.
4FH	Write inhibit error	<ul style="list-style-type: none"> It was attempted to write an operation inhibit function or write inhibit during run function while the unit was operating.
50H	Data error	<ul style="list-style-type: none"> Data that has been written has exceeded an effective range.
51H	Write error	<ul style="list-style-type: none"> It was attempted to write new function data during writing another function.



- The latest communication error code has been stored in M26.
- Alarms occurred on the inverter will have either code numbers M16, M17, M18, or M19.

M16: Latest alarm

M17: Previous alarm

M18: Alarm before the previous alarm

M19: Alarm before the two old alarms

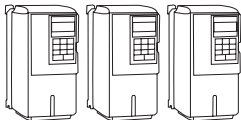


For more detailed information, refer to your inverter's operation manual.

3.4 Yaskawa Inverters

3.4.1 System Structure

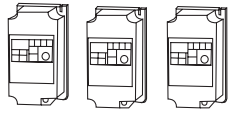


This section explains the system structure for the connection between an inverter made by Yaskawa and the LT.

■ Varispeed G7/F7 Series

Inverter ^{*1}	Link I/F	Cable Diagram	Unit Type
			
CIMR-G7A□□□□ CIMR-F7A□□□□	Communication connector on inverter	RS-422 (1:1 connection, 4-wire type) <Cable Diagram 1> RS-422 (1:n connection, 4-wire type) <Cable Diagram 2> RS-422 (1:1 connection, 2-wire type) <Cable Diagram 3> RS-422 (1:n connection, 2-wire type) <Cable Diagram 4>	LT Type C

**1 The • in the inverter model differs depending upon the maximum applicable motor capacity.*

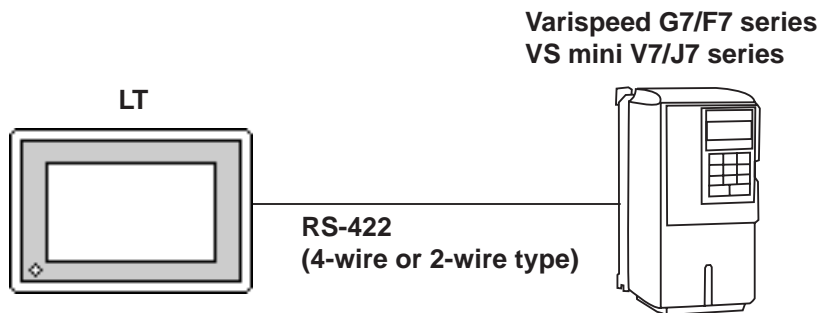
■ Vs mini V7/J7 Series

Inverter ^{*1}	Link I/F	Cable Diagram	Unit Type
			
CIMR-V7□A□□□□	Communication connector on inverter	RS-422 (1:1 connection, 4-wire type) <Cable Diagram 1> RS-422 (1:n connection, 4-wire type) <Cable Diagram 2>	LT Type C
CIMR-J7□A□□□□	RS-422/RS-485 I/F card (S1-485/J7)	RS-422 (1:1 connection, 2-wire type) <Cable Diagram 3> RS-422 (1:n connection, 2-wire type) <Cable Diagram 4>	

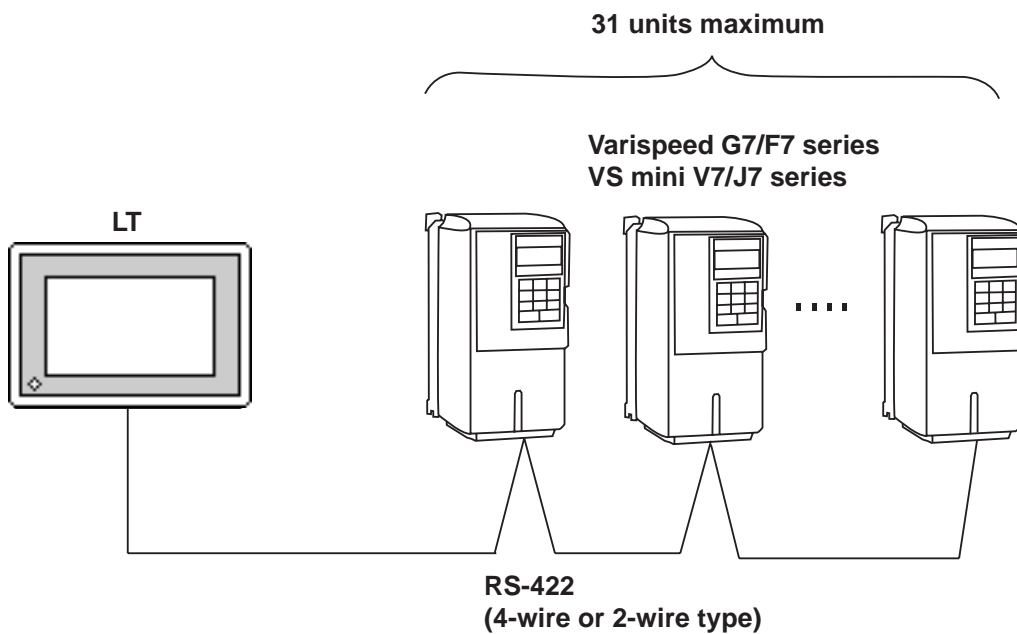
**1 The • in the inverter model differs depending upon the maximum applicable motor capacity.*

■ Connection Structure

◆ 1 : 1 connection



◆ 1 : n connection



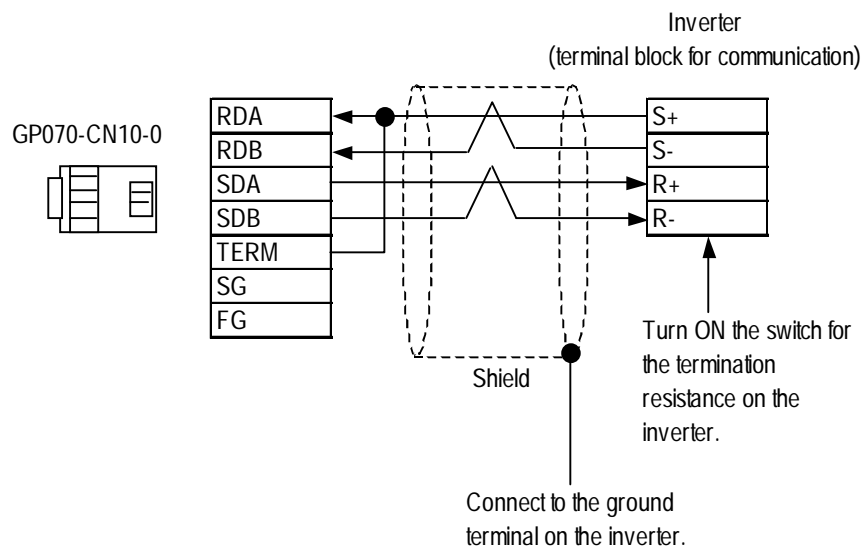
3.4.2 Cable Diagrams



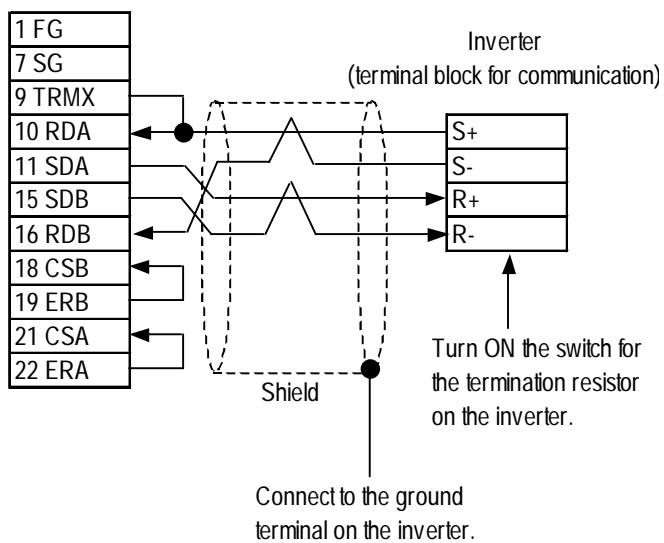
- **Separate the communication wiring from the main circuit wiring and other power line.**
- **Ground the FG according to your country's applicable standards.**
- **When the RS-422 port is used, limit the cable length to 500 meters maximum.**
- **To connect the shielded cable to the FG, use the ground terminal on the inverter rather than that on the LT.**

Cable Diagram 1 (1:1 RS-422, 4-wire type)

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

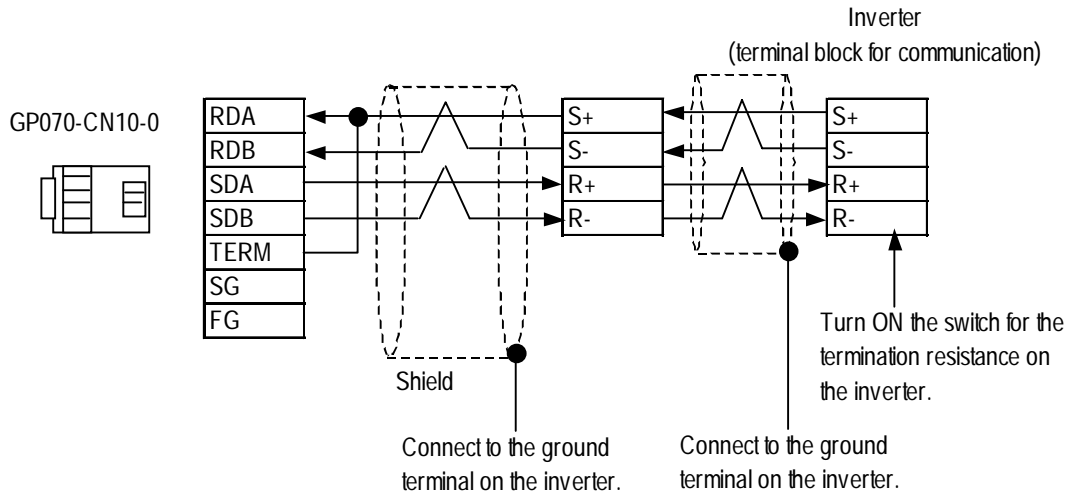


<When making your own connection>

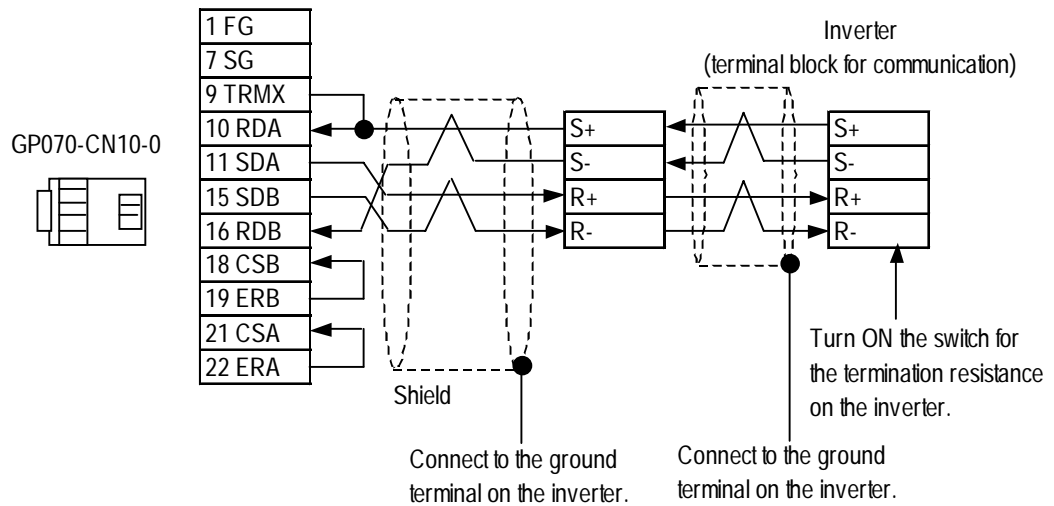


Cable Diagram 2 (1:n RS-422, 4-wire type)

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

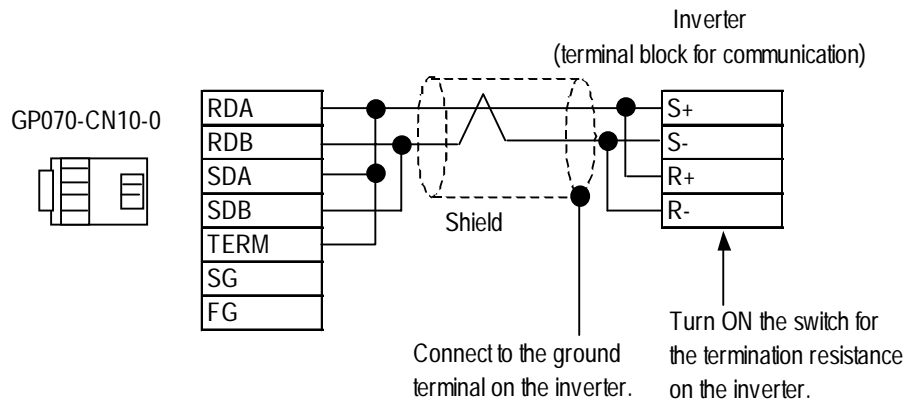


<When making your own connection>

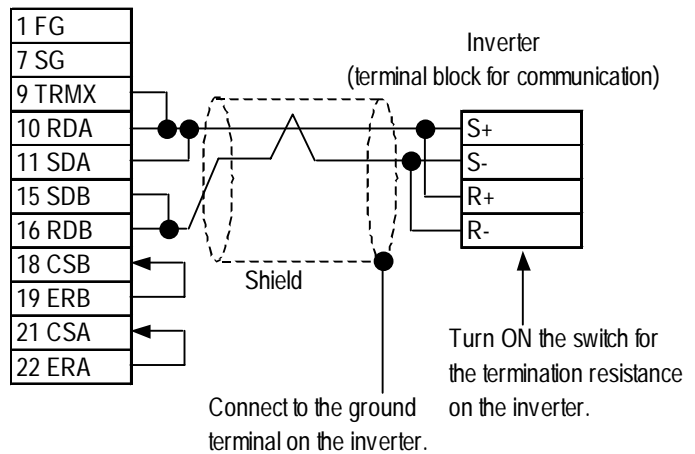


Cable Diagram 3 (1:1 RS-422, 2-wire type)

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>

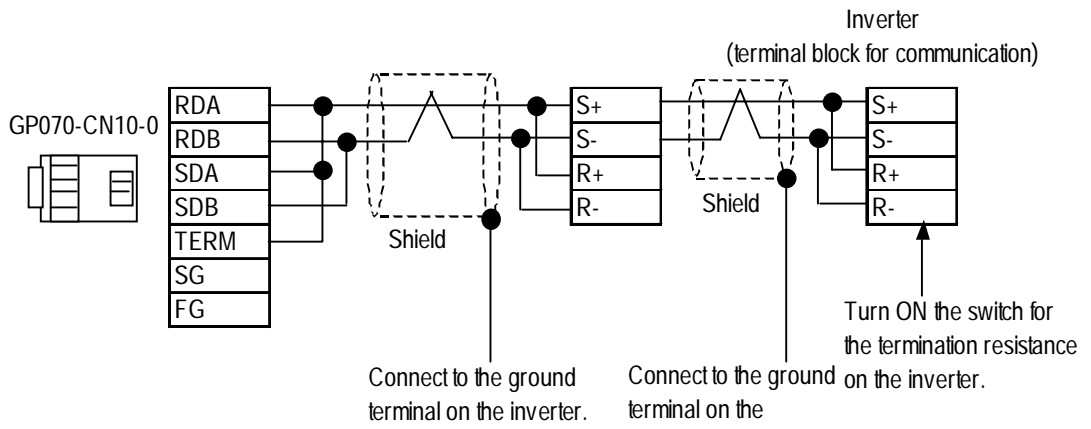


<When making your own connection>

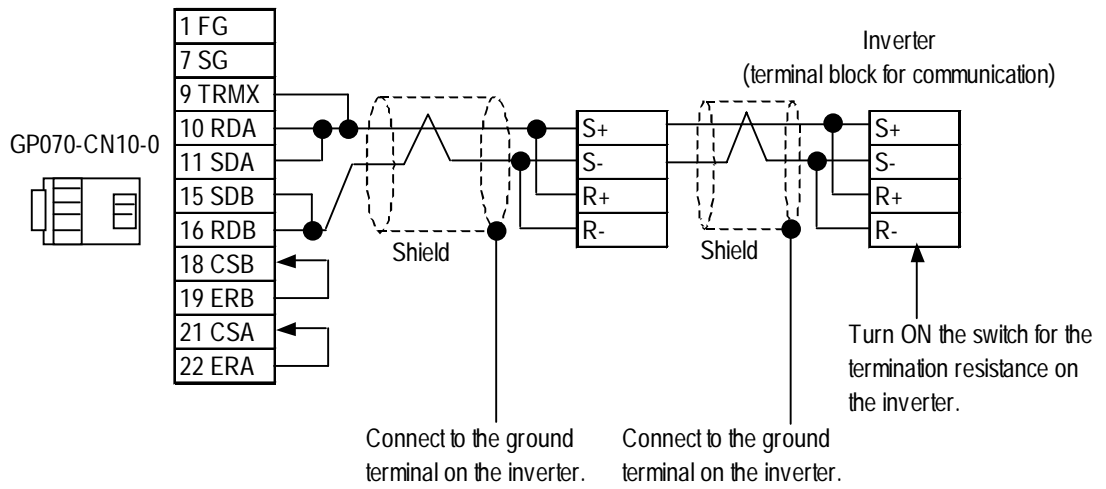


Cable Diagram 4 (1:n RS-422, 2-wire type)

<When using Digital's RS-422 connector terminal adapter GP070-CN10-0>



<When making your own connection>



3.4.3 Supported Devices

Varispeed G7/F7 Series vs. mini V7/J7 Series

 Setup System Area here.

Device	Bit Addresses	Word Addresses	Remarks
Bit Register	BR00000 ~ BR03FFF	_____	*1*2*3*4 L/H
	BR04000 ~ BR07FFF	_____	
	BR08000 ~ BR0BFFF	_____	
Register	_____	0000 ~ 03FF	*1*2 Bit F
	_____	0400 ~ 07FF	
	_____	0800 ~ 0BFF	

*1 The available register numbers and the availability of read/write are different depending upon the inverter models. For further information, refer to the instruction manual for each inverter model.

*2 Specify the MEMOBUS register number indicated in the instruction manual for your inverter. As an example, the correspondence of the constant numbers and names of the inverter to register numbers is shown below. For further information, refer to the instruction manual for each inverter model.

Ex) Inverter Constant Numbers and Names and Register Numbers

Constant No.	Name	Description	Setting Range	Default Value	Change during Operation	Control Mode			MEMOBUS Register
						V/f without PG	V/f with PG	Vector without PG	
A1-02	Selection of Control Mode	Select an inverter control mode. 0: V/f control without PG 1: V/f control with PG 2: Vector control without PG The control mode is not initialized by selecting INITIALIZE.	0 ~ 2	0	x	0	0	0	102H
b1-01	Selection of frequency command	Select a frequency command input method. 0: Digital operator 1: Control circuit terminal (analog input) 2: MEMOBUS communication 3: Optional card 4: Pulse column input	0 ~ 4	1	x	0	0	0	180H

Register No.

Settings on LT Editor

<Bit register>

01/BR 0001 F

- Bit address (use 0 to F)
- Device address (MEMOBUS register number of inverter)
- Device name
- Station address of inverter

Enter the station address of the inverter to be specified.

<Register>

01/0001

- Device address (MEMOBUS register number of inverter)
- Station address of inverter

Enter the station address of the inverter to be specified.

*3 When data is written, the values other than those for the specified bits of the selected register are retained. (Immediately before data is written, the data on the selected register is temporarily read out, and then written with only the specified bits rewritten.)

*4 To write bits to a write-only register, use the register device instead. Trying to write data to a write-only register will result in a host communication error (02:02:##) (## stands for the station address at which the error has occurred). Refer to "15.4.5 Error Codes."

*5 When data is written to bit addresses, this write is made on a word basis. Therefore, all the bits other than the specified ones on the same register will be turned OFF.



- **The system data area (20 words) of the LT cannot be allocated to the data area available on the inverter. Even if the system data area is set using the LT Editor or the offline LT, this allocation cannot be made. To use the read-in area, specify the first address of the system area.**

3.4.4 Environment Setup

■ Varispeed G7/F7 Series

LT Settings		Inverter Settings	
Baud Rate	9600bps	Port Transmission Rate	9600bps
Data Length	8bit	Data Length	8 bits (fixed)
Stop Bit	2bit	Stop Bit	1 bit (fixed)
Parity Bit	Even	Parity Bit ^{*1}	Even Parity
Control Method	ER Control	RTS Control	Provided
Communication Format	2-wire/4-wire type	_____	_____
Station No. (DEC)	1	Station Address (HEX)	1 ~ 1F
_____		Selection of Frequency Command ^{*2}	MEMOBUS Communication
		Selection of Operation Command ^{*3}	MEMOBUS Communication

**1 The default value is Parity Invalid.*

**2 Make this selection when issuing the frequency command from the LT.*

**3 Make this selection when issuing the operation command from the LT.*

■ VS mini V7/J7 Series

LT Settings		Inverter Settings	
Baud Rate	9600bps	Port Transmission Rate	9600bps
Data Length	8bit	Data Length	8 bits (fixed)
Stop Bit	2bit	Stop Bit	1 bit (fixed)
Parity Bit	Even	Parity Bit	Even Parity
Control Method	ER Control	RTS Control	Provided
Communication Format	2-wire/4-wire type	_____	_____
Station No. (DEC)	1	Station Address (DEC)	1 ~ 31
_____		Selection of Frequency Command ^{*1}	MEMOBUS Communication
		Selection of Operation Command ^{*2}	MEMOBUS Communication

**1 Make this selection when issuing the frequency command from the LT.*

**2 Make this selection when issuing the operation command from the LT.*

3.4.5 Error Codes

<Error Codes Specific to Inverters>

An error code specific to the inverter is displayed in the lower left corner of the LT screen such as "Host communication error (02:**:##)." ** stands for the error code specific to the Inverter. ## stands for the station address of the inverter where the error has occurred.

■ Error Codes

Error Code	Error Name	Description
01	Function code error	A function code that is not available on the inverter was used.
02	Wrong register number	The register you tried to access is not used. A register that is not used was specified at the start address for continuous read-out.
03	Wrong number of registers	The number of read-out data is not within a range between 1 and 16. When data was written, the number of data in the message is not the number of registers multiplied by 2.
21	Setting error	When any control data or constant was written, it was outside the allowable setting range.
22	Write mode error	When the inverter is protected from write (e.g., during its operation), you tried to write data. Data was written to a read-only register.
23	Write during UV operation	Data was written when the main circuit was at low voltage (UV).
24	Write during processing of constants	You tried to write data when the inverter was processing constants.

4 Servos

This chapter describes system configurations using the LT and each manufacturer's servo, as well as applicable devices for those configurations. It also gives examples of environment setup.

4.1 Connectable Servos

The following table lists the servos that can be connected to the LT:

Company	Series	CPU *1	Device name in LT Editor
Matsushita Electric Industrial Co.	MINAS-A	M□DA□□□□□□	Matsushita Electric Industrial Co.'s MINAS-A/S Series
	MINAS-S	MUDS□□□□□□	

*1 □□□□□□ varies depending upon the servo types.

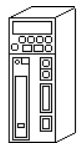

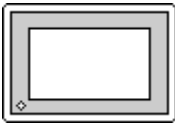


4.2 Matsushita Electric Industrial Servo

4.2.1 System Structure

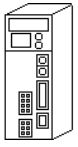

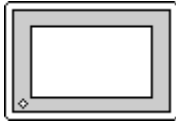
This subsection describes system configurations where the LT unit is connected to Matsushita Electric Industrial Co.'s servo.

■ MINAS-A Series

Servo	Cable Diagram	Applicable Cable	Unit Type
			
M□DA□□□□□□ ^{*1}	RS-232C (1:1)	DV0P1160 made by Matsushita Electric Industrial Co.	LT Type C
	RS-232C (1:n)	DV0P1160 made by Matsushita Electric Industrial Co.	

*1 □□□□□□ varies depending upon the servo types. For detailed information, refer to the manual or catalog of the servo used.

■ MINAS-S Series

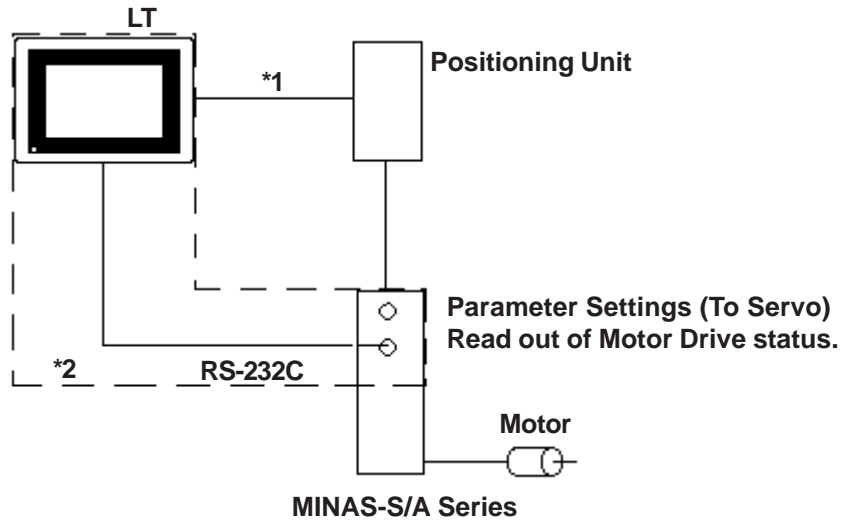
Servo	Cable Diagram	Applicable Cable	Unit Type
			
MUDS□□□□□□ ^{*1}	RS-232C (1:1)	DV0P1160 made by Matsushita Electric Industrial Co.	LT Type C

*1 □□□□□□ varies depending upon the servo types. For detailed information, refer to the manual or catalog of the servo used.

◆ **Connections**

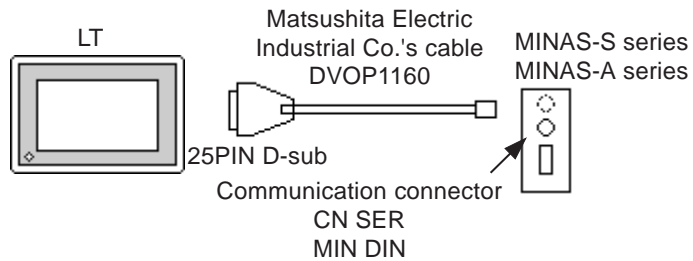
Positioning data cannot be sent from the LT to the Servo unit. To send positioning unit pulse signals to the servo, the positioning unit is required.

- 1:1 connection



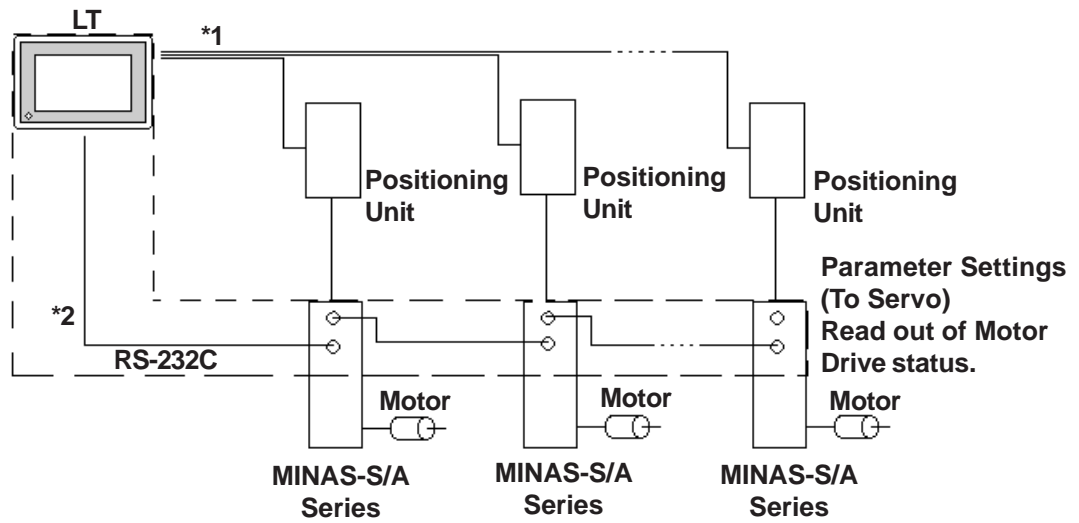
*1 The Connection between the LT and the Positioning Unit becomes a DIO connection.

*2 This manual explains only the range shown here. (dotted lines)



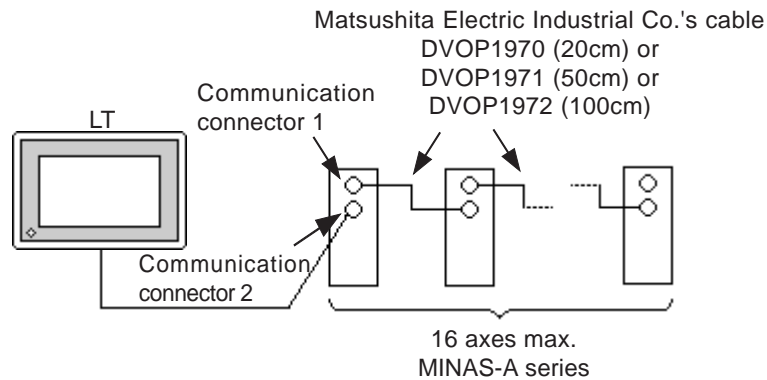
- Connect a MINAS-S series servo to the communication connector CN SER.
- Connect a MINAS-A series servo to the communication connector 2 CN SER.

- 1:n connection (MINAS-A series only)



*1 The Connection between the LT and the Positioning Unit becomes a DIO connection.

*2 This manual explains only the range shown here. (dotted lines)



- **Note:** In the case of 1:n connection, if the tag setup specifies that the parameter information on multiple servos is read or written on the same screen, it may take several seconds for display updating or other operations. If the parameter information from more than one servo is read out on the same screen, it will take, normally, approximately 0.5 seconds before the parameter information on each servo has been read out. It is recommended that the parameters for multiple servos be set on their respective screens. This will allow more efficient data checking and be useful for other purposes.










4.2.2 Supported Devices

The following table shows the range of devices that are supported by the LT:

■ **MINAS-S/A Series**

 may be specified at the first address of the system area.

Device	Bit Addresses	Word Addresses	Remarks
Driver model readout	————	05_00 ~ 05_05	*1
Status readout (control mode)	————	20_00	Bit 5 *1 *4
Status readout (status)	————	20_21	Bit 5 *1 *4
Command pulse counter readout	————	21_00	Bit 31 *1 *3 L/H
FB pulse counter readout	————	22_00	Bit 31 *1 *3 L/H
Current speed readout	————	24_00	Bit 5 *1
Current torque output readout	————	25_00	Bit 5 *1
Current deviation counter readout	————	26_00	Bit 31 *1 *3 L/H
Input signal readout	————	27_00	Bit 31 *1 *3 L/H
Output signal readout (data)	————	28_00	Bit 31 *1 *3 L/H
Output signal readout (warning data)	————	28_01	Bit 5 *1
Current speed readout	————	29_00	Bit 5 *1
Current torque readout	————	29_01	Bit 5 *1
Current deviation counter readout	————	29_02	Bit 31 *1 *3 L/H
Status, input signal, and output signal readout (control mode)	————	2A_00	Bit 5 *1 *4
Status, input signal, and output signal readout (status)	————	2A_01	Bit 5 *1 *4
Status, input signal, and output signal readout (input signal)	————	2A_02	Bit 31 *1 *3 L/H
Status, input signal, and output signal readout (output signal)	————	2A_03	Bit 31 *1 *3 L/H
Status, input signal, and output signal readout (warning data)	————	2A_04	Bit 5 *1
Absolute encoder readout (encoder ID)	————	2D_00	Bit 5 *1 *6
Absolute encoder readout (status)	————	2D_01	Bit 5 *1 *6
Absolute encoder readout (1-rotation data)	————	2D_02	Bit 31 *1 *5 *6 L/H
Absolute encoder readout (multi-rotation data)	————	2D_03	Bit 5 *1 *6
Individual readout/write of parameter	————	80_00 ~ 80_7F	Bit 7 *1
Write of parameter to EEPROM	————	84_00	*2 *7
Current alarm data readout	————	90_00	Bit 5 *1 *4
Individual readout of user alarm history (history No.)	————	91_00 ~ 91_0F	Bit 7 *1 *4
Individual readout of user alarm history (alarm No.)	————	91_11 ~ 91_1F	Bit 7 *1 *4
Batch readout of user alarm history	————	92_01 ~ 92_14	Bit 5 *1 *4

Device	Bit Addresses	Word Addresses	Remarks
Clearing of user alarm history (also in EEPROM)	—————	93_00	*2 *7
Clearing of alarm	—————	94_00	*2 *7
Clearing of absolute encoder	—————	9B_00	*2 *6 *7
Individual readout of user parameter (parameter value)	—————	B0_00 ~ B0_07F	 *1
Individual readout of user parameter (MIN value)	—————	B0_100 ~ B0_17F	 *1
Individual readout of user parameter (MAX value)	—————	B0_200 ~ B0_27F	 *1
Individual readout of user parameter (attribute)	—————	B0_300 ~ B0_37F	 *1
Individual readout of user parameter page (parameter value)	—————	B1_000 ~ B1_07F	 *1
User parameter page readout (MIN value)	—————	B1_010 ~ B1_17F	 *1
User parameter page readout (MAX value)	—————	B1_020 ~ B1_27F	 *1
User parameter page readout (attribute)	—————	B1_030 ~ B1_37F	 *1
User parameter page write	—————	B2_000 ~ B2_07F	 *2

*1 Exclusively for readout

*2 Exclusively for write

*3 32-bit device

*4 Handled as byte data by the AC servo, but as word data by the LT.

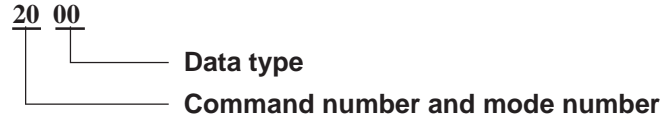
*5 Used as 24-bit data by the AC servo, but as a double-word device by the LT.

*6 Only the MINAS-A series is supported.

*7 Writing arbitrary data executes the command.



- Assign the parameters and other similar AC servo data to device codes and addresses as follows. For the command numbers and mode numbers, refer to “Lists of MINAS-A and MINAS-S series command numbers and mode numbers.”



- When creating part on the screen creation software, specify the controller unit number when entering an address. If not, the last entered unit number is assumed. (The default value at startup is 00.)

00 / 20_ 00

└───┬─── Servo ID number

└───┬─── Command number and mode number

└───┬─── Data type

■ Lists of MINAS-A and MINAS-S series command numbers and mode numbers

AC Servo Motor Driver		LT	Description	Item	R/W	Particulars
Command	Mode	Device				
0	5	05_00 ~ 05_05	Driver model readout	———	R	*1
2	0	20_00	Status readout	Control mode	R	*2 *5
		20_21		Status	R	*2 *5
	1	21_00	Command pulse counter readout	———	R	*3
	2	22_00	FB pulse counter readout	———	R	*3
	4	24_00	Current speed readout	———	R	*1
	5	25_00	Current torque output readout	———	R	*1
	6	26_00	Current deviation counter readout	———	R	*3
	7	27_00	Input signal readout	———	R	*3
	8	28_00	Output signal readout	Data	R	*3 *5
				Warning data	R	*1 *5
	9	29_00	Current speed/torque/deviation counter readout	Data (speed)	R	*1 *5
				Data (torque)	R	*1 *5
				Data (deviation)	R	*3 *5
	A	2A_00	Status/input signal/output signal readout	Control mode	R	*2 *5
				Status	R	*2 *5
				Input signal	R	*3 *5
				Output signal	R	*3 *5
				Warning data	R	*1 *5
	D	2D_00	Absolute encoder readout	Encoder ID	R	*1 *5
				Status	R	*1 *5
1-rotation data				R	*4 *5	
Multi-rotation data				R	*1 *5	
8	0 and 1	80_00 ~ 80_7F	Individual readout/write of parameter	———	R/W	*1 *8
	4	84_00	Write of parameter to EEPROM	———	W	*1
9	0	90_00	Current alarm data readout	———	R	*2
	1	91_00 ~ 91_0F	Individual readout of user alarm history	History No.	R	*2 *5
		91_11 ~ 91_1F		Alarm No.	R	*2 *5
	2	92_01 ~ 92_14	Batch readout of user alarm history	———	R	*2
	3	93_00	Clearing of user alarm history	———	W	*1
	4	94_00	Clearing of alarm	———	W	*1
	B	9B_00	Clearing of absolute encoder	———	W	*1 *11

AC Servo Motor Driver		LT	Description	Item	R/W	Particulars
Command	Mode	Device				
B	0	B0_00 ~ B0_07F	Individual readout of user parameter	Parameter value	R	*1 *7 *9
		B0_100 ~ B0_17F		MIN value	R	*1 *7 *9
		B0_200 ~ B0_27F		MAX value	R	*1 *7 *9
		B0_300 ~ B0_37F		Attribute	R	*1 *7 *9
	1	B1_000 ~ B1_07F	User parameter page readout	Parameter value	R	*1 *7 *10
		B1_010 ~ B1_17F		MIN value	R	*1 *7 *10
		B1_020 ~ B1_27F		MAX value	R	*1 *7 *10
		B1_030 ~ B1_37F		Attribute	R	*1 *7 *10
	2	B2_000 ~ B2_07F	User parameter page write	—	W	*1 *8

*1 Word device

*2 Used as byte data by the AC servo motor driver, but as a double-word device by the LT.

*3 Double-word device

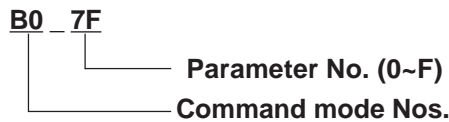
*4 Used as 24-bit data by the AC servo motor driver, but as a double-word device by the LT.

*5 The device names are same, but the device codes are different for each address.

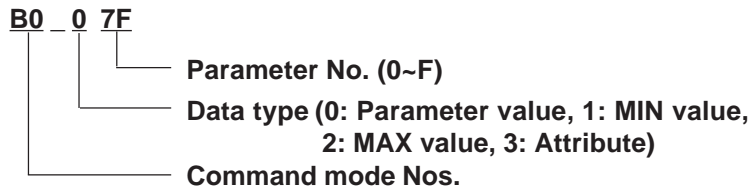
*6 Use the same command when reading out the driver model. Therefore, the data that can be read out from this device is the same as the driver model readout.

*7 For the parameter numbers and other detailed information, refer to the organization and list of parameters in the instruction manual for the AC servo driver.

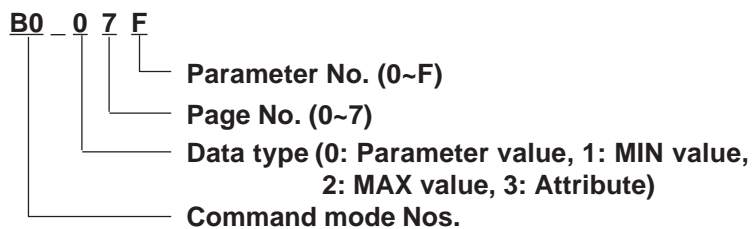
*8 Specify a device as follows:



*9 Specify a device as follows:



*10 Specify a device as follows:



*11 Only the MINAS-A series is supported.

4.2.3 Environment Setup

The following tables show the communication settings for the servo and the corresponding settings for the LT, which are recommended by Digital:

■ MINAS-A Series

LT Setup		Servo Setup	
Baud Rate	19200bps	Baud Rate	9600bps
Data Length	8 bits (fixed)	_____	_____
Stop Bit	1 bit (fixed)	_____	_____
Parity Bit	None (fixed)	_____	_____
Data Flow Control	ER Control	_____	_____
Communication Format (RS-232C)	RS-232C	_____	_____
Unit No.	0	ID Rotary Switch ^{*1}	0

*1. Set the ID No. to 0.

■ MINAS-S Series

LT Setup		Servo Setup	
Baud Rate	19200bps	Baud Rate	9600bps
Data Length	8 bits (fixed)	_____	_____
Stop Bit	1 bit (fixed)	_____	_____
Parity Bit	None (fixed)	_____	_____
Data Flow Control	ER Control	_____	_____
Communication Format (RS-232C)	RS-232C	_____	_____
Unit No.	0	_____	_____

4.2.4 Error Codes

■ Servo Error Codes

An error code specific to the servo is displayed as "Host communication error (02:**:##)" in the lower left part of the LT screen. "**" stands for the error code specific to the servo, and "##" stands for the servo unit number where the error has occurred.

Error No.	Description	Causes
0x90	RS485 error	The unit that has been specified in the 1:n connection cannot be found.
0xA0	Command error	A command that is not supported has been transmitted.
0xC0	Data error	The written data exceeds the specified range.

5**Analyzers**

This chapter describes the system structure with a specific company's servo and the LT, lists the supported devices, and shows an example of environment setups.

5.1**Connectable Analyzers**

The following analyzer can be connected.

Manufacturer	Series Name	Moisture Analyzer	Device name in LT Editor
JT Engineering	JE-70	JE-70	JTE analyzer



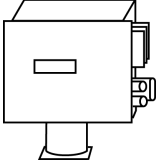


5.2 JT Engineering Inc. Analyzers

5.2.1 System Structure

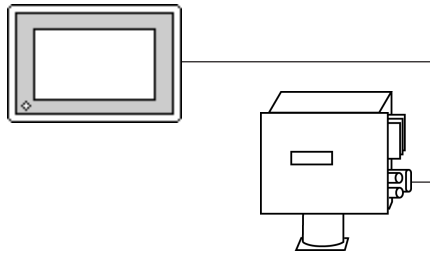
This section describes the system structure using JT Engineering Inc. JE-70 series analyzer and the LT.

For the connection diagram, see "15.1.2 Connection diagram."

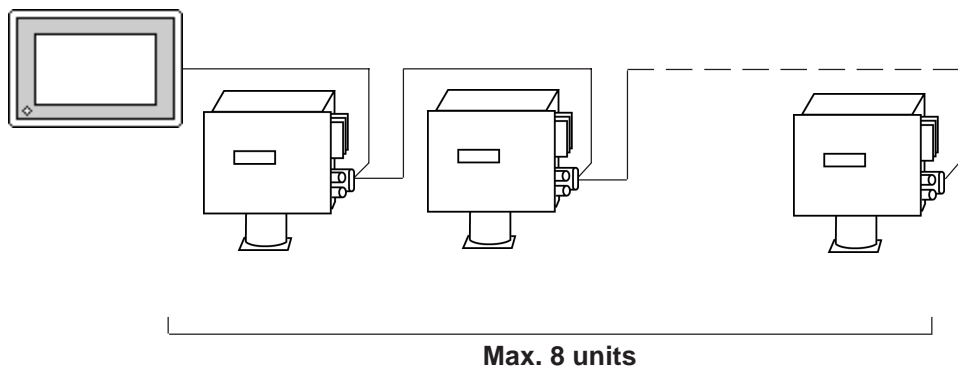
■ JE-70 Series

Analyzer	Cable Diagram	Unit Type
		
JE-70	RS-232C <Cable Diagram1 > RS-422 (2-wire type) 1:1 <Cable Diagram 2> RS-422 (2-wire type) 1:n <Cable Diagram 3>	LT Type C

◆ 1:1 RS-232C, RS-422



◆ 1:n RS-422



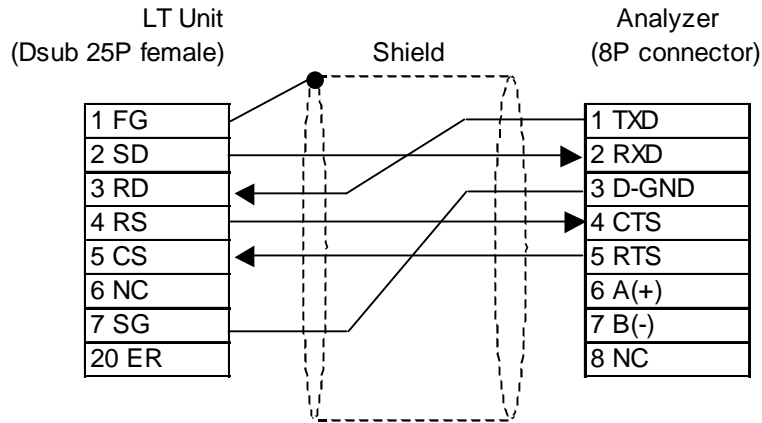
5.2.2 Cable Diagram

The following cable diagram may differ from the one recommended by JT Engineering, but using this design will not cause any operation problems.



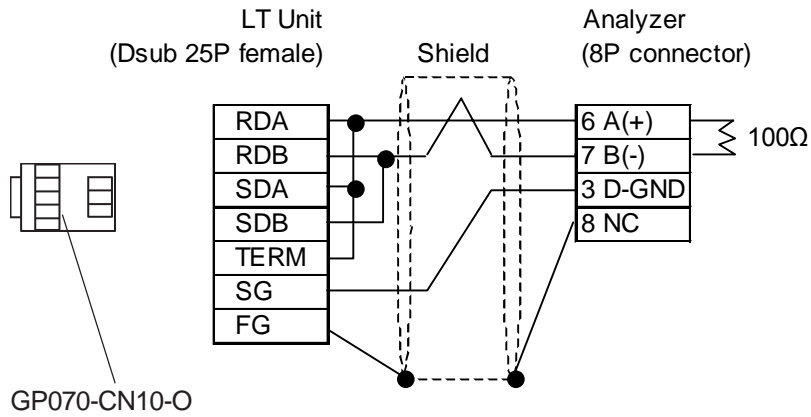
- **Connect the LT side of the FG to a shielded cable.**
- **The cable connected to the RS-232C port should be within 15 meters.**
- **The cable connected to the RS-422 port should be within 500 meters.**
- **To use a communication cable, be sure connect the SG.**

Cable Diagram 1 RS-232C

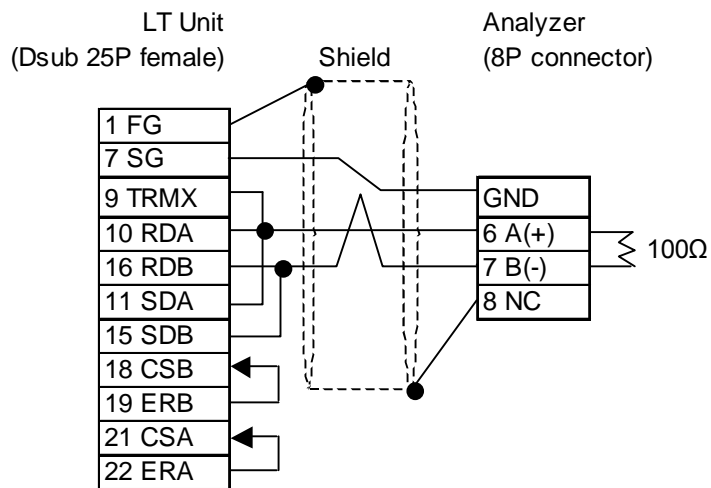


Cable Diagram 2 1:1 RS-422

- When using Digital's RS-422 connector terminal adapter, GP070-CN10-O



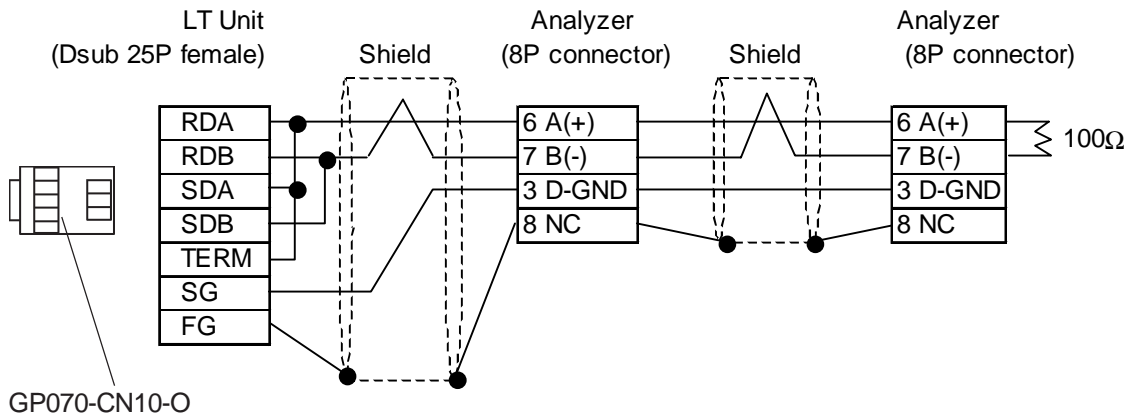
- When making your own cable connections



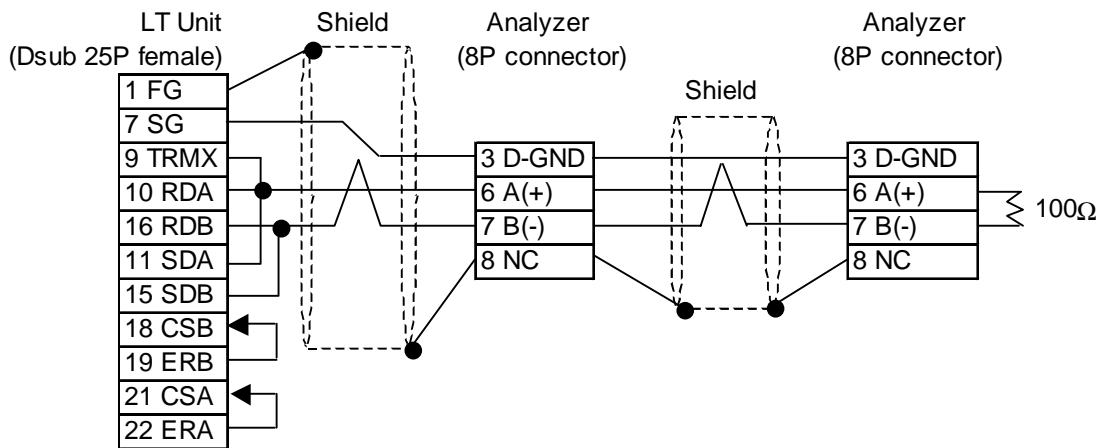
- When Pin Nos. 9 and 10 on the serial interface on the LT side are connected to each other, a termination resistance of 100Ω is created between RDA and RDB.
- Use a shielded twisted-pair cable AWG#20 or larger.

Cable Diagram 3 1:n RS-422

- When using Digital's RS-422 connector terminal adapter, GP070-CN10-O



- When making your own cable connections



- **Up to 8 analyzers can be connected.**











- When Pin Nos. 9 and 10 on the serial interface on the LT side are connected to each other, a termination resistance of 100Ω is created between RDA and RDB.
- Use a shielded twisted-pair cable AWG#20 or larger.

5.2.3 Supported Device

The following table describes the range of devices supported by the LT.

■ **JE-70 Series**

 Setup System Area here.

Device	Bit Address	Word Address	Particulars
Status Error	M0000 ~ M0031	M000 ~ M0016	 *1
Error	M0032 ~ M0079	M0032 ~ M0064	
Current Value	---	D0000 ~ D0160	
Common Constant	---	R0000 ~ R0098	
Recipe Constant	---	R0100 ~ R2098	
Equipment-specific Data	---	R2100 ~ R2130	
Filter Constant	---	R2132 ~ R2198	
Correction Parameter	---	R2200 ~ R2346	

L/H

*1 Status Error - According to moisture analyzer specifications, M device(s) are Read-Only and cannot be written to.



- **Device Read and Write is possible only for even-numbered addresses. Odd-numbered addresses are Read only.**
- **When reading from multiple devices, be sure to designate the number of devices using an even number.**

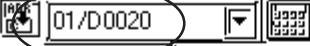
Example of device settings

When setting up Parts in LT Editor, specify the ID number of the analyzer when entering addresses.

01/D20

Device address
ID number of analyzer

Word Address



Constant

0

Function

- Word Set
- Add/Sub
- Digit(ADD)
- Digit(SUB)

Word Address dialog box:

D 0020 **01**

Buttons: Back, Ctr, A, B, C, D, E, F, 7, 8, 9, 4, 5, 6, 1, 2, 3, 0, ENT

Enter the ID number of the analyzer you want to specify.



- **If no ID number is specified, the last entered ID number is assumed (the default value is 01).**

5.2.4 Environment Setup

The following lists Digital's recommended analyzer and LT communication setup.

■ JE-70 Series

LT Setup		Analyzer Setup	
Baud Rate	38400 bps (fixed)	_____	_____
Data Length	8 bits (fixed)	_____	_____
Stop Bit	1 bit (fixed)	_____	_____
Parity Bit	Non (fixed)	_____	_____
Data Flow Control	ER Control (fixed)	_____	_____
Communication Format (using RS-232C)	RS-232C	DSN on the basis board	RS-232C
Communication Format (using RS-422)	RS-422 2-wire type	DSN on the basis board	RS-422
Unit No.	Analyzer Setup	ID number ^{*1}	1 ~ 8
Send Wait	20 msec or more	_____	_____

**1 The ID number of the analyzer may be specified in a range between 1 and 10. When the analyzer is used with the LT, specify the ID number in a range between 1 and 8.*



- **To communicate with the JE-70 series, specify 20 ms or more for the transmission wait time of the LT.**

The transmission wait time should be specified using System Setup in LT Editor. Choose Extended Setup from Communication Setup and then specify the transmission wait time.

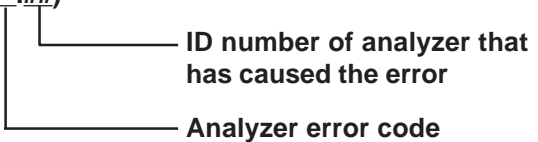
5.2.5 Error Code

■ Analyzer error codes

◆ JE-70 Series

An error message such as "Host communication error (02:**:##)" at the lower left part of the screen of the LT (** stands for an error code specific to the analyzer).

Host communication error (02.**.##)



Error code	Description	Details
01	Checksum code error	The checksum code sent by the host is wrong.
02	Command error	The command (symbol) sent by the host is other than BR, WR, BW, WW, JR, QR, JW, QW, and TT.
03	Device number too large	The device number sent by the host is too large.
04	Word-based write to M-device	The host has issued a write request to the M-device using the WW or QW command.
05	Number of word devices is odd	When the host has issued a word-based write or read to word devices, the number of word devices is odd.
06	First address for word device is odd	When the host has issued a write or read request to a word device, the first address for the word address is odd.
07	Measurement recipe number is not registered yet	When the host has requested changing the recipe number for the measured components, that recipe number is not registered yet (the host has not written the recipe number).
08	Recipe number for display is not registered yet	When the host has requested changing the recipe number for display, that recipe number is not registered yet (the host has not written the recipe number).
09	Recipe number for output is not registered yet	When the host has requested changing the recipe number for output, that recipe number is not registered yet (the host has not written the recipe number).
0A	Recipe number of display is not measured yet	The host has requested changing the recipe number for display, but the recipe number after the change is not under measurement.
0B	Recipe number for output is not measured yet	The host has requested changing the recipe number for output, but the recipe number after the change is not under measurement.



6 Memory Link Communication

This chapter explains one-to-one communication between the LT unit and equipment such as a personal computer or a one-board microcomputer which do not have their own protocols.

Reference For information about the extended mode, refer to the GP70 Series Memory Link Communication Protocol Manual.

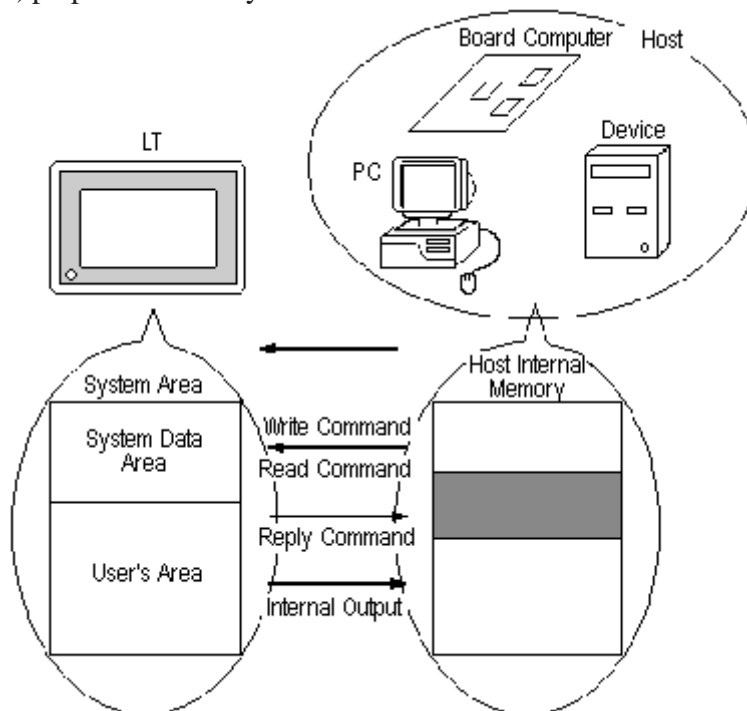


Note: When LT (Only Type C) unit communicates with Devices, the communication method will be Direct Access method. For Direct Access method, refer to this manual Chapter 1 Direct Access Communication.

6.1 Setting Up Memory Link Communication

Data transmission between the LT and Host (Device) are run according to the host's ladder logic program.

The LT runs its screen display relying on the host's data write commands, which are based on the screen display's data send restrictions. And, the LT, following the host's Reading command, passes stored data over to the host. Communication occurs between the LT and host in this way, and normally, the initiative is held on the host side. Data transmission between the LT and Device is aided by the memory area (System Area) prepared internally in the LT.



6.1.1 System Area

The System Area is the medium that allows data transmission between the LT and host. The System area is prepared internally in the LT; the LT runs the screen display based on the System Area data.

The System Area is 4096 words in size, organized as follows.

LS0	System Data Area
⋮	
LS19	Reading Area
LS20	
⋮	User Area
⋮	
LS2032	Special Relays
⋮	
LS2047	Reserved
LS2048	
⋮	User Area
LS2095	
LS2096	
⋮	
LS4095	

◆ **System Data Area**

This is the write area for data necessary to operate the LT screen control data and error information. The data write contents of each address is predetermined.

Reference For more information, refer to 4-1-2 “Contents and Range of System Data Area”

◆ **User Area**

This area is used for LT-Host data transmissions. On the host side, determine which LT address the data will be written to, and create a program to perform the data write operation. Plus, to display the written data on the LT side, another setup must be performed Parts Setup.

For the host to read data written with keypad input and touch panel input (i.e. switch), a program must be made on the host side that reads data from the LT.



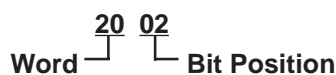
When using the Device Monitor feature, the User's Area (LS2096 to LS4095) will be reserved and cannot be used.

◆ **Special Relays**

This area is for setting up LT's various status information.



- **Writing to System Address 13, using a switch, or similar method, causes an interrupt output to the host. On the host, read this one byte using a command like the BASIC INPUT\$ instruction, to call various subroutines which depend on the value, thus greatly simplifying the program.**
- **When specifying an address bit, enter the bit position (00~15) after the word device.**
Ex. When specifying bit 02 of User's Area address 20:



◆ **Reserved**

Please do not use this area. It is only for LT's internal use. If you use this area, the LT will not operate properly.

6.1.2 Contents and Range of System Data Area



Important

When you wish to turn the LT's display OFF, use the Screen Display ON/OFF bit. Do not use the Control area's Backlight OFF bit. Be aware that this feature's system Data Area settings and range used during Memory Link Communication will differ from the settings used with Direct Access Communication.

Address	Detail	Function	Bit	Particulars
1	Status *1		0 to 2	Reserved
			3	Writes a set value *2
			4 to 9	Reserved
			10	Backlight Alarm *3
			11 to 15	Reserved
3	Error Status Each bit changes according to the LT error function. When an error occurs, the corresponding bit will turn on. * A bit that has turned on remains on until the power is turned off and back on, or until RUN mode is re-entered from OFFLINE mode. or details and the handling process about the Error Status contents, refer to the Section 1.1.3.		0, 1	Unused
			2	System ROM/RAM
			3	Screen Memory Checksum
			4	SIO Framing *4
			5	SIO Parity *4
			6	SIO Overrun *4
			7, 8	Unused
			9	Initialization of Internal Memory Checksum Necessary
			10	Timer Lock Error
4	Clock Data (Year)	"Year / Month / Day / Hour / Minute " Data is stored in BCD's 2digits. (E.g.) 98/02/01 17:15	0 to 7	Stores the last 2 digits of the Calendar year as 2 BCD digits
			8 to 15	Unused
5	Clock Data (Month)		0 to 7	Stores 01 to 12 (Month) as 2 BCD digits
			8 to 15	Unused
6	Clock Data (Day)		0 to 7	Stores 00 to 31 (Day) as 2 BCD digits
			8 to 15	Unused
7	Clock Data (Hour)		0 to 7	Stores 00 to 23 (Hour) as 2 BCD digits
			8 to 15	Unused
8	Clock Data (Minute)		0 to 7	Stores 00 to 59 (Minute) as 2 BCD digits
			8 to 15	Unused
10	Interrupt Output (Touch OFF)	If you Write in word data, the bottom 8 bits will be output as an interupt code after touching OFF.However FFh will not be output.		
11	Control *5		0	Backlight *6
			1	Buzzer ON
			2, 3	Reserved
			4	Buzzer 0:Output, 1:No Output *7
			5	Reserved
			6	Interrupt Output when touching panel to turn the display ON. (Interrupt Code:FFh) 0: Disabled 1: Enabled *8
			7 to 15	Reserved

Address	Detail	Function	Bit	Particulars
12	Screen Display *9 ON/OFF	FFFFh : Screen clears almost immediately 0h: Screen turns ON		
13	Interrupt Output *10	Using a switch or other method to write absolute value data from LT causes an output of the interrupt code using the contents of the bottom 8 bits (Will not out put FFh)		
15	Screen Display No.	Write the Screen No. in binary to change	0 to 14	Screen change number, 1 to 8999.(1 to 1999 when using BCD input)
			15	Compulsion Change Screen 0:Normal, 1:Compulsion Change Screen
16	Reserved	Reserved		
17	Reserved	Reserved		
18	Reserved	Reserved		
19	Reserved	Reserved		

*1 Monitor, in bit units, only the necessary bits.

Since reserved bits may be used for LT system maintenance, etc., their ON/OFF status is not defined.

*2 Every time a value is written with the Keypad Input Display, the bit is reversed.

*3 When the backlight burns out, the Status LED's orange light turns ON, and the StatusData Area's "Status"*1 bit 10 will turn ON.

*4 Only LT Type C can be used.

*5 Be sure to turn all reserved bits OFF since they may be used for LT system maintenance, etc.

*6 With the LT series, the backlight turns OFF when this bit is ON(LCD display does not change) and turns ON when the bit is OFF.

When the Control area's Backlight OFF bit turns ON, only the backlight will turn OFF, however, the LCD display will remain ON and all touch switches set up on the display can still be used. Use the Screen display ON/OFF bit to actually turn the screen display OFF.

*7 Control Bit 1 (Buzzer On) outputs as shown below.

Buzzer Sound While Control Bit1 is on, the LT internal buzzer is activated.

*8 Do not write control codes 00 to 1F to word address 13. It may terminate data communication.

*9 After the System Data Area's "Screen Display ON/OFF" bit is set to turn the display OFF, simply touching the screen will turn the display ON again.

*10 Interrupt output when touching the panel to turn the display OFF to ON.

- Only when the display is turned ON by touching the panel, interrupt output will be operated.



- Addresses 0, 2, 9, 10, 14, 16, 17, 18, 19 are reserved areas. Do not write data to these addresses.
- When addresses 3, 12, 13, 15 are utilized for System Control, displays that depend on parts do not function.
- When addresses 12, 13, 15 are used to control word units, bit write cannot be performed.
- Writing FFFFh to address 12 causes the screen display to erase within moments. When you wish to erase the screen using the STANDBY MODE TIME entered in LT's INITIALIZE setup, write 0000h in address 12.
- Do not write control codes 00-1F in address 13. Data transmission may become impossible.

6.1.3 Special Relays

The structure of the Special Relays is as follows:

◆ **Reserved**

The Reserved address value is undefined. Do not use this area.

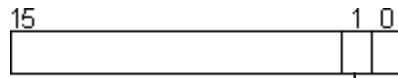
2032	Common relay information
2033	Reserved
2034	
2035	1 Second Binary Counter
2036	Parts Scan Time
2037	Reserved
2038	Parts Scan Counter
2039	Reserved
:	
:	
2047	

◆ **Common Relay Information (2032)**

15	12	11	10	9	8	7	6	5	0

1	Remains ON after when a screen change (base, window) occurs until the screen's internal processing is complete.
2	ON only in the middle of an SIO error developing.
3	ON when displaying the Initial screen after powering up.
4	Always ON
5	Always OFF
6	Turns ON when backup SRAM data has been deleted
7	Turns ON if a BCD error occurs while D script is being used.
8	Turns ON if a zero division error occurs while D script is being used.
9	Filing data. Turns ON if the data is not transferred to Backup SRAM.
10	Filing data transfer is triggered by the Control Word Address. Turns ON if the data can not be transferred from Device to SRAM. Also data transfer between Devices is triggered by the Filing Data Display. Turns ON if the data is not trans
11	Filing data. Via transfer data to and from SRAM to LS area, via Filing Data Display.
12	When using D-script, turns ON if a communication error occurs when the function memcpy () is used, or reading the data from designated Address Offset. Turns OFF when data read is normally completed.
13-15	Reserved

◆ **Base Screen Information (2033)**



Remains on from the base screen change to when the screen's internal processing is completed.

◆ **1 Second Binary Counter (2035)**

Begins counting in one second intervals after the LT's power is turned ON. The data is binary.

◆ **Parts Scan Time (2036)**

The time it takes to prepare all the parts setup on the display screen. The data is stored as binary, millisecond units. The data renews itself at the point when preparation for all the object parts is complete. The data's default value is 0. It is accurate within ± 10 ms.

◆ **Parts Scan Counter (2038)**

Counts until all the Parts used in a display screen have completed their preparation. The data is binary.



The Special Relay is not write protected. Do not turn this Relay's data ON or OFF by using parts or other method.

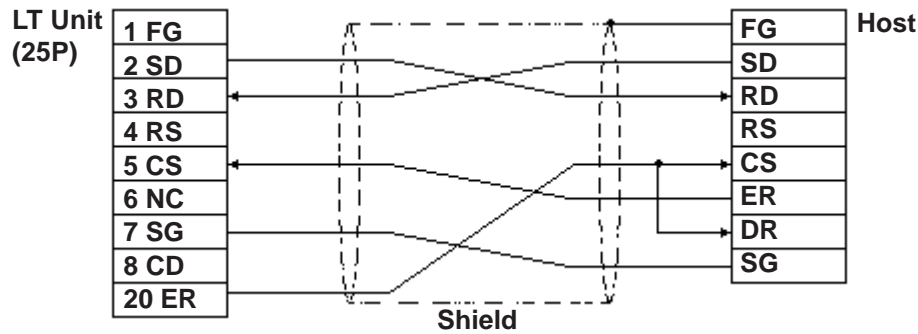
6.2 Cable Diagrams

Explains the connection between the LT and host.

6.2.1 RS-232C Communication

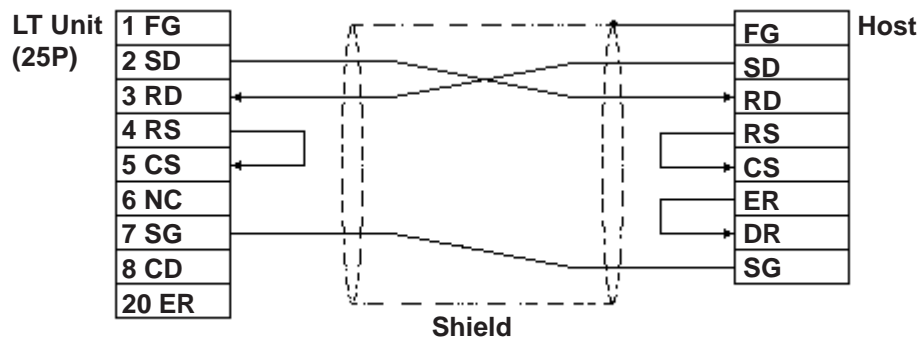
When using an RS-232C cable, there are two types of control formats: DTR (ER) Control and XON/XOFF Control. The LT-Host connection for each type is illustrated below.

■ DTR (ER) Control



Set the host's control software so that the host will not transmit data to the LT when the LT's ER is turned OFF.

■ XON/XOFF Control



- Depending on the host, the RS-232C connector's shape, pin numbers and corresponding signal names may differ. Be sure to follow the host interface specifications.
- The maximum cable length is 15m.

6.2.2 RS-422 Communication

When using an RS-422 cable, there is only the XON/XOFF Control. The various LT-Host connections are illustrated below.

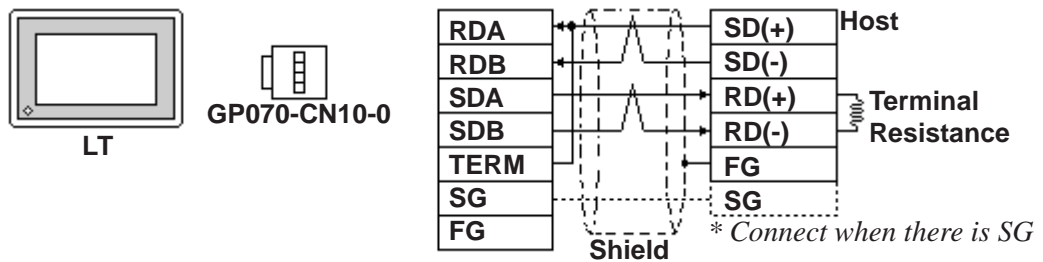


- Insert a termination resistor between RDA-RDB.
- For a 24AWG line, use a twist pair cable with a static electrical capacity of 50pF/m, and a standard characteristic impedance of 100W



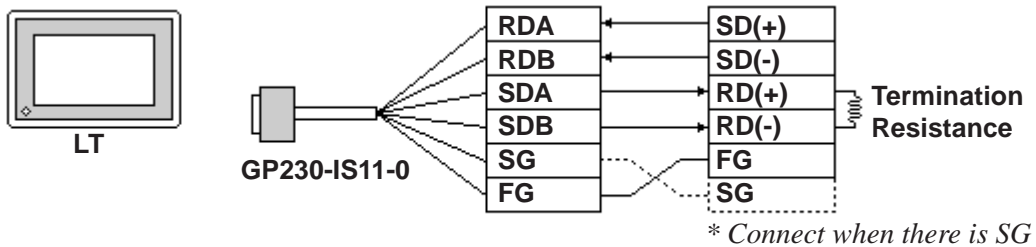
- The maximum length of the cable is 600m. However, depending on the Device, the maximum length of the cable is limited. When connecting, refer to the Device's User's Manual.
- Depending on the connected Host, the connection method and termination resistance differs.

- When using Digital's RS-422 connector terminal adapter, GP070-CN10-0



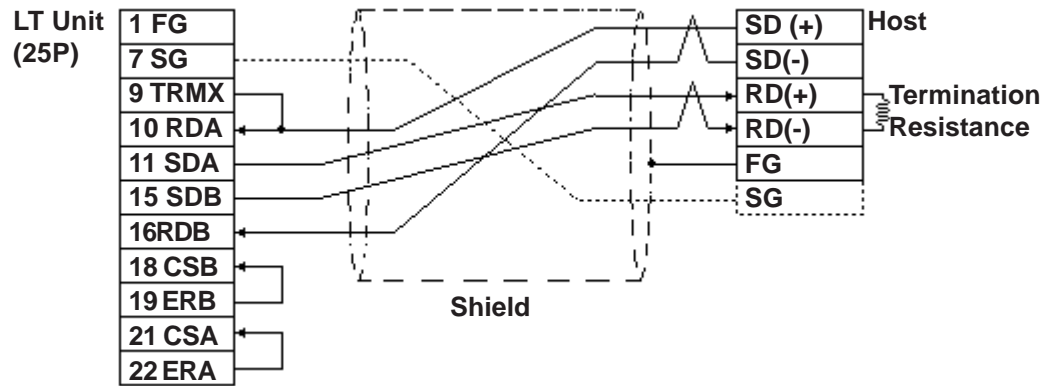
As a result of connecting GP070-CN10-0's RDA and TERM, a 100W termination resistance is inserted between RDA—RDB on the LT.

- When using Digital's RS-422 Cable, GP230-IS11-0



When connecting the #9 and #10 pins in the LT Serial I/F, a termination resistance of 100W is added between RDA and RDB.

- When making your own cable connections

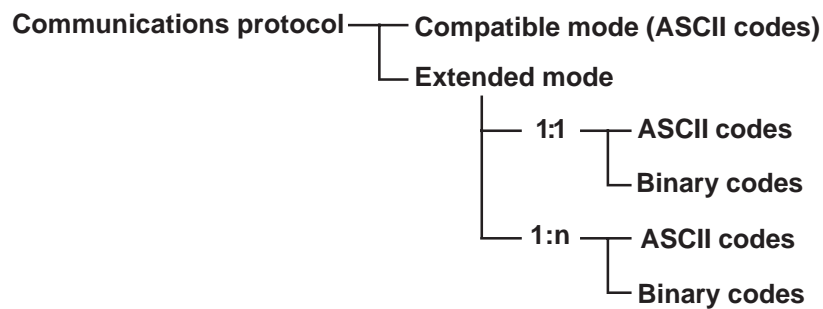


Note: When connecting the #9 and #10 pins in the LT Serial I/F, a termination resistance of 100Ω is added between RDA and RDB.



6.3 Memory Link Commands

The communications protocol shows the format of data transferred between the host computer and the LT and the procedure for this data transfer. The communications protocol for the LT is classified into the following modes according to the application and the data processing capability of the host computer.



Compatible mode

In this mode, only writing to the system area (Esc W) and reading from the system area (Esc R) commands are performed using communications protocol. The compatible mode is basically a teletype protocol using ASCII codes. Therefore, the load for controlling the communications on the host computer is decreased. In contrast, the reliability of the transmitted and received data is relatively low.

Extended mode

This mode is a protocol which supports not only commands for writing to and reading from the system area, but also drawing commands. The extended mode is a communications protocol compatible with the multi-drop connection between the host computer and the LT. To improve the reliability of communications data, you may specify whether sum check codes are used or not and whether ACK and NCK are used or not. The ASCII codes and the binary codes are dependent on the development of the software environment. Select whichever codes are appropriate.



Note: Only the commands in the compatible mode are covered in this manual.



Reference For the extended mode, Refer to *The Memory Link Communications Manual for the GP70 Series* (sold separately).

LT-Host data transmissions are run as described for each command below.

Read command This command reads data from the setup System Area address.

Reply command This command responds to the Read command and passes this data from the LT to the Host.

Write command This command writes the data to the setup System Area address.

Interrupt output Using a touch tag or other method to write data to System Data Area address 13 causes an interrupt code in the contents of the bottom 8 bits, which is then output to the Host side.



Note: When using double-words (32-bit data), the upper and lower data are set up as follows:

0	H (High)	(Upper)
1	L (Low)	(Lower)



Send the read command from the Host after receiving the reply command.

Ex. Data communication between the Host computer and the LT



Send the read command (2) after receiving the reply command (1).

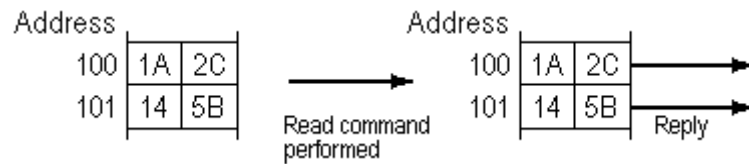
When the read command is sent continuously without waiting for the reply command, a system error may be generated two or three hours later.

6.3.1 Read Command

The contents of the Read command are as follows:

ESC (1Bh)	Start Code
R (52h)	Read command
Address (4 bytes)	
Read Word Number (4 bytes)	
CR (0Dh)	Return

Ex. Reads 2 words of hexadecimal data from System Area address 100.



Read Command

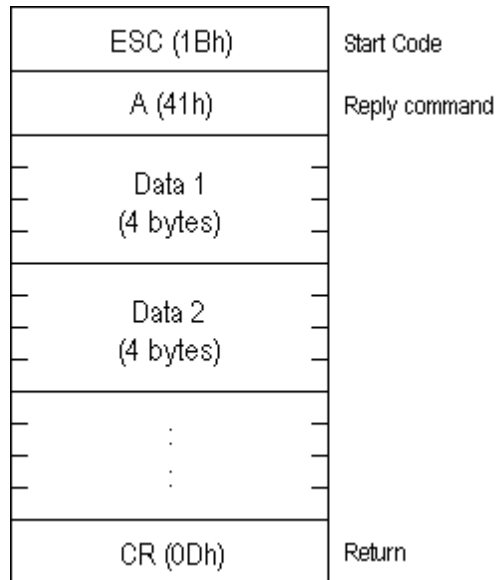
Esc	R	0	0	6	4	0	0	0	2	CR
Start Code	Read Command	Address 100				Read Word Number 2				Return



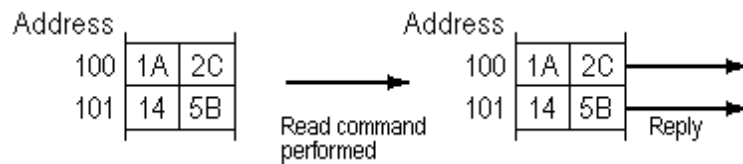
Note: The Address and Read Word Number can be entered in ASCII Code.

6.3.2 Reply Command

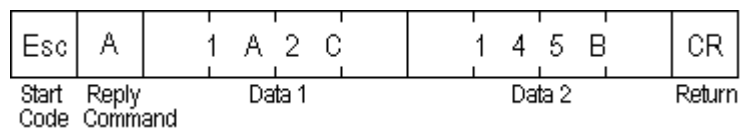
The contents of the Reply command are as follows:



Ex. Read 2 words of hexadecimal data from System Area address 100.



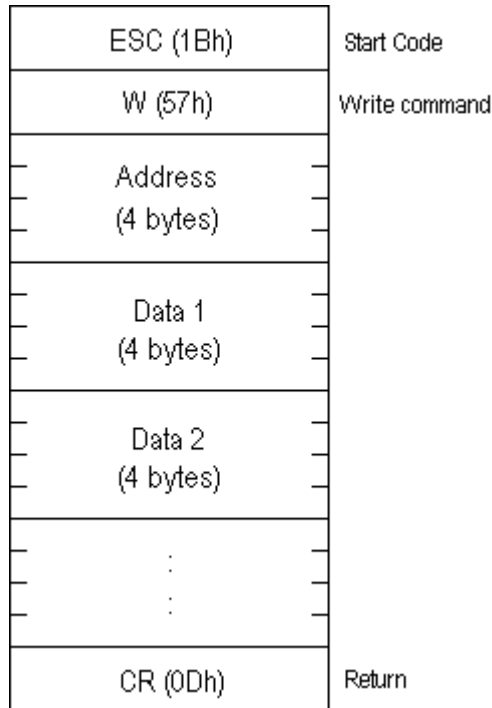
Reply Command



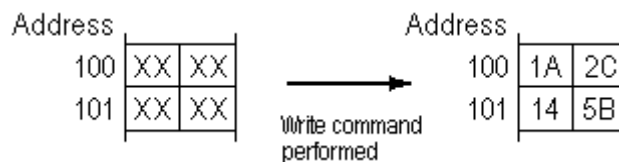
- The response command is output automatically from the LT in answer to the read command received.
- The Address and Data can be entered in ASCII Code.
- Data is read, in order, from the setup address.

6.3.3 Write Command

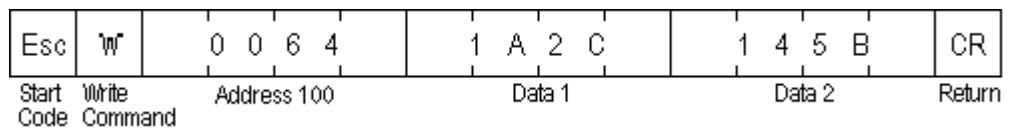
The contents of the Write command are as follows:



Ex. Writes hexadecimal data 1A2C and 145B from System Area address 100.



Write Command



- Note:**
- The *Address* and *Data* can be entered in ASCII Code.
 - Data is written, in order, from the setup (start) address.
 - In Compatible mode, the Reply command does not return.
 - If you keep sending the Write command to LT constantly, be aware that LT might fail to update the screen data.



A1 Maximum Number of consecutive Addresses

The following lists the maximum number of consecutive addresses that can be read by each Device. Refer to these tables to utilize *Block Transfer*.



Note:

When the device is setup using the methods below, the Data Communication Speed declines by the number of times the device is read.

- When consecutive addresses exceed the maximum data number range
- When an address is designated for *division*
- When device types are different

To speed up data communication, plan the Parts layout in screen units, using consecutive devices. (Includes the Alarm.)

A.1.1 Maximum number of Consecutive Device Addresses

■ Yokogawa M&C

Device	Max. No. of Consecutive Addresses
D	63 Words
I	63 Words

■ Yamatake

Device	Max. No. of Consecutive Addresses
Data	5 Words

■ RKC INSTRUMENT INC. Controllers

<CB/SR-Mini Series (Modbus protocol)>

Device	Max. No. of Consecutive Addresses
————	125 Words

<CB/REX-F/LE100 Series (RKC protocol)>

Device	Max No. of Consecutive Addresses
CB	1 Word
REX	
LE	

■ **Omron Corporation**

Device	Max. No. of Consecutive Addresses
C0	2 Double Words
C1	
C3	
A	1 Word

■ **Shinko Technos Corporation**

Device	Max.No.of Consecutive Addresses
DatItems	1 Word
Setting Value Memory 1 to 7	1 Word
Channel 1 to 20	1 Word *1

**1 Although only a single word can be read at a time from a single controller, up to 20 channels can be read simulataneously.*

■ **Fuji Electric Corporation**

< Micro-Controller X Series (Model:PXR)>

Device	Max. No. of Consecutive Address
00001 ~	1 bit
10001 ~	8 bit
30001 ~	15 words
40001 ~	60 words
31001 ~	15 words
41001 ~	60 words

■ TOHO ELECTORICS INC.

Device	Max. No. of Consecutive Addresses
00_	1 word
10_	
100_	
110_	
120_	
300_	
1020_	
Step Temperature Setting SSV	
Final Step Setting END	
Step time Setting STI	
Final Step Finish Condition Setting SOK	
Step Wait Zone SWZ	
Step Wait Time SWT	
Time Signal ON Time SON	
Time Signal OFF Time SOF	
Execution Time SRN	
End Signal ON Time SEO	

■ Shimaden Co., Ltd.

<SR253/SR90/SR80/MR13/FP93/SD16/EM70 Series>

Device	Max No. of Consecutive Address
Data Address	10 Words

■ Fenwal

Device	Max. No. of Consecutive Address	Device	Max. No. of Consecutive Address
Input signal IN	1 Word	Temperature value before high-point correction for IRr/c 2-point correction value IA	1 Word
Decimal place in linear input UN		Temperature value after high-point correction for IRr/c 2-point correction value IB	
With or without IRr/c 2-point correction IR		Temperature value after low-point correction for IRr/c 2-point correction value IC	
Control mode CM		Temperature value after low-point correction for IRr/c 2-point correction value ID	
Filter constant FS		Transmission output scaling H and L DS	2 Words
Control LED illumination direction OD		Setting value for heater breakage current CA	1 Word
Control output direction OA		Warning sensitivity AD	
Burnout direction BO		Main temperature setting S1	
Output limit method LT		Warning 1: 1 point SP	2 Words
Warning type AK		Warning 1: Bands H and L SB	
Warning 1: Alarm warning code HA		Warning 2: 1 point DP	1 Word
Warning 1: Temperature warning code A11		Warning 2: Bands H and L DB	2 Words
Warning 2: Temperature warning code A21		Warning 3: 1 point TP	1Word
Warning 3: Temperature warning code A31		Warning 3: Bands H and L TB	2 Words
Warning LED illumination direction LE	Output method OU	1 Word	
CT type CT	Number of warnings AN		
Upper and lower limits of setting range HL	RUN/STOP RS		
Linear input scaling H and L L	Auto tuning AT		
Upper and lower output limits OL	Key locking KY	1 Word	
Proportional time PT	Mode locking ML		
Proportional band PB	POWER ON/OFF ON		
Integral action time IT	Current temperature PV		
Derivative action time DT	Operation panel MV		
ARW AR	Temperature control GC		8 Words
ON/OFF sensitivity DI	Warning GA		
Manual reset RT	Panel data GP		
Sensor error correction SA			

Using Inverters

■ Mitsubishi Electric

Device	Max. No. of Consecutive Address
————	1 Word
P	1 Double Word
OPE	1 Word
OUTF	1 Double Word
OUTC	1 Word
OUTV	
SPM	
SSEL	
SOF	
SOC	
SOV	
FSET	
RUNS	
MOT	
RBRK	
ELOF	
OCPV	
COPK	
IPOW	
OPOW	
A12D	
A34D	
A56D	
A78D	
RUNC	
INVS	
RWRT	
SFWE	
SFWR	
SFRE	
SFRR	
ERCL	
RSET	
ALLC	
LNKP	
SECP	

■ Fuji Electric

Device	Max. No. of consecutive Address
Basic Function	1 Word
Terminal Function	
Control Function	
Motor 1	
High Level Function	
Motor 2	
Option	
Order Data	
Monitor Data	

■ Yasukawa

Device	Max. No. of Consecutive
Bit Register	16 Words
Register	

Using Servo

■ Matsushita Electric

Device	Max. No. of consecutive Address
05_	6 Words
20_	1 Word
21_	2 Words
22_	2 Words
24_	1 Word
25_	
26_	2 Words
27_	2 Words
28_	3 Words
29_	4 Words
2A_	6 Words
2D_	5 Words
80_	1 Word
90_	
91_	
92_	14 Words
B0_	4 Words
B1_	64 Words

Using Analyzer

■ JT Engineering Analyzer

Device	Max. No. of consecutive Address
Status Error and Error (M)	32 Words
Current Value (D)	64 Words
Common Constant, Recipe Constant, Station-specific Data, Filter Constant, and Compensation Parameter (R)	64 Words