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Cat. No. W120-E1-7

SYSMAC
C-series Rack PCs
Wired Remote I/O

SYSTEM MANUAL

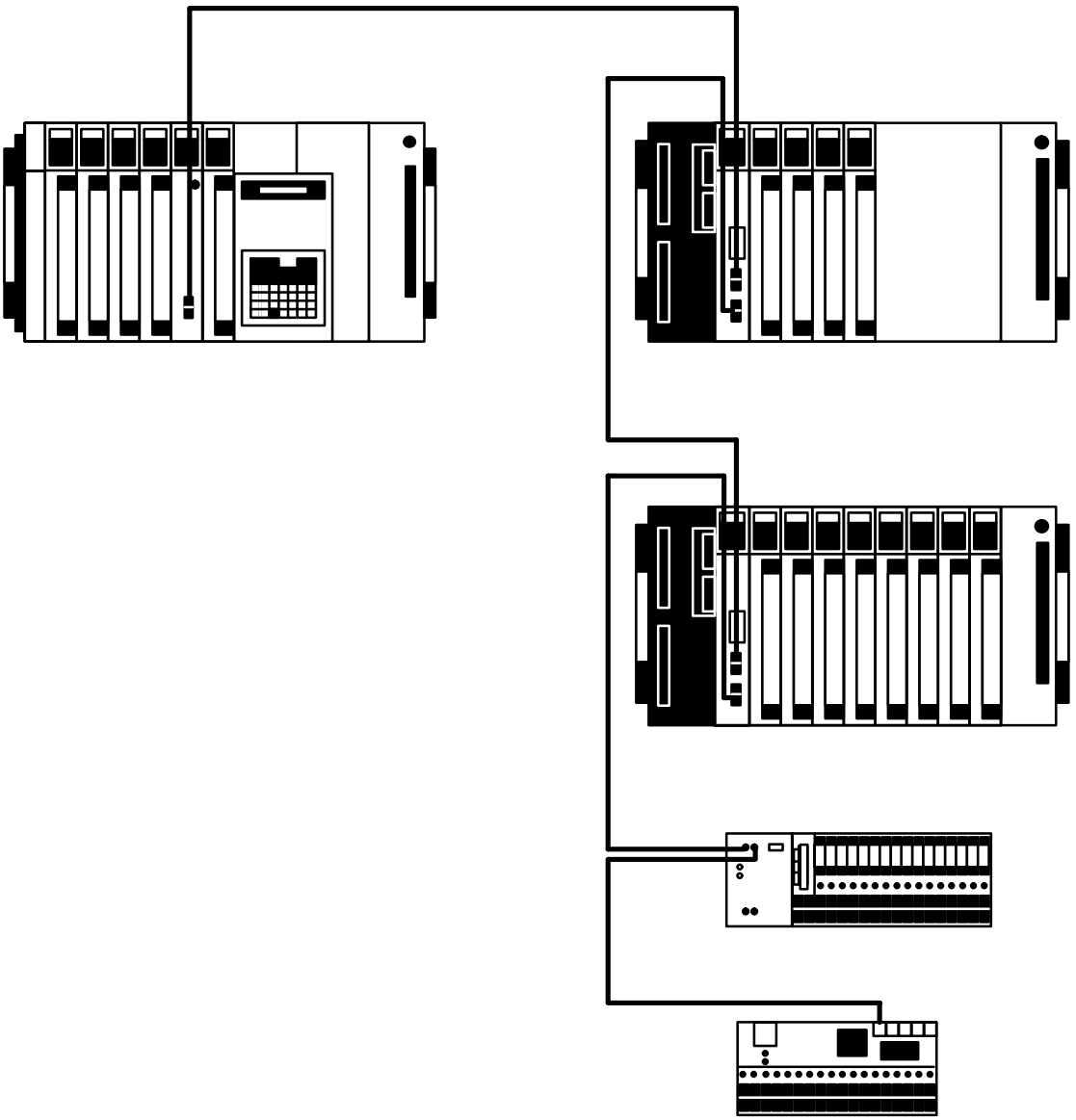
OMRON

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Wired Remote I/O

System Manual

Revised May 2000



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Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ Caution Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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About this Manual:

This manual describes the means and Units necessary to construct a Wired Remote I/O System consisting of at least one Remote I/O Master Unit and one or more Remote I/O Slave Units or Remote Terminals. (The term “Wired” refers to the links used to create the Remote I/O System, e.g., that between a Remote I/O Master Unit and a Remote I/O Slave Unit.) Remote I/O Systems reduce wiring requirements for remote control from a PC by performing distributed control actions through execution of a program in the memory of a single PC’s CPU. The 3G2A5-RM201 Remote I/O Master Unit can be used with any C-series Rack PC except the C200H PC. The C200H-RM201 Remote I/O Master Unit is used with a C200H PC. Remote I/O Slave Units, though generally used with the corresponding Remote I/O Master Unit, can be used in “combined” system configurations.

This manual has been prepared to explain how to incorporate Wired Remote I/O Systems into C120, C500, C200H, C1000H, and C2000H PC Systems. It provides the necessary information, such as system configuration, settings, and I/O word allocation, for connecting Remote I/O Master Units, Remote I/O Slave Units, and I/O Units.

Before attempting to set up and operate your Remote I/O System, familiarize yourself with all relevant parts of this manual. For more detailed descriptions of manual content, refer to the introductions for individual sections.

Section 1 introduces Wired I/O Systems and describes their characteristics.

Section 2 describes some of the many possible system configurations and the limitations of each type of system.

Section 3 provides names and descriptions of basic functions, internal circuits, and methods for differentiating differentiating unit types. Settings required to operate the system and successfully communicate program actions are explained, and example system settings are provided.

Section 4 provides details on Wired Remote I/O Systems, and the main Units used to build these Systems, included within these are mounting restrictions and wiring considerations of the systems. Parts of the Units, switch setting, and examples of switch settings are provided.

Section 5 explains how to install Wired I/O Systems and includes information on dimensions, differences between Units, and wiring.

Section 6 offers details on response time computations.

Section 7 describes error indications and error processing. Both indicator lights and dedicated error-related flags are provided.

Appendix A provides a list of the basic specifications and complete model numbers of products used in Wired I/O Systems.

Appendix B provides technical specifications.

Appendix C provides information on using CS1-series PCs.

⚠WARNING Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

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PRECAUTIONS

This section provides general precautions for using the Wired Remote I/O System and related devices.

The information contained in this section is important for the safe and reliable application of the Wired Remote I/O System. You must read this section and understand the information contained before attempting to set up or operate the Wired Remote I/O System.

1 Intended Audience . . . . . .
2 General Precautions . . . . . .
3 Safety Precautions . . . . . .
4 Operating Environment Precautions . . . . . .
5 Application Precautions . . . . . .

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1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

2 General Precautions

The user must operate the product according to the performance specifications described in the relevant manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating the System. Be sure to read this manual before attempting to use the System and keep this manual close at hand for reference during operation.

⚠ WARNING It is extremely important that the Wired Remote I/O System be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying the Wired Remote I/O System to the above-mentioned applications.

3 Safety Precautions

⚠ WARNING Do not attempt to take any Unit apart while the power is being supplied. Doing so may result in electric shock.

⚠ WARNING Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

⚠ Caution Tighten the screws on the terminal block of the AC Power Supply Unit to the torque specified in the operation manual. The loose screws may result in burning or malfunction.

⚠ Caution Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

⚠ WARNING Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.

⚠ WARNING Provide safety measures in external circuits (i.e., not in the Programmable Controller), including the following items, in order to ensure safety in the system if an abnormality occurs due to malfunction of the PC or another external factor affecting the PC operation. Not doing so may result in serious accidents.

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- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.
- The PC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. As a countermeasure for such errors, external safety measures must be provided to ensure safety in the system.
- The PC outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.

4 Operating Environment Precautions

⚠ Caution Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

⚠ Caution Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

⚠ Caution The operating environment of the Wired Remote I/O System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the System.

5 Application Precautions

Observe the following precautions when using the Wired Remote I/O System.

⚠ WARNING Always heed these precautions. Failure to abide by the following precautions could lead to serious or possibly fatal injury.

- Always ground the system to 100 Ω or less when installing the Units. Not connecting to a ground of 100 Ω or less may result in electric shock.
- Always turn OFF the power supply to the PC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Mounting or dismounting I/O Units, CPU Units, Memory Units, or any other Units.

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- Assembling the Units.
- Setting DIP switches or rotary switches.
- Connecting cables or wiring the system.
- Connecting or disconnecting the connectors.

⚠ Caution Failure to abide by the following precautions could lead to faulty operation of the Wired Remote I/O System, or could damage the PC or PC Units. Always heed these precautions.

- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Always use the power supply voltages specified in this manual. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.
- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.
- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.
- Disconnect the functional ground terminal when performing withstand voltage tests. Not disconnecting the functional ground terminal may result in burning.
- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in this manual. Incorrect tightening torque may result in malfunction.
- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring may result in burning.
- Mount Units only after checking terminal blocks and connectors completely.
- Be sure that the terminal blocks, Memory Units, expansion cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
  - Changing the operating mode of the PC.
  - Force-setting/force-resetting any bit in memory.
  - Changing the present value of any word or any set value in memory.
- Resume operation only after transferring to the new CPU Unit the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.
- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.

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- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.
- When replacing parts, be sure to confirm that the rating of a new part is correct. Not doing so may result in malfunction or burning.
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static built-up. Not doing so may result in malfunction or damage.

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SECTION 1
Introduction

This section introduces Wired I/O Systems and describes their characteristics.

1-1 Remote I/O Systems . . . . . .
1-2 Wired Remote I/O Systems . . . . . .

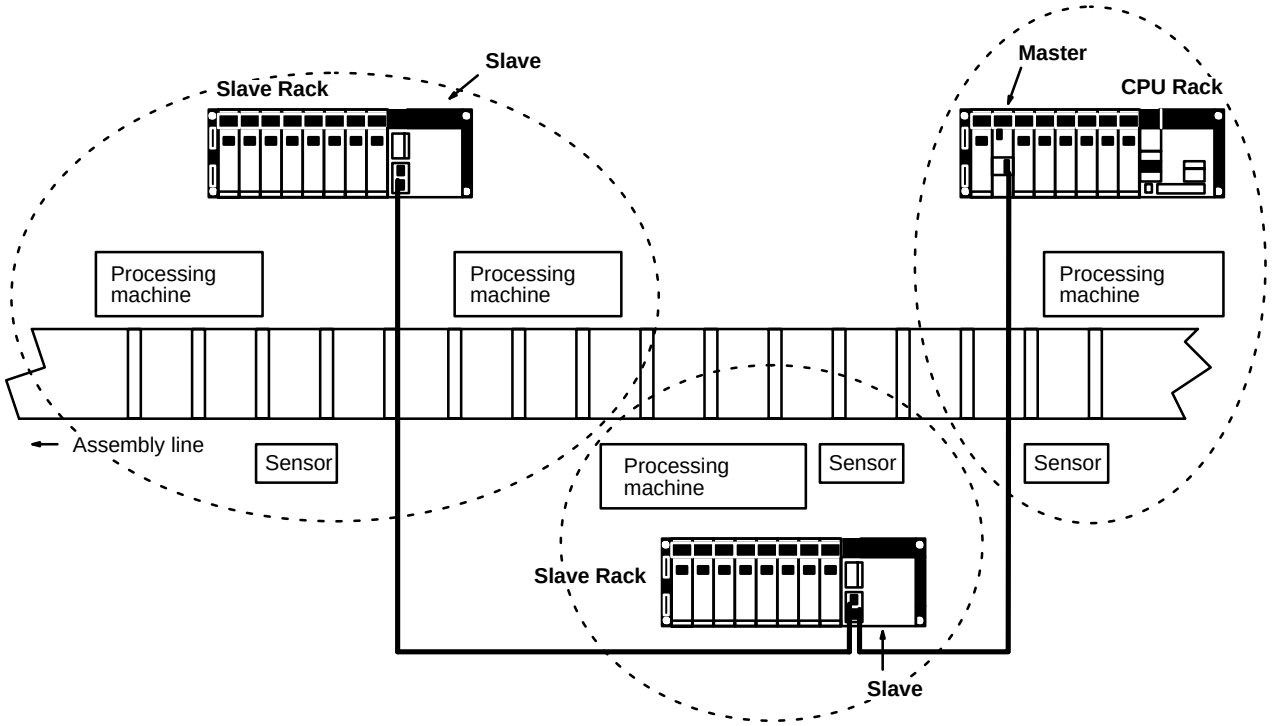
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1-1 Remote I/O Systems

Assembly lines are often extremely long, making it difficult if not impossible to wire all I/O devices directly from CPU Racks or Expansion I/O Racks. A Remote I/O System can be used to solve this problem. In a Remote I/O System, a Rack can be located farther from the CPU Rack than is possible with Expansion I/O Racks connected directly to the CPU Rack.

By locating a Rack farther from the CPU Rack, a Remote I/O System eliminates the time and mess in wiring (or changing wiring) to many devices that are separated from the CPU Rack. Although all I/O points must ultimately be wired individually, the question is one of distance: Do you want to wire dozens of terminals all the way across a factory complex or do you want to run a single cable for most of the distance and then wire individual terminals locally?

The following diagram illustrates how a simple Remote I/O System would be set up. Slave Racks, described below, are controlled by the CPU Unit through the Master. The dotted circles show the devices that would be controlled through the Units on each Rack.



Wiring distance could also be reduced by placing an independent CPU Rack near every location that required control, but in doing so, each PC would have to be programmed independently and the activities of all the PC programs would need to be coordinated, a very difficult job. Here too, a Remote I/O System simplifies the task by allowing a single CPU Unit, and thus a single program, to integrate control of the entire process. A Remote I/O System thus has these two advantages: Racks can be located a greater distance from the CPU Rack and coordinating control actions is simplified because all control is exerted by one program.

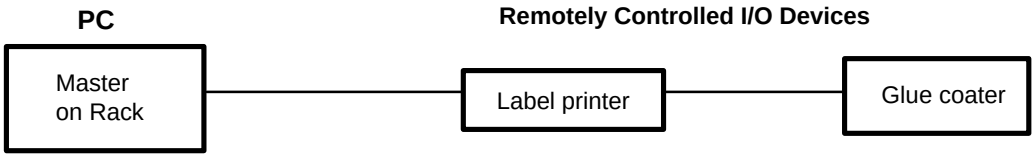
A third advantage of Remote I/O Systems is reduced noise interference. This is the result of the single cable that replaces the otherwise numerous wires that would be required all the way from the CPU and Expansion I/O Racks to the I/O devices.

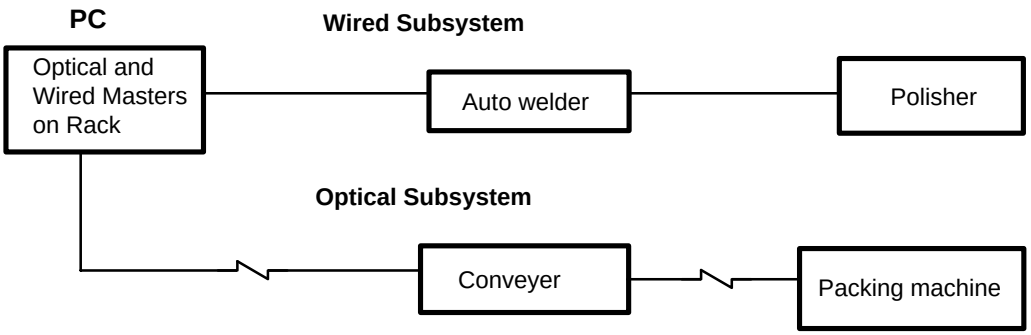
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A Remote I/O System directly involves only one PC and the program in it and through it a large number of I/O points can be controlled a greater distance from the PC. This is achieved by mounting a **Remote I/O Master Unit** to the CPU Rack to control I/O points located possibly many kilometers away. Each Master serves as a 'switching point' for controlling all of the I/O points accessed through it. These I/O points are accessed through the Master, not controlled by it. All I/O control comes from the program in the CPU Unit.

More than one Master can be mounted to a single PC, with each Master forming the starting point of a **Remote I/O Subsystem**, i.e., a Remote I/O Subsystem includes one Master plus all of the **Remote I/O Units** controlled through it.

The Remote I/O Units that can be included in each Subsystem depend on the specifications of the Master. Masters are available either with optical or wire specifications. **Optical Remote I/O Systems** transfer data through **optical fiber cables** to enable the greatest transmission distance and the greatest resistance to electrical noise. **Wired Remote I/O Systems** use wire cables which don't offer as great a distance as Optical Subsystems, but do greatly reduce the burden of wiring remote I/O and afford greater resistance to noise than independently wired I/O points. Both types of Master can be mounted to the same PC to meet specific distance and noise-resistance requirements.





All Remote I/O Systems consist of at least one Remote I/O Master Unit connected in series to one or more Units accessed through it. One of these Units that is common to most Remote I/O Systems is a Remote I/O Slave Unit.

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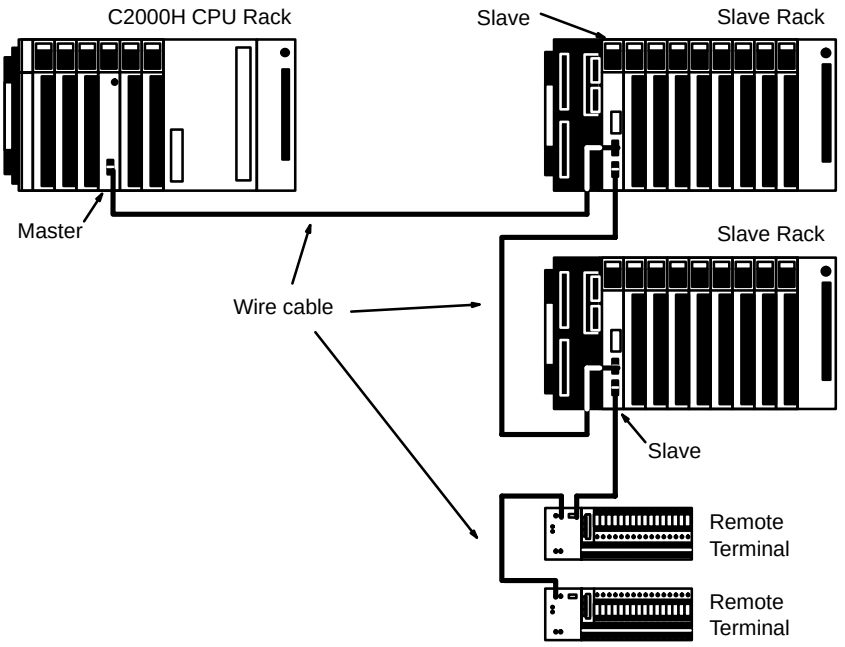
A Master is mounted to the CPU Rack or an Expansion I/O Rack; a Slave is mounted to a Backplane to form what is called a **Slave Rack**. To a Slave Rack is mounted the same other Units as those mounted to the CPU or Expansion I/O Rack, with only a few exceptions (e.g., Link Units other than Slaves cannot be mounted to Slave Racks). The advantage of a Slave Rack is that it can be located a considerable distance from the CPU Rack with the only connection required being a cable running from the Master to the Slave. The actual distance a Slave Rack can be removed from the Master, as well as the other Units used to configure a Remote I/O System, depends on the type of Remote I/O System being used. Collectively, all of the Units connected in a Remote I/O System are referred to as **Remote I/O Units.**

This manual describes Wired Remote I/O Systems. Optical Remote I/O Units are described in the *Optical Remote I/O System Manual (W136).*

1-2 Wired Remote I/O Systems

In a Wired Remote I/O System, the Master is connected to other Remote I/O Units through wire cable. These Remote I/O Units include Wired Masters, Wired Slaves, and **Remote Terminals**. Link Adapters can also be included in the System to enable the use of **optical cable links**.

A basic Wired Remote I/O System is shown below.



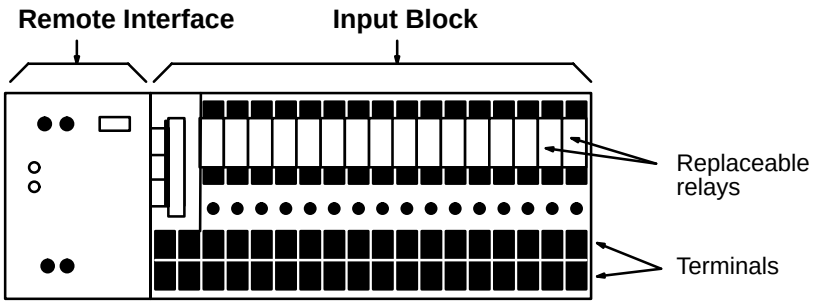
Remote Terminals

A Remote Terminal can be used when there is only a limited number of I/O points required in a single location. Each Remote Terminal provides up to 16 input or output points.

There are two basic types of Remote Terminal. A G72C Remote Terminal is a ‘stand-alone’ Unit that occupies one location in the Remote I/O System. It provides 16 fixed transistor inputs or outputs and can be used for any application suited to these.

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The other basic type of Remote Terminal consists of two parts: a Remote Interface and an I/O Block. The Remote Interface functions to transmit input or output signals between the Remote I/O System and the I/O Block. I/O Blocks enable easy removal and replacement of individual relays, including relays with a large **switching capacity**, making them ideal for controlling large motors, heavy equipment, etc. An I/O Block is available for either 16 input points or 16 output points.



The types of field devices that can be handled is the only functional difference between G72C Remote Terminals and Remote Interfaces connected to I/O Blocks. There is no difference that affects the software operation of the Remote I/O System. In the remainder of this manual, the term Remote Terminal will be used to refer collectively to both types of Remote Terminals unless there is a reason to specify one or the other.

Link Adapters

Converting Link Adapters can be used to create optical cable links within an otherwise Wired System. The connections to Masters, Slaves, and Remote Terminals are still wire cable; the optical connections are only between Link Adapters. Refer to *2-4 Optical Connections in Wired Systems* for details.

Branching Wired Remote I/O Systems through Branching Link Adapters is not possible.

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SECTION 2
System Design

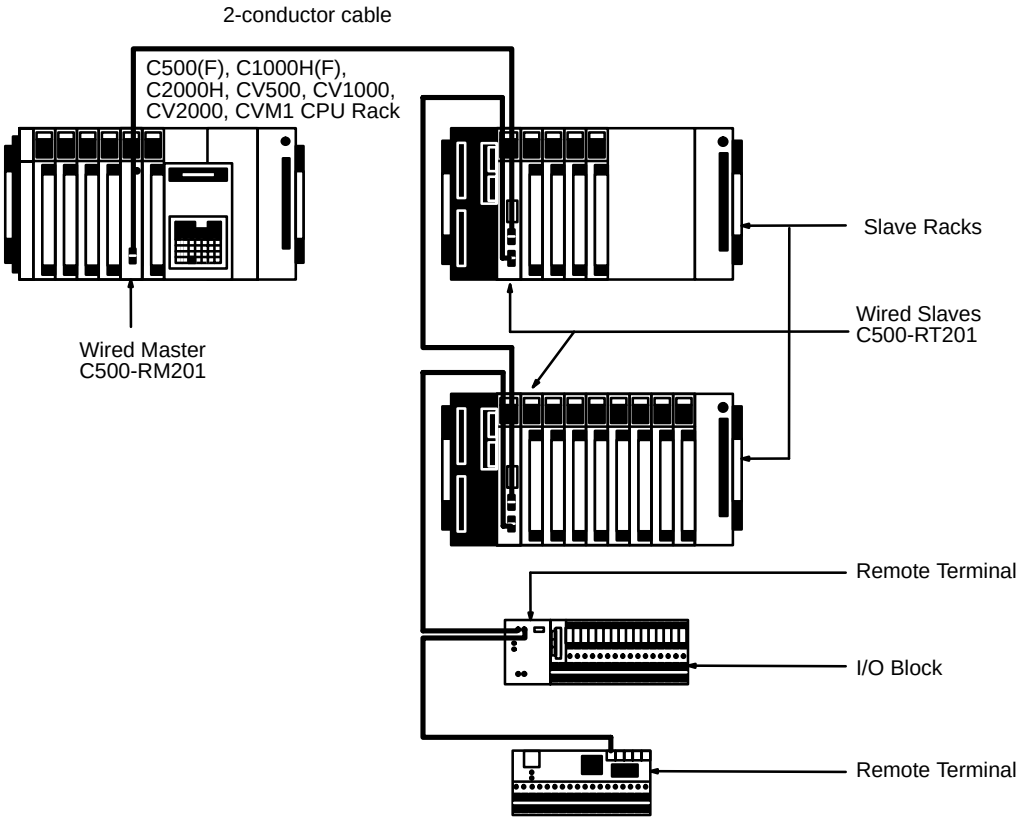
Although there are many possible Remote I/O Systems that can be built out of Masters, Slaves and Remote Terminals, each System is limited by the capacity of the PC and the nature of the other Units in the System. *Section 2-1* describes System configurations based on the C500-RM201 Master and C500-RT201 Slave (i.e., for C120, C500, C1000H, and C2000H Systems), and outlines connection requirements, mounting restrictions, and System size limitations. *Section 2-2* provides the same information for C200H Systems. *Section 2-3* explains combining Masters and Slaves from different Systems. Finally, *Section 2-4* describes how to incorporate optical links into Wired Remote I/O Systems.

2-1 Basic System . . . . .
2-1-1 C120 Systems . . . . .
2-1-2 C500 Systems . . . . .
2-1-3 C1000H and C2000H Systems . . . . .
2-2 C200H Systems . . . . .
2-3 Combined Systems . . . . .
2-4 Optical Connections in Wired Systems . . . . .
2-5 Multilevel Systems . . . . .

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2-1 Basic System

The following figure shows a basic System configuration illustrating some aspects of Wired Remote I/O Systems designed with the C500-RM201 Master. Refer to following subsections for specific examples and limitations.



Unit Connection

At least one Master is always necessary to connect Slaves and/or Remote Terminals. Connect each Master and all the Remote I/O Units controlled through it in series. All Units can be combined in any fashion and connected in any order as long as they are in series and the Master is on one end of the line. I/O Blocks are mounted to Remote Interfaces.

Mounting Remote I/O Units

Masters can be mounted to any I/O slot on the CPU or Expansion I/O Rack in all but C120 Systems. In C120 Systems, Masters must be mounted to the I/O Interface Unit's position (leftmost slot) on C500 Backplanes.

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Remote Terminals

Remote Interface and I/O Blocks are used in pairs, each of which provides 16 points. The I/O Block is easily connected to the Remote Terminal by way of a connector. G72C Remote Terminals, on the other hand, do not require a separate I/O Block. Remote Interface and I/O Blocks are paired as follows:

I/O	I/O Block	Remote Terminal
AC Input	G7TC-IA16 100/110 VAC or G7TC-IA16 200/220 VAC	G71-IC16 12 VDC or G71-IC16 24 VDC
DC Input	G7TC-ID16 12 VDC G7TC-ID16 24 VDC	G71-IC16 12 VDC G71-IC16 24 VDC
Output	G7TC-OC16 12 VDC G7TC-OC16 24 VDC	G71-OD16 12 VDC G71-OD16 24 VDC

Maximum Number of Connectable Remote I/O Units

The number of Units in any one System is limited by the capacity of the PC. Detailed limitations are provided in the following table. These totals include all Optical and Wired Master Subsystems controlled by the PC.

PC	C120	C500, CV500, CVM1-CPU01-EV2	C1000H, C2000H, CV1000, CV2000, CVM1-CPU11-EV2 /CPU21-EV2
Masters per PC	4	4	8
Slaves per Master	2	2	8 (see note)
Slaves per PC	8	8	16 (see note)
Remote Terminals per Master	16	32	32
Words per Master	16 (256 points)	32 (512 points)	

Note Always set the address number of the Remote I/O Unit in order starting from #0. The CPU Unit will determine the number of Slaves connected according to the address number of the Remote I/O Unit, as shown in the following table, even if only one Slave is actually connected. Therefore, if the address number is designated from the larger number, the actual total number of Remote I/O Units that can be connected to one PC will be limited.

Largest Unit No. Set	Number of Slaves Connected (as Determined by the CPU Unit)
0 or 1	2
2 or 3	4
4 or 5	6
6 or 7	8

Example

If three Slaves connected to separate Masters mounted to the same CPU Rack were set as Unit number 4, the PC would assume, as shown above, that each Master had six Slaves attached, for a total of 18, or two more than allowed in the System. An error would thus be generated, even if the three Slaves were actually the only Slaves in the System.

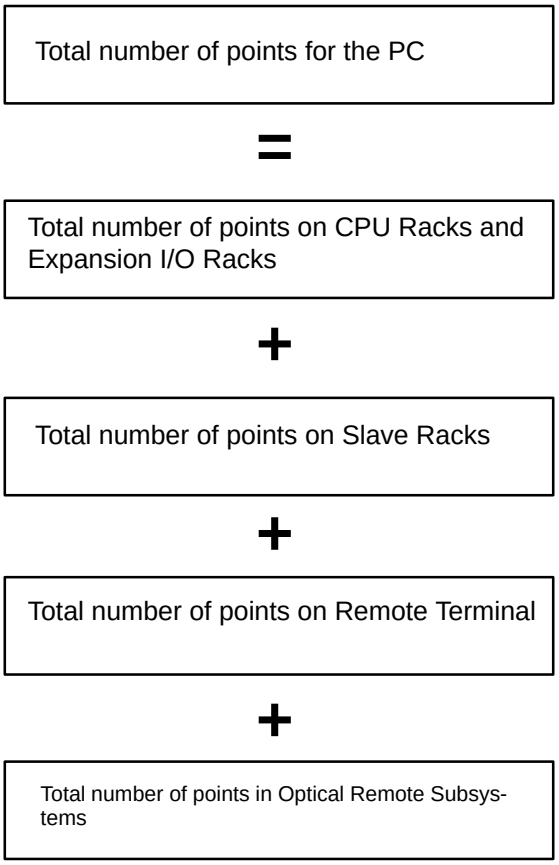
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Total I/O Points

The total number of I/O points in the System must not exceed the number of I/O points provided by the PC to which the Master(s) is mounted or connected.

PC	Maximum Number of I/O Points
C2000H	2,048
C1000H	2,048*
C500	512
C120	256

*The total number of I/O points in a C1000H System can be up to 2,048, as long the number of I/O points on the CPU Rack and Expansion I/O Racks connected to the CPU Rack (i.e., not I/O points on Slave Racks) is limited to 1,024.

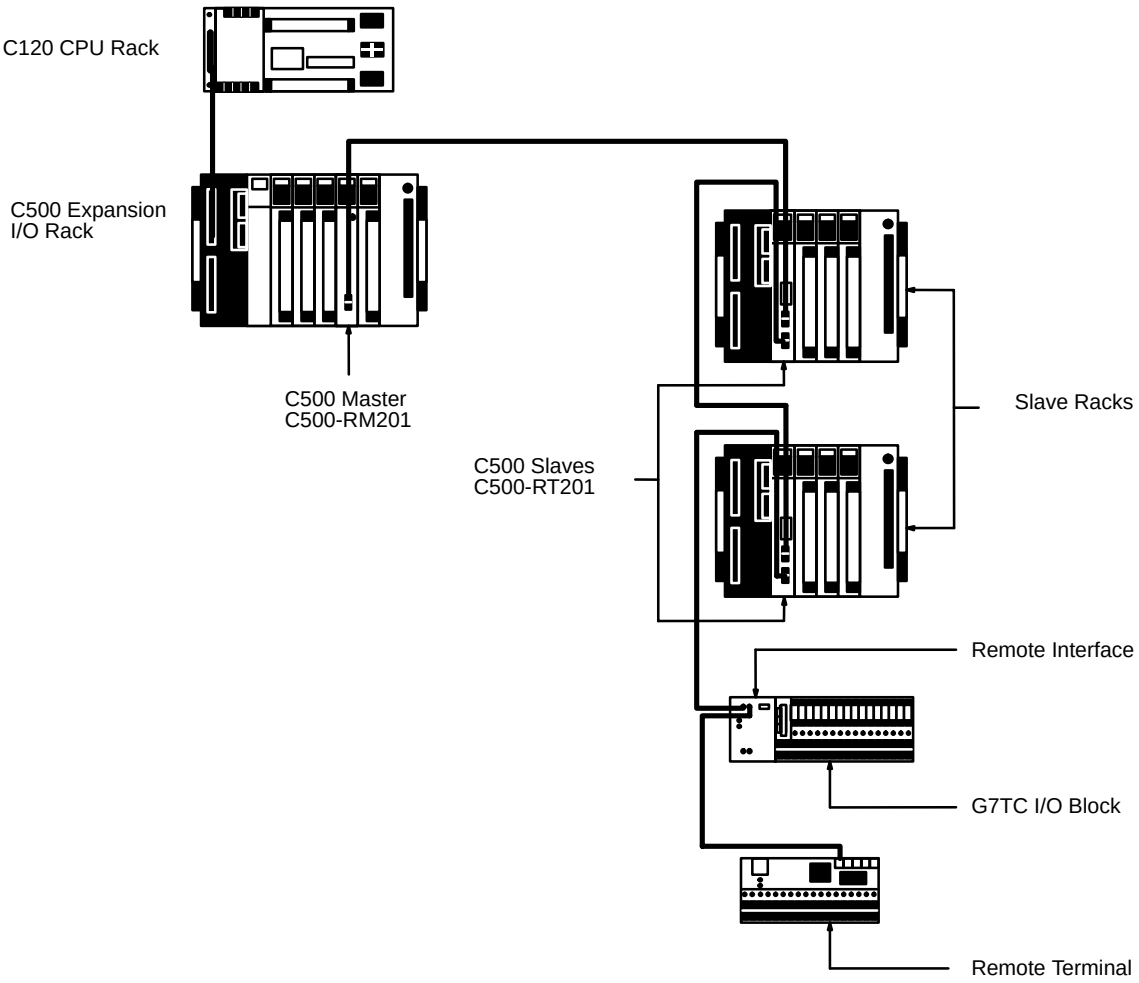


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2-1-1 C120 Systems

In C120 Systems, up to four Masters can be connected to the same PC, and up to two Slaves and 16 Remote Terminals can be connected to any one Master. Note that a Master in a C120 System must be mounted to an I/O slot on a C500 Expansion I/O Rack.

C120 PCs provide 256 I/O points. This means that the total number of points used in the System must be 256 or less. If, for example, 256 points are controlled by one Master connected to a C120 PC, there cannot be any more Masters or I/O points employed for that C120 PC.

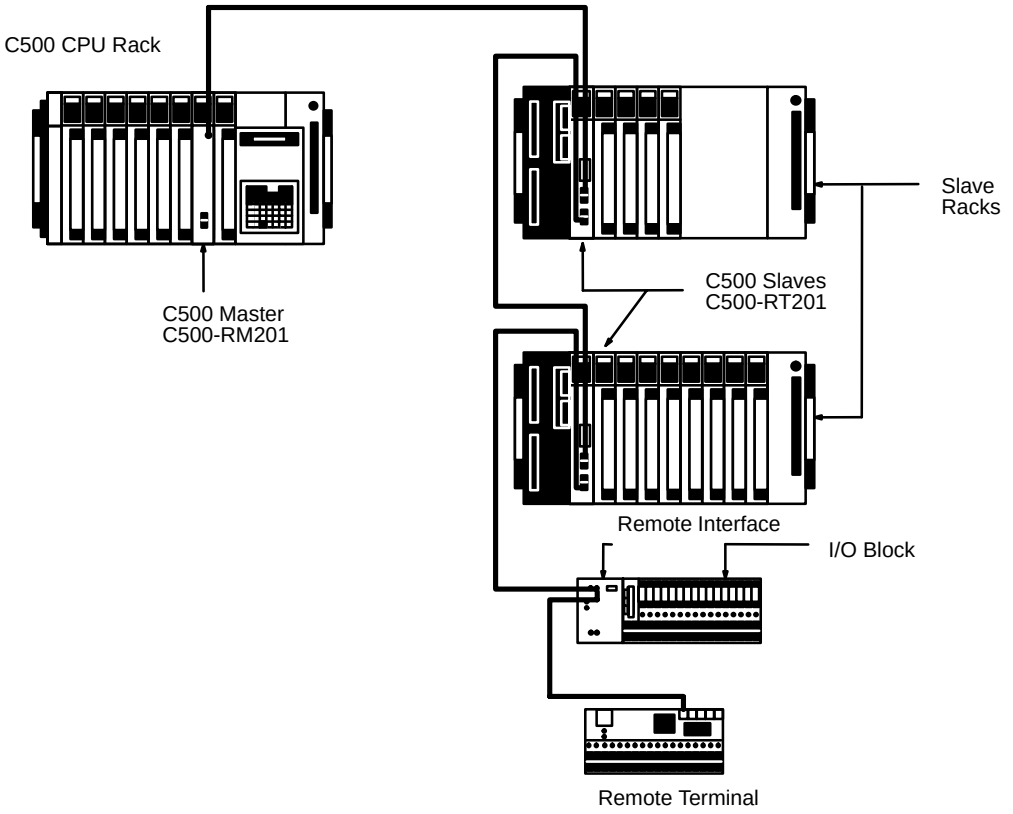


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2-1-2 C500 Systems

In C500 Systems, up to four Masters can be connected to the same PC, and up to two Slaves and 32 Remote Terminals can be connected to any one Master.

C500 PCs provide 512 I/O points. This means that the total number of points used in the System must be 512 or less. If, for example, 512 points are controlled by one Master connected to a C500 PC, no more Masters or I/O points can be employed for that C500 PC.

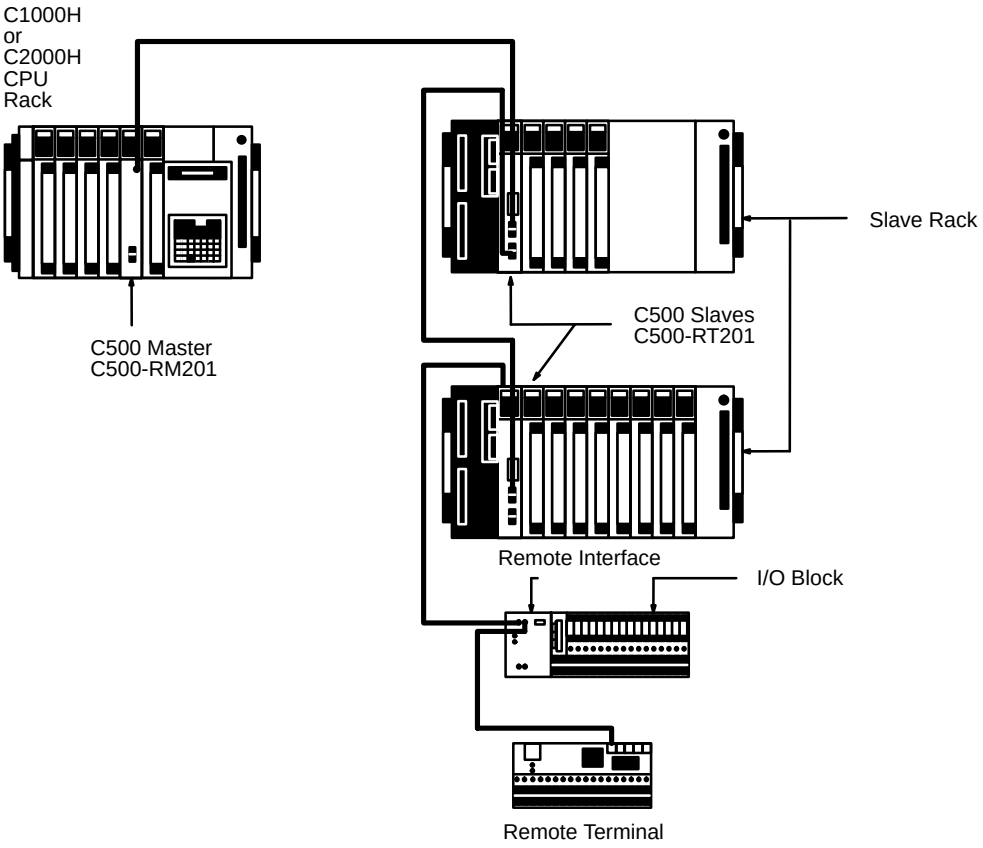


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2-1-3 C1000H and C2000H Systems

In C1000H and C2000H Systems up to eight Masters can be connected to the same PC. In C1000H and C2000H Systems, up to eight Slaves and 32 Remote Terminals can be connected to any one Master.

When a Remote I/O System is included, C1000H and C2000H PCs provide 2,048 I/O points. This means that the total number of points used in the System must be 2,048 or less. If, for example, 2,048 points are controlled by four Masters on C1000H and C2000H PCs, no more Masters or I/O points can be employed on the PCs. (The number of I/O points for the I/O Units on a C1000H CPU Rack and Expansion I/O Racks must be kept to within 1,024.)The number of points for any one Master, must be kept to 512 or less.



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2-2 C200H Systems

When constructing a Remote I/O System from C200H Masters and Slaves, up to 2 Masters, 5 Slaves (regardless of the number of Masters), and 32 Remote Terminals can be included. Optical Masters and Slaves, if controlled by the PC, must be included in these totals. Expansion I/O Racks can be connected to Slave Racks, however this limits the number of Slaves which the PC can control i.e., each such Expansion I/O Rack must be counted as a Slave Rack. The basic rules for Remote I/O Systems apply, e.g., each Master Subsystem must be connected in series with a Master on one end and a terminator (either a Remote Terminal or Slave) on the other end.

Mounting Locations

Masters can be mounted to any slot on the C200H CPU Rack or Expansion I/O Rack. Masters should not be mounted, however, to either of the rightmost two slots of the CPU Rack, as this would prevent mounting devices directly to the CPU Unit. I/O Blocks are mounted to the Remote Interface, just as in Systems using C500-RM201 Masters (see *2-1 Basic System*). Masters cannot be mounted to Slave Racks or to Expansion I/O Racks connected to Slave Racks

Note

1. The only Units that can be mounted to Remote I/O Slave Racks are Basic I/O Units and Special I/O Units.
2. High-density I/O Units (Group 2) and B7A Interface Units (Group 2) cannot be used on Remote I/O Slave Racks.
3. A Remote I/O Master Unit cannot be used if the CPU Unit is the C200H-CPU02.
4. High-density I/O Units mounted on a Remote I/O Slave Rack can be used only if the Remote I/O Master Unit is the C200H-RM201.

Special I/O Units

The numbers of Special I/O Units that can be mounted to any one Slave Rack are shown in the following table. These figures assume that Units are used only from one of the three groups.

Group A	Group B	Group C	Group D
High-Speed Counter Unit	Multi-Point I/O	Temperature Sensor Voice Unit	Position Control Unit (C200H-NC211, C200HW-NC413) Motion Control Unit (C200H-MC221)
Position Control Unit (C200H-NC111/112, C200HW-NC113/213) ASCII Unit Analog I/O Units	---	---	---
4 total	8 total	6 total	2 total

If Units from more than one group are used, the following equations must be met:

$3A + B + 2C + 6D \leq 12$

$A + B + C + D \leq 8$

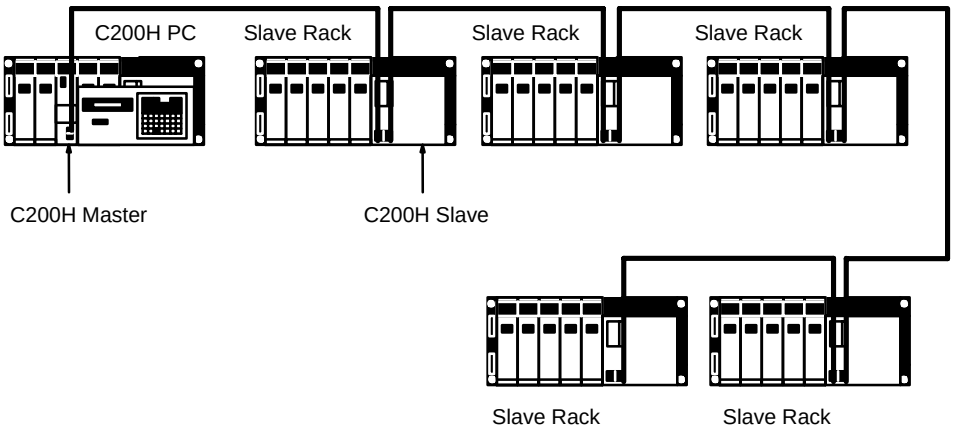
The total number of Special I/O Units that can be used on all Racks combined is 10. If PC Link Units are also used in the PC System, they must also be included in the total.

Transmission Time

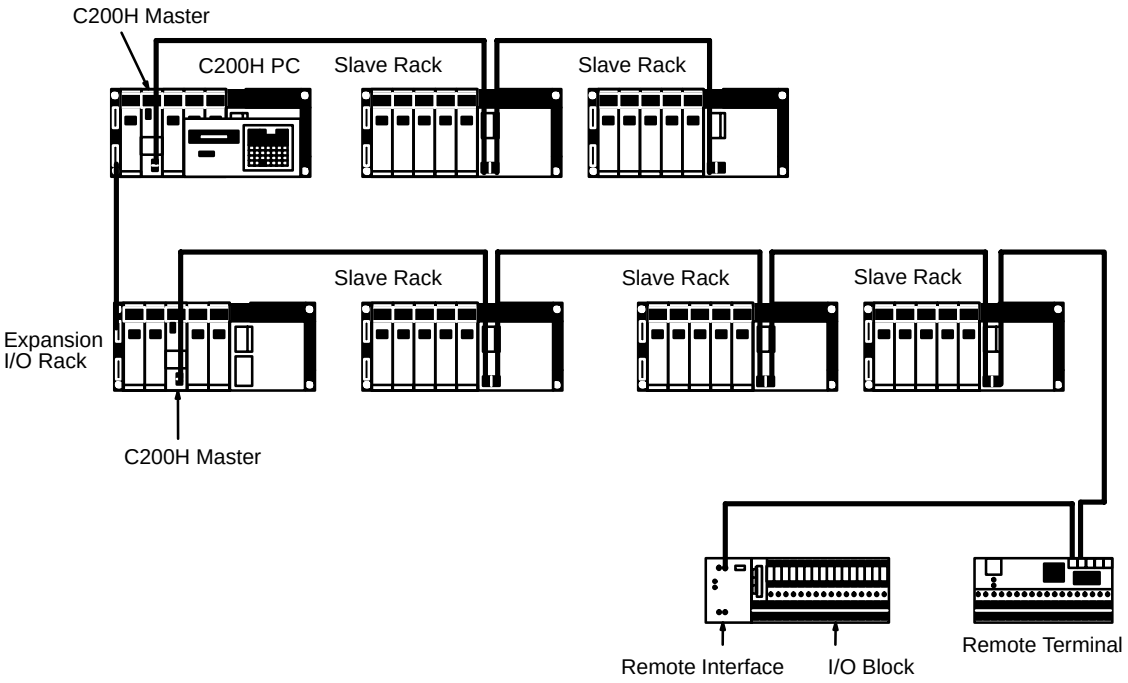
Transmission time will be decreased with the same number of Slaves if two Masters are used rather than one. Refer to *Section 6 I/O Response Times*.

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Example System 1: One Master



Example System 2: Two Masters

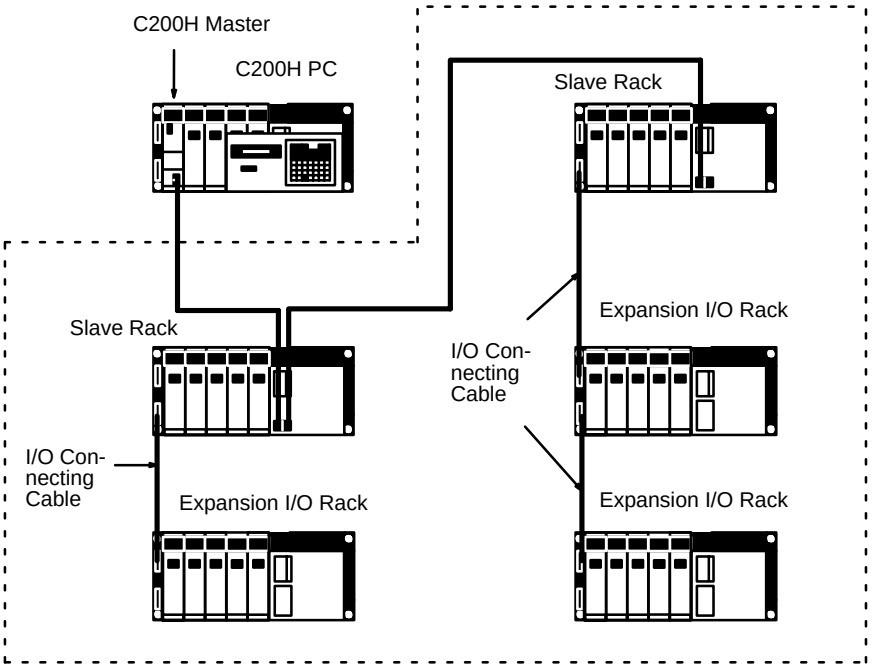


Example System 3: Master with Extra Expansion I/O Racks

A maximum of two C200H Expansion I/O Racks can be connected to a Slave Rack. I/O Connecting Cable (2-conductor cable) is used to connect the extra Expansion I/O Racks.

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Individual sections of cable must not be longer than 2 m. Each extra Expansion I/O Rack must be counted as a 'Slave' when computing the number of Slaves controlled by the PC.

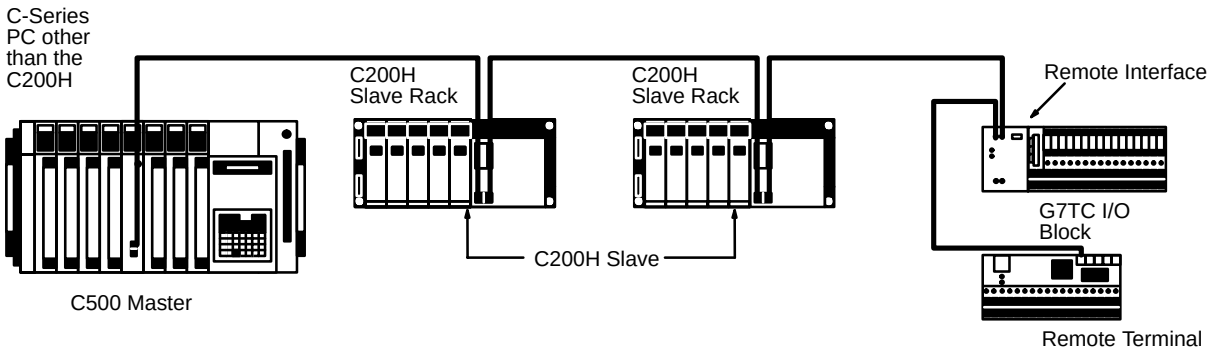


2-3 Combined Systems

C500 and C200H Remote I/O Units can be combined into the same System. That is, C500 Slaves can be connected to C200H Masters; C200H Slaves, to C500 Masters.

Example 1: C500 Master and C200H Slaves

The maximum number of connectable Units is the same as in any Remote I/O System based on the C500-RM201 (see *2-1 Basic System*). Word assignments will be based on the C500 PC, i.e., based on the order and positions of I/O Units mounted, and not on fixed slot words. Special I/O Units cannot be mounted to C200H Slave Racks controlled by a C500 Master; all mounted Units will be assigned only one word each. The "type of Master" switch an all C200H Slaves controlled by C500 Masters must be turned ON to designate a Master other than the C200H Master.



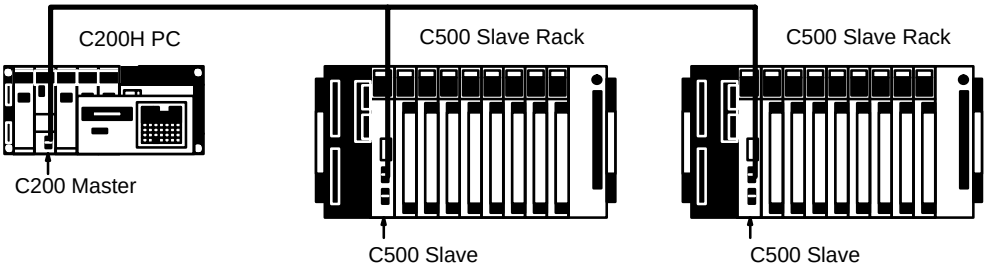
⚠ Caution When C200H Slave Racks are connected to Masters on PCs other than the C200H/C200HS, all Output Units on these Slave Racks will be treated as having at least 16 output points. disabling the Fuse-burnout and Alarm Detection Bits on Units that normally provide them (e.g., C200H-OD411, C200H-OD213, C200H-OD214, and C200H-OA221).

When using the C200H Backplane for 10 slots as a remote I/O Slave for the CVM1/CV500/CV1000/CV2000, only the 8 slots from the left can be used; the 9th and 10th slots from the left cannot be used.

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Example 2: C200H Master and C500 Slaves

When connecting C500 Slaves to C200H Masters, each C500 Slave must be counted as 2 Slaves when figuring the total number of Slaves. This total, which includes all optical and wired Slaves, must be no greater than 5 for any one C200H PC. Here, Special I/O Units can be mounted to C500 Slave Racks. Word assignments will be based on the C500 PC's System, i.e., based on the order and positions of I/O Units mounted (starting at the left), and not on fixed slot words.



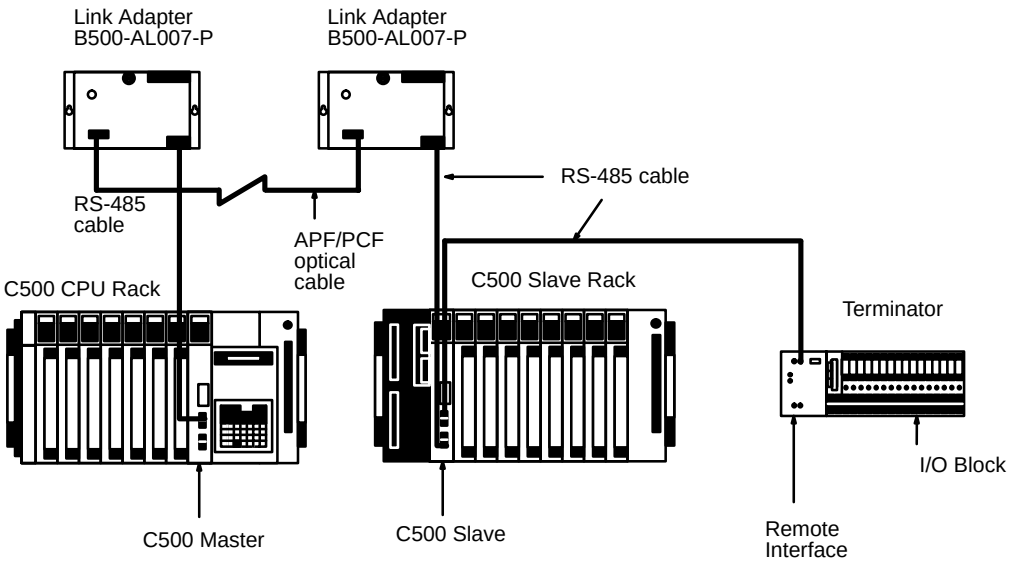
2-4 Optical Connections in Wired Systems

Two B500-AL007-P Link Adapters can be used to extend the transmission distance and/or to prevent interference from noise by inserting an optical link between two Remote I/O Units. The two Link Adapters convert between wire and optical signals, transmitting over the optical link between them. The AL007-P Link Adapter is thus always used in pairs, and always between Wired Remote I/O Units. The entire Master Subsystem, from Master to terminator, must still be connected in series.

Up to 8 Link Adapters (4 pairs) can be used for each Master. To take full advantage of an optical link, shorten wire links as much as possible, even to the point of placing the Link Adapter on the same control panels as the Remote I/O Units.

Maximum cable length for any one section of optical cable is 20 m for all-plastic optical fiber cable (APF); 200 m for plastic clad optical fiber cable (PCF).

Refer to the Link Adapter manual for details on this and other uses of Link Adapters.



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Handling Optical Fiber Cable

Although special characteristics of optical fibers call for care in connecting optical devices, laying optical fiber cables basically does not differ from laying wire cables. All OMRON PCF Cables and the 3G5A2-PF101 APF (length: 1 m) Cable come with connectors attached. Connectors for all other APF Cables must be assembled by the customer. Note the following precautions when handling optical fiber cables:

1, 2, 3...

1. Always turn the power off to the Link Adapter when connecting or disconnecting an optical fiber cable.
2. Always hold the connect when disconnecting an optical fiber cable; never pull on the cable.
3. APF and PCF connectors are designed to be inserted only in one direct; do not try to force them in the wrong way.
4. Insert APF and PCF connectors until they lock into position.
5. Always place the protective caps on unused Link Adapter modules.
6. If dirty, clean connectors gently with a tissue or sanitary cotton, using ethyl alcohol if necessary. Do not use any solvent other than ethyl alcohol.
7. Do not allow heavy objects to fall on optical cable or otherwise subject it to excessive shock or strain.

2-5 Multilevel Systems

There is no reason that a Remote I/O System must remain restricted to either wired or optical communications. PCs support multiple Masters, some of which can be Wired and some of which can be Optical.

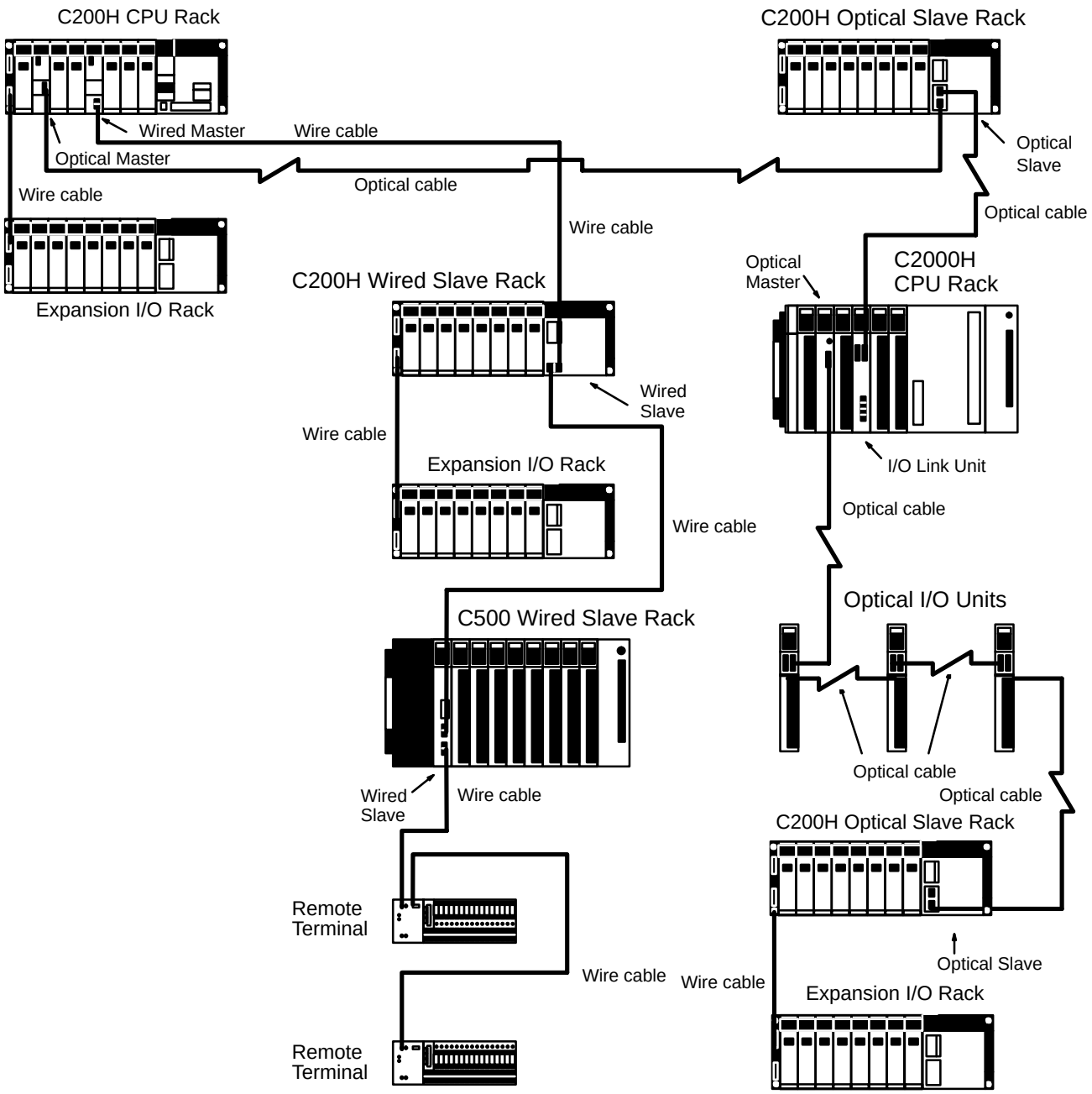
Although the number of Subsystems supported by each PC is limited, each Subsystem can be considered independently from the others as long as the total capacity of the PC is not exceeded. It is important to note that although both Wired and Optical Masters can be controlled by the same CPU Unit, Optical and Wired Remote I/O Units cannot be combined in the same Subsystem, i.e., Optical Masters can be connected only to Optical Slaves, Optical I/O Units, and I/O Link Units; Wired Masters can be connected only to Wired Slaves and Remote Terminals.

In the following example, two CPU Racks are used. The one in the upper left corner controls two Remote I/O Subsystems, one Wired and one Optical. The Optical System contains an I/O Link to the other CPU Rack (at the right), which has one Remote I/O Subsystem controlled by it.

The Optical I/O Units, Slave Rack, and Expansion I/O Rack beneath the CPU Rack at the right are controlled through the Optical Master on this CPU Rack. Note that if there was no Master on this Rack and the Optical I/O Units and Slave Rack were connected through the I/O Link Unit, they would become the last Units in the Optical Remote I/O Subsystem controlled by the CPU Unit at the upper left, and be controlled by it.

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Another aspect of Remote I/O Systems demonstrated by this diagram is the presence of Expansion I/O Racks, both connected to a CPU Rack and to Slave Racks. Although normally not shown in system diagrams for Link Systems, Expansion I/O Racks can be used to increase the number of I/O Units mountable at any one location.



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SECTION 3
Data Exchange and Operations

PCs transmit I/O data through Masters, Slaves, and Remote Terminals according to allocated words.

Although words are not allocated to Masters and Slaves, they are allocated to all I/O Units and Remote Terminals in the System. To enable proper word allocation, Unit numbers must be set for all Slaves and, in some Systems, word multipliers must be set for Masters. A Slave or Remote Terminal must also be set as a terminator for each Master.

Section 3-1 provides block diagrams of various Remote I/O Units. *Section 3-2* provides details and examples of Unit connections, word settings, terminator settings, word multiplier registration, and the word allocations that result from these. The basic setting procedure for the entire System is outlined in *Section 3-3*. Finally, *Section 3-4* provides example program sections used to start System operation when power is turned on to a Slave, rather than to the Master as it normally is.

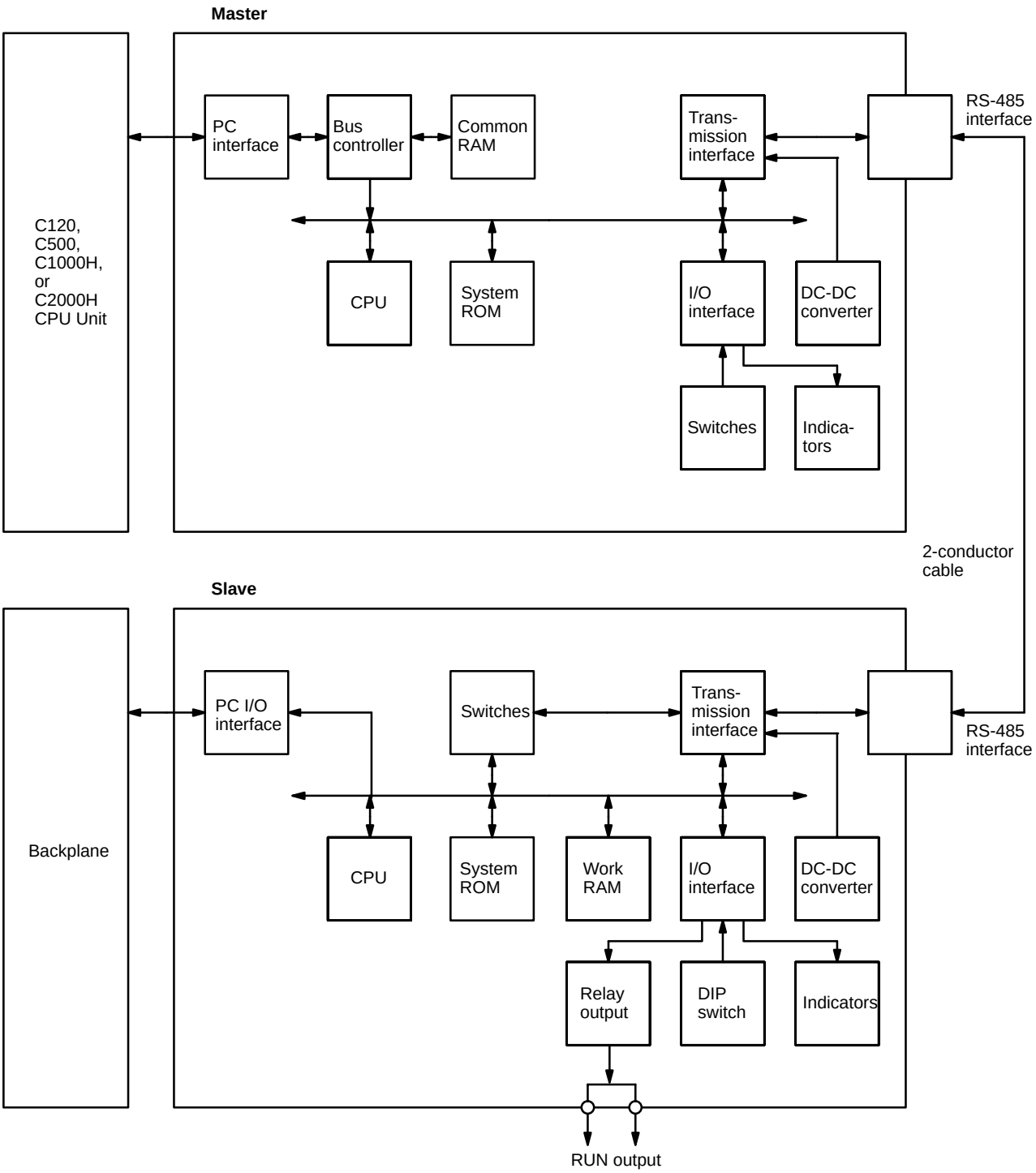
3-1 Block Diagrams . . . . .
3-2 Unit Numbers and I/O Word Allocation . . . . .
3-2-1 C500 Masters . . . . .
3-2-2 C200H Masters . . . . .
3-2-3 Combined Systems . . . . .
3-3 Setting Procedure . . . . .
3-4 Delayed Activation of Slaves . . . . .

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3-1 Block Diagrams

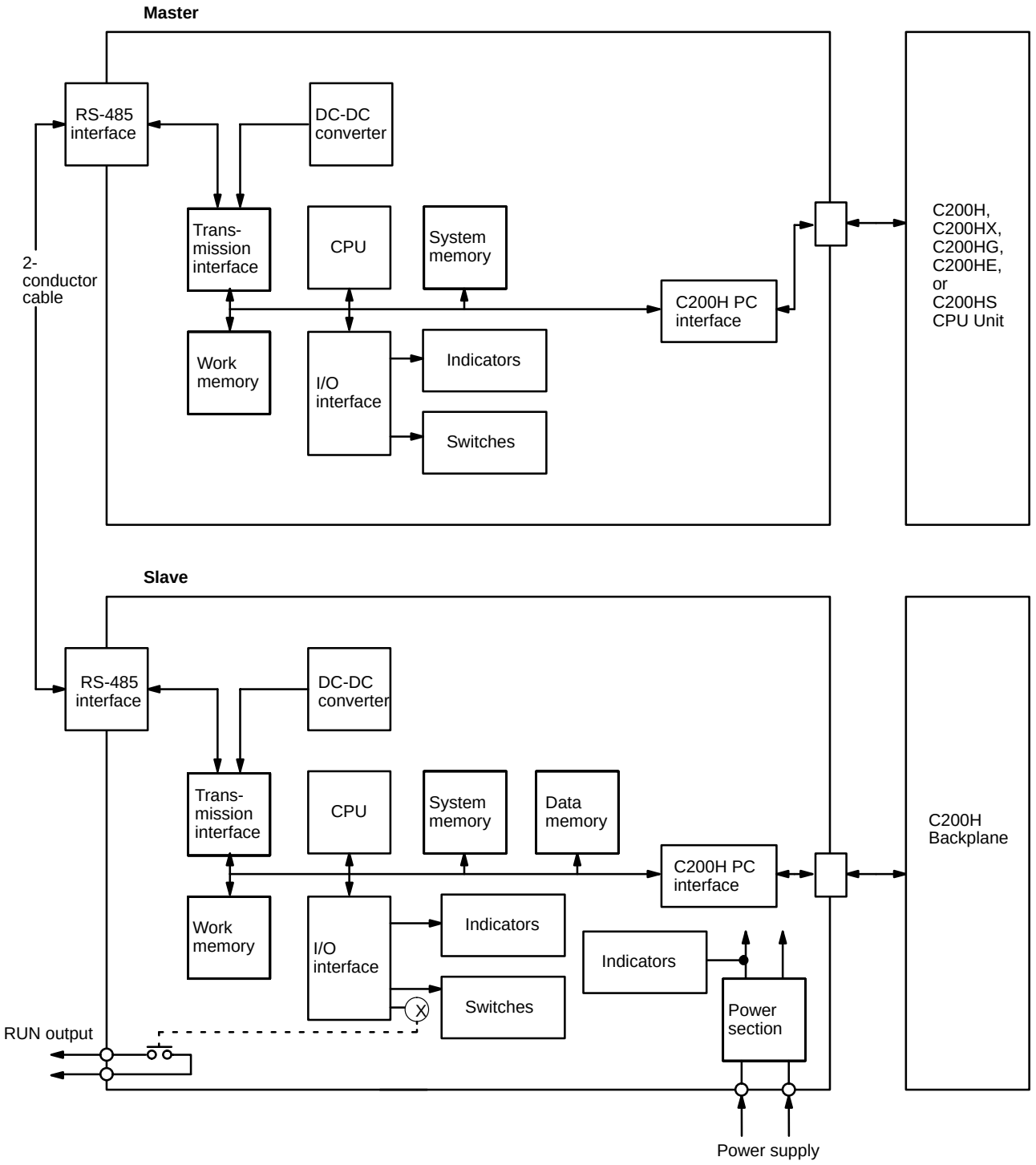
The following block diagrams are for Units available in Wired Remote I/O Systems.

C500 Master and Slave



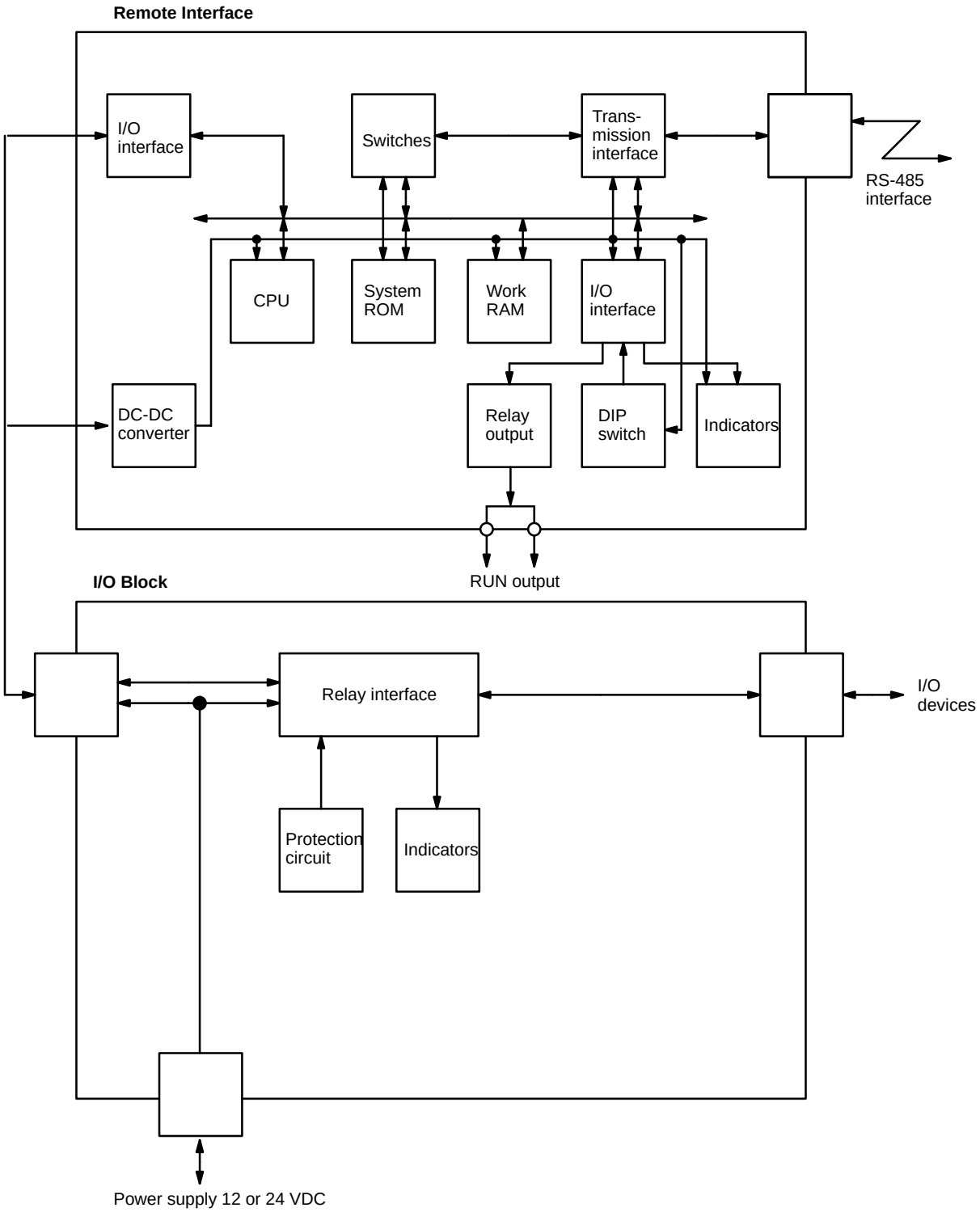
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C200H Master and Slave



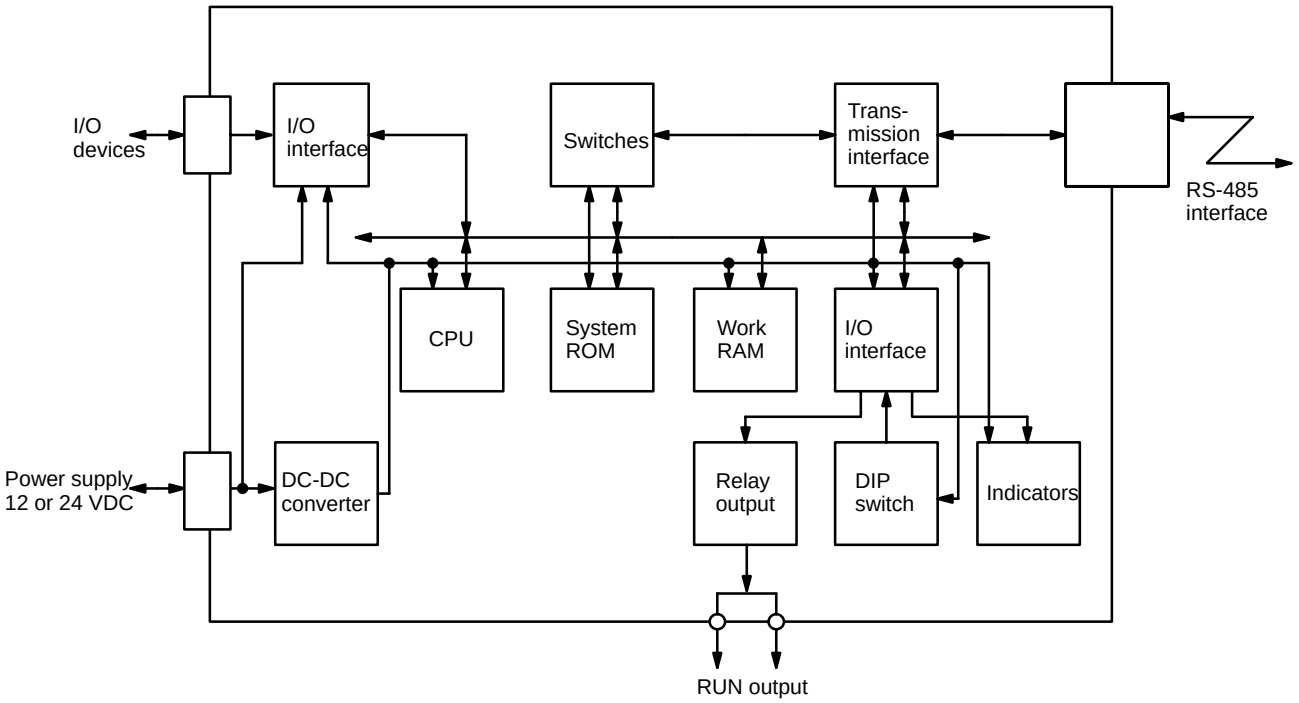
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Remote Interface and I/O Blocks

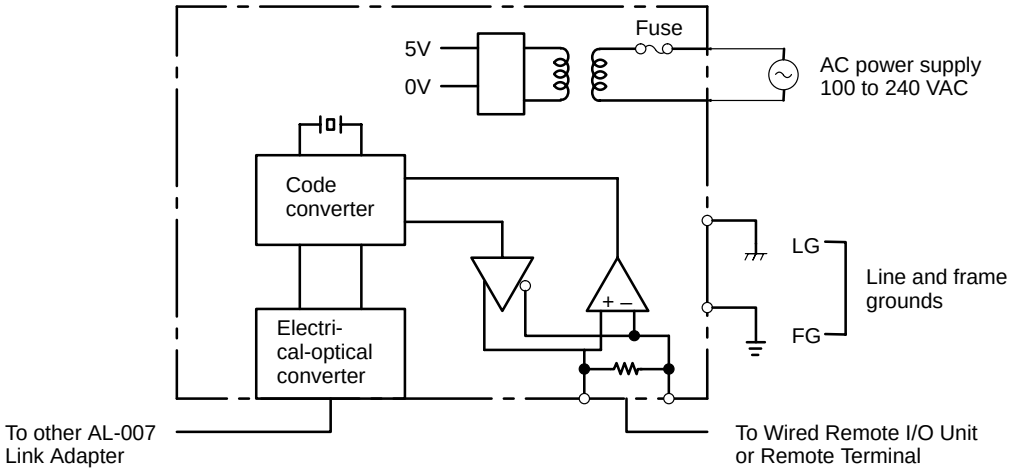


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G72C Remote Terminal



AL007-P Link Adapter



3-2 Unit Numbers and I/O Word Allocation

Basic Allocation

Word allocations on Racks in Remote I/O Systems follow basically the same pattern as the PC to which the Master is mounted, i.e., by the mounting order of and by the number of words required for each Unit mounted for C120, C500, C1000H, and C2000H Systems and by fixed slot words in C200H Systems.

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In either case, allocations start from the lowest word starting on the left side of the CPU Rack. When a Master is reached on a Rack, allocation jumps to the leftmost Unit mounted on the first Slave Rack connected to the Master, and then to the second Slave Rack, etc, until the terminator is reached. Then allocations return to the Unit following the Master and continue across the CPU Rack and Expansion I/O Racks until all the Units on all Racks have been allocated. Details on and examples of allocation are provided below.

Words for Units not mounted to Racks (i.e., Remote Terminals) are not determined as described above, but according to switch settings on the Units, as described below.

Terminator

There must be one terminator set for each Master, and it must be the Unit at the opposite end of the I/O bus from the Master.The terminator may be a Slave or a Remote Terminal. The Master checks for a terminator immediately upon power application. If the terminator is properly set, the other Units connected to the I/O bus are acknowledged. All following operation is based on this initial check. Therefore, if a Unit is not attached properly or if the power to a Unit is not on when this check is performed, that Unit will be ignored during actual operation.

3-2-1 C500 Masters

Setting Slave Unit Numbers and Terminators

Because more than one Slave can be attached to each Master, Unit number settings are necessary to distinguish the Slaves. Unit numbers 0 through 7 can be set for C1000H and C2000H, Slaves; unit numbers 0 and 1, for all others. The Slave assigned unit number 0 is referred to as Slave #0; the Slave assigned unit number 1, as Slave #1, etc. The same unit number cannot be used on more than one Slave under the same Master. Setting unit numbers other than those listed above will prevent Slave operation.

Set the Slave directly connected to a Master as Slave #0, the Slave connected to Slave #0 as Slave #1, and so on. Setting unit numbers and a terminator is necessary for every Master, even when only one Slave is connected. Refer to *Section 4 Switch Settings* for details on setting procedures.

I/O Units can be mounted to Slave Racks in any location desired numbers are automatically allocated left to right in the order the I/O Units are mounted.

Setting Remote Terminal Words

A PC I/O word must be allocated for each Remote Terminal connected in the System; words are not automatically allocated. Any word from 0 through 31 can be set in all Systems but C120 Systems, where words between 0 and 15 must be set.

In C1000H and C2000H Systems, words 0 through 127 are allocated by the PC's CPU Unit to enable use of up to 128 words even though actual word settings are from 0 through 31. This is achieved by combining word settings with word multipliers, which are explained next.

Word Multipliers in C1000H and C2000H Systems

Because the C1000H and C2000H PCs can handle up to 2,048 points (or 128 words), words 32 to 127 of these PCs cannot be allocated without some identification other than word settings. It is therefore necessary to assign word multipliers to the Masters to which Remote Terminals are mounted and identify the words with these multipliers as well. These numbers run from 0 through 3.

Word numbers, word settings, and word allocations are related as shown by the following equation:

I/O word allocation = (32 words x word multiplier) + (word set on Unit)

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For example, suppose word 28 is set on a Remote Terminal and word multiplier 2 is assigned to the Master of that Remote Terminal. The I/O word allocated to the Remote Terminal, viewed from the PC, is computed as follows:

32 words x 2 + 28 words = word 92

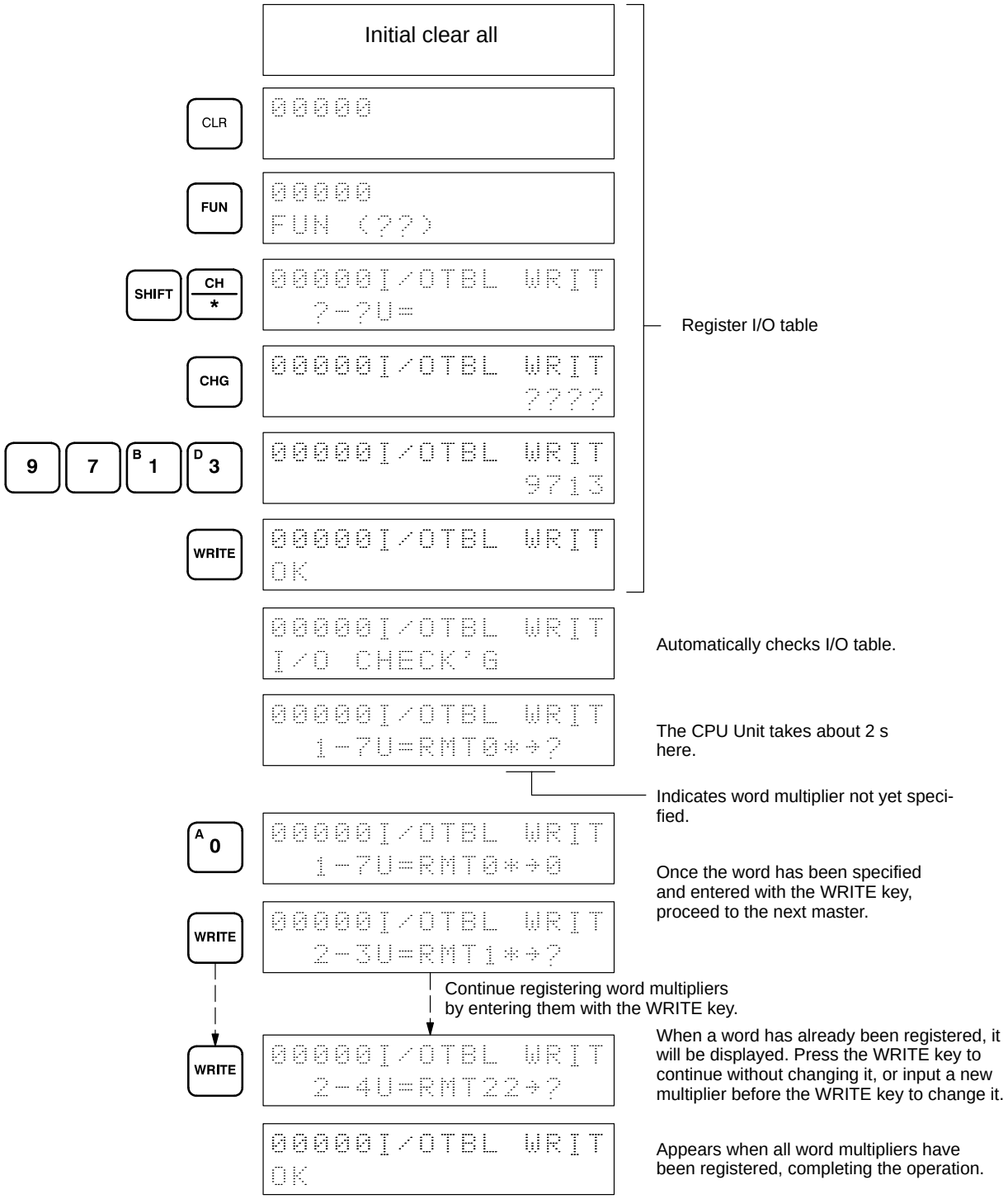
A word multiplier is not assigned to a Master to which only Slaves are connected because words will be automatically allocated to the I/O Units on these Slaves. The I/O words assigned in Remote I/O Systems must not be the same as the I/O words allocated elsewhere.

The same word multiplier can be assigned to more than one Master as long as the word settings for the Units connected to the Masters are different, i.e., as long as the allocated words differ.

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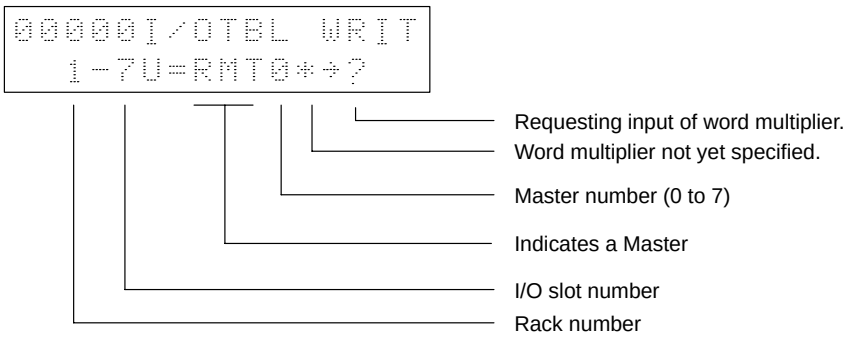
Setting Word Multipliers

Set the word multipliers in a C1000H and C2000H System using the Programming Console as shown below. Before setting word multipliers, set the mode selector to PROGRAM. Word multipliers must be assigned only to the Masters to which Remote Terminals are connected. Displays for word multipliers are not displayed for Masters to which only Slaves are connected.



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Meaning of Displays



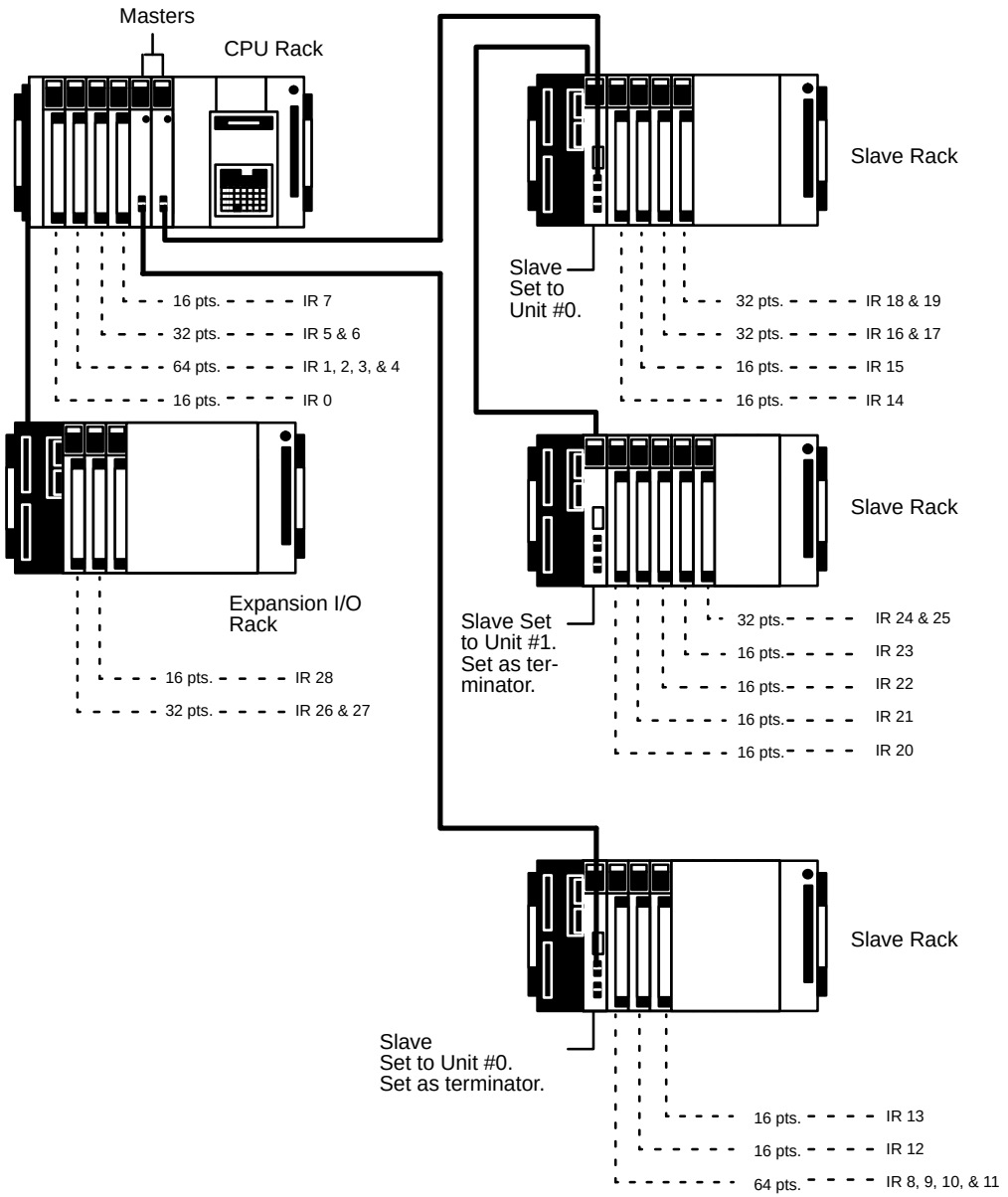
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I/O Word Allocation Examples

The following examples show four possible Systems and the word allocations for them. They do not show all possible connections or the maximum number of Units possible for each System. Refer to *Section 4-1* for the maximum number of connectable Units.

Example 1: C500 with Slaves

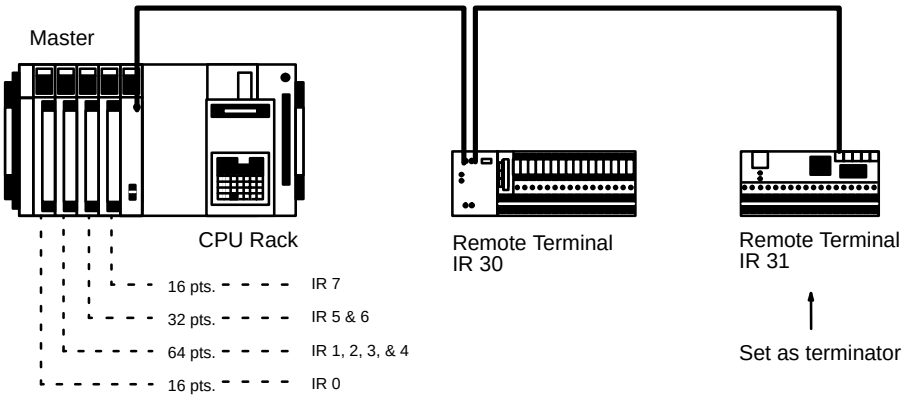
With two Slaves connected to one Master, the Slaves are set to unit numbers 0 and 1. The order does not matter. The last Unit must be set as the terminator. If only one Slave is connected, set it to unit number 0 and as the terminator. Words are automatically allocated for all I/O Units.



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Example 2: C500 with Remote Terminals

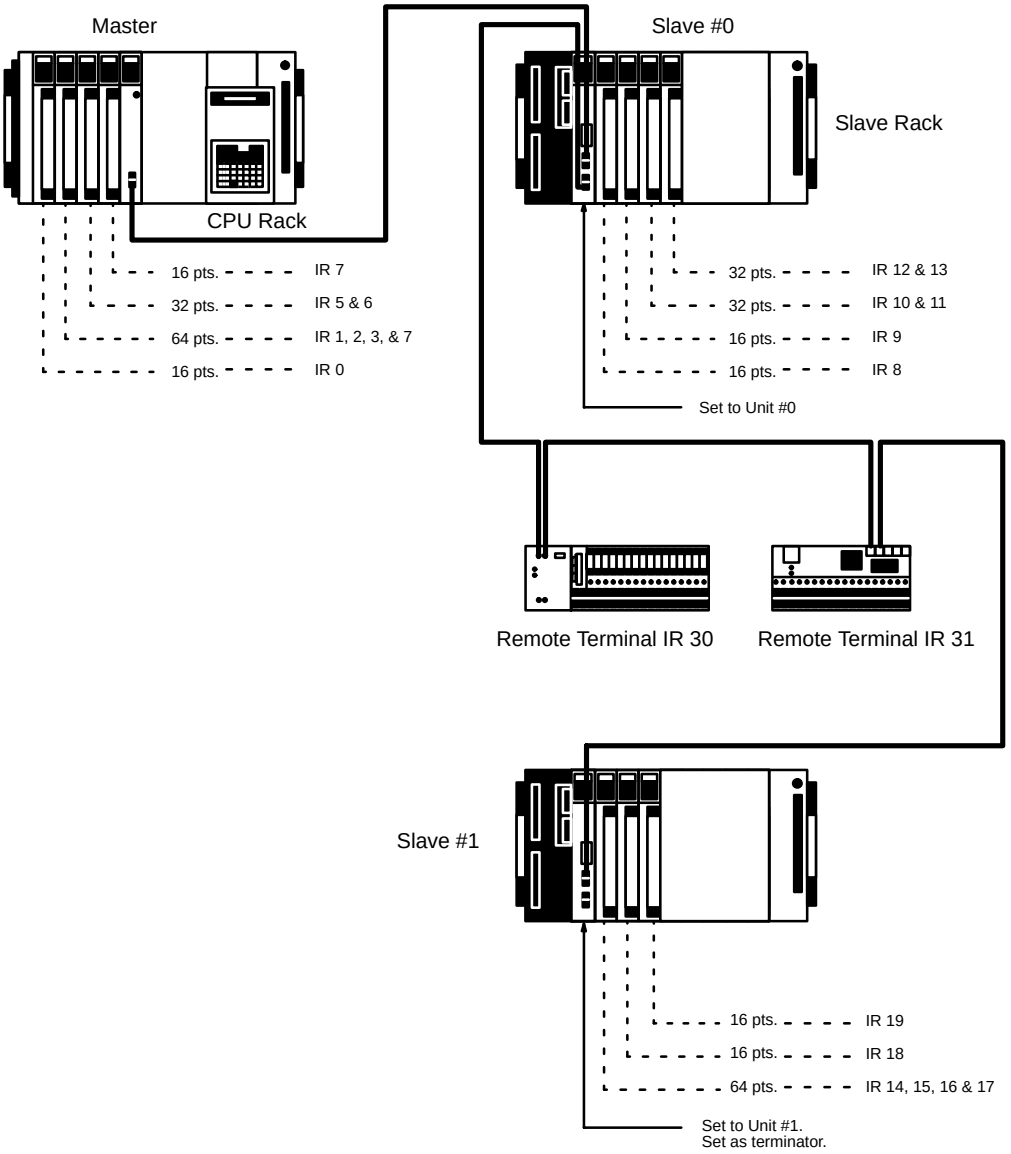
Because the I/O Units are allocated words starting at the lower end (word 00), duplication can be avoided by starting Remote Terminal words from the upper end, i.e., from 31 in all Systems except C120 Systems, where it is best to start word settings backward from 15. Do not set words that are already being used for other I/O points.



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Example 3: C500 with Slaves and Remote Terminals

Here, as in Example 2, word duplication can be avoided by setting Remote Terminal words starting from the upper end.

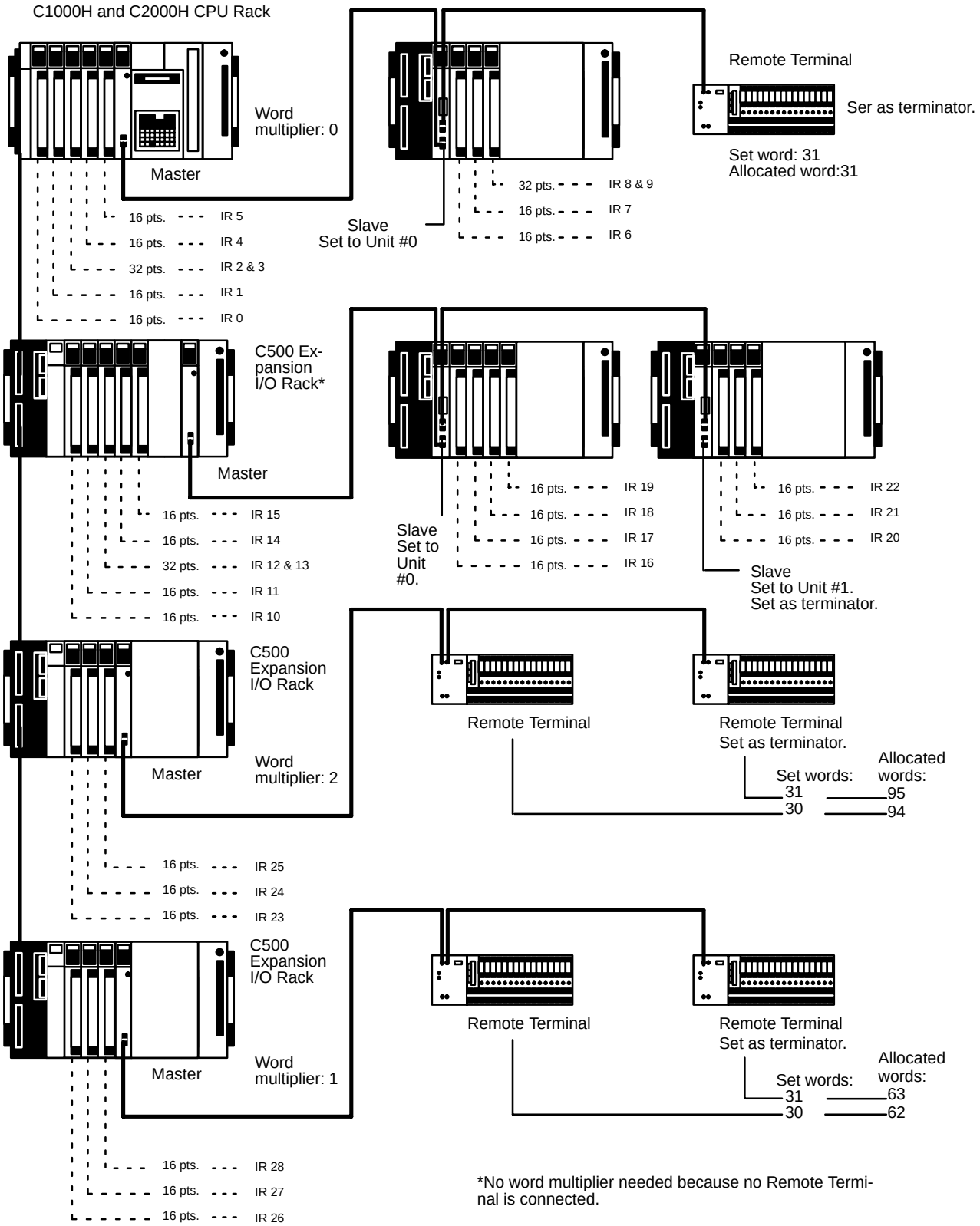


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Example 4: C1000H and C2000H with Slaves and Remote Terminals

Duplication can be avoided here too by starting Remote Terminal words from the upper end. (See Example 2, above, for details.)

Do not set words that are being used for other I/Os.



*No word multiplier needed because no Remote Terminal is connected.

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3-2-2 C200H Masters

I/O Unit Word Allocations

I/O Units on C200H Slave Racks are allocated words according to the unit number set on the Slave and the word assigned to the slot to which the I/O Unit is mounted. For example, if the Slave is Unit #0, words 50 through 59 are allocated to the Slave Rack. I/O slots on the Rack would be, from left to right, 50, 51, 52 ... 58, and 59. Slot words do not change even if an I/O Unit is not mounted in every slot. Slot words not used on shorter Racks can be use as work words. The following table shows the words allocated for each Slave unit number. Note that the Slave will not operate if the same unit number is set for more than one Slave or if a number not between 0 and 4 (inclusive) is assigned. If an Expansion I/O Rack is connected to a C200H Slave Rack via I/O Connecting Cable, the Expansion I/O Rack will be automatically assigned the words for the next unit number. Such unit numbers cannot be set on any other Slave.

Unit number	Words
0	50 through 59
1	60 through 69
2	70 through 79
3	80 through 89
4	90 through 99

Remote Terminal Words

Remote Terminals connected to C200H Masters are allocated words 200 through 231. The actual word numbers will be 200 greater than the numbers set on the Remote Terminals.

Terminators

The last Slave, Remote Terminal in each Master Subsystem must be set as the terminator no matter how large the Subsystem is. Without a terminator set for each Master Subsystem, the I/O System and the PC will not operate, and the END RS indicator on the PC will remain lit. If a Programming Console is mounted, the display will show that the CPU Unit is on standby.

Master Unit Numbers

C200H Masters must also be assigned unit numbers. These numbers determine response to error processing and AR area Error flags and Restart bits. See *4-1 Remote I/O Units* for unit number switch settings and *7-2 Error Codes and Monitoring* for details on error flags and restart bits.

C200H Masters must also be assigned Unit numbers. These numbers determine response to error processing and AR area error flags and restart bits. See *4-1 Masters and Slaves* for unit number switch settings and *7-2 Error Codes and Monitoring* for details on Error flags and Restart bits.

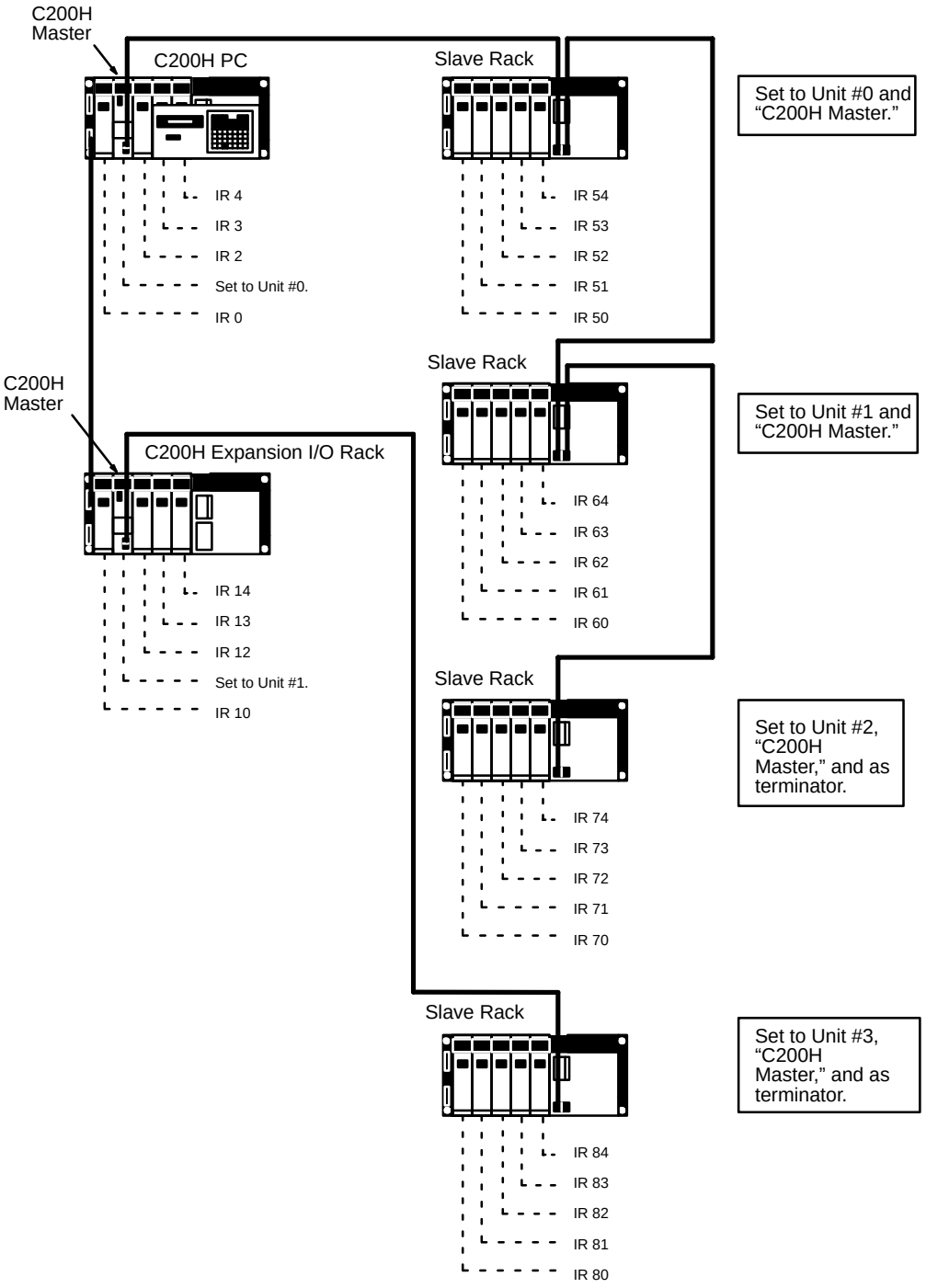
Master Designations on C200H Slaves

The Master to which a C200H Slave is connected must be designated on the “type of Master” switch on each C200H Slave. See *Section 4* for details on switch settings.

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Example 1: C200H Masters and Slaves

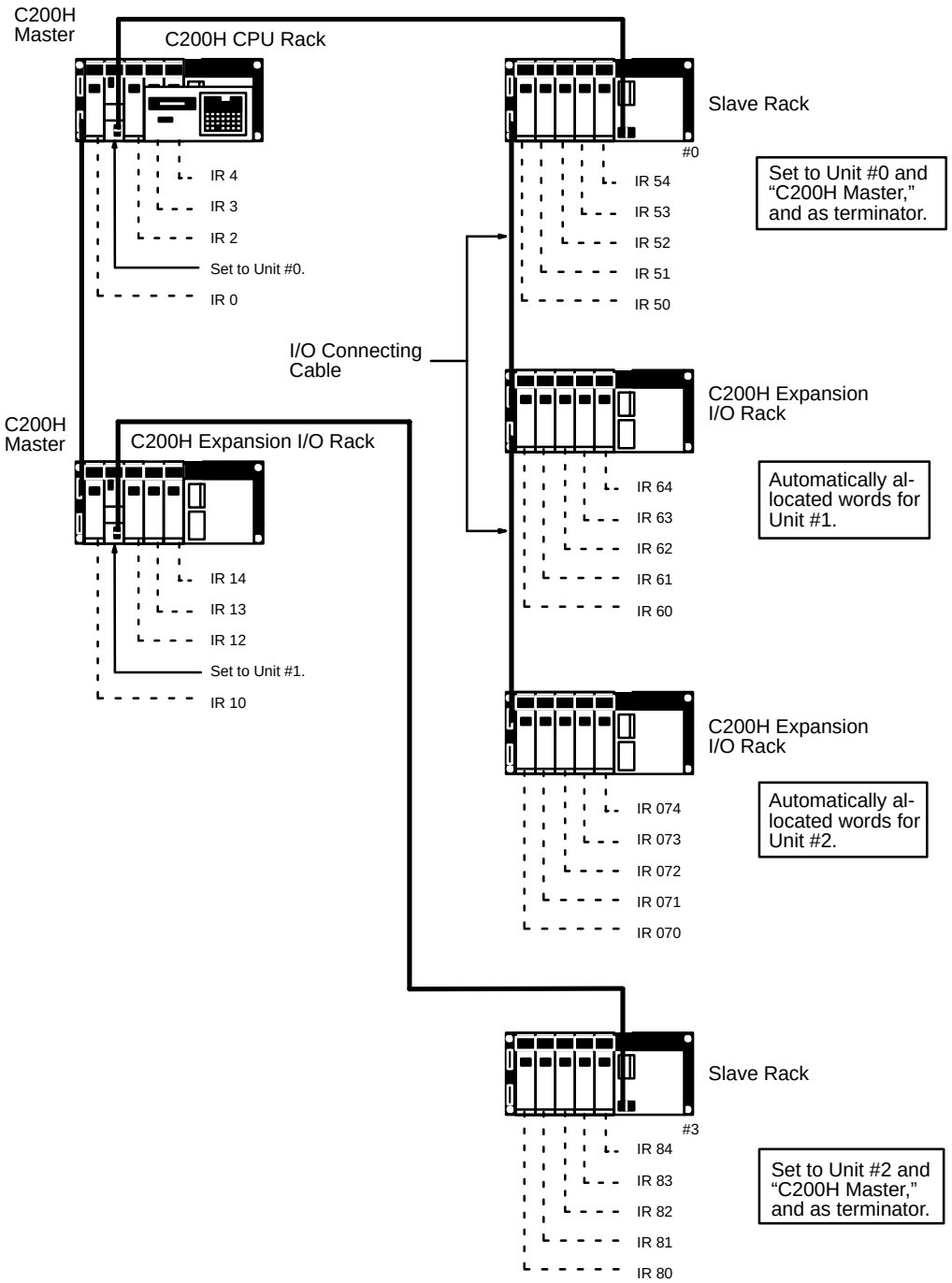
This example System shows word allocations for two C200H Masters, one on the CPU Rack and one on an Expansion I/O Rack, and four of the maximum possible five C200H Slaves. (The unallocated I/O words may be used as work words.)



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Example 2: C200H Masters, Slaves, and Extra Expansion I/O Racks

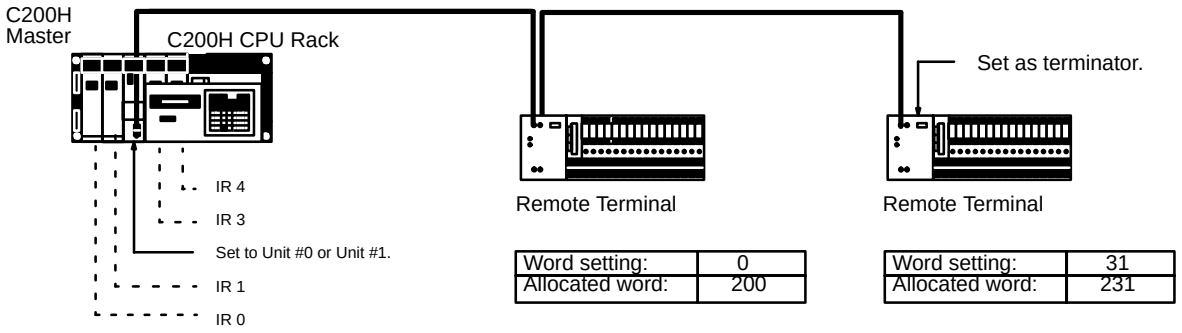
This example System shows word allocations for two C200H Masters, one on the CPU Rack and one on an Expansion I/O Rack, two of the maximum possible five C200H Slaves, and two extra Expansion I/O Racks. The extra Expansion I/O Racks are counted as two more Slaves in the maximum of five and automatically allocated word for unit numbers. (The unallocated I/O words may be used as work words.)



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Example 3: C200H Masters and Remote Terminals

This example Systems shows word allocations for one C200H Master, and two of the maximum possible 32 Remote Terminals. As shown, the words actually allocated to Remote Terminals connected in C200H Master Subsystems are 200 higher than the settings. (Unallocated I/O words may be used as work words.)



3-2-3 Combined Systems

C200H Masters and C500 Slaves

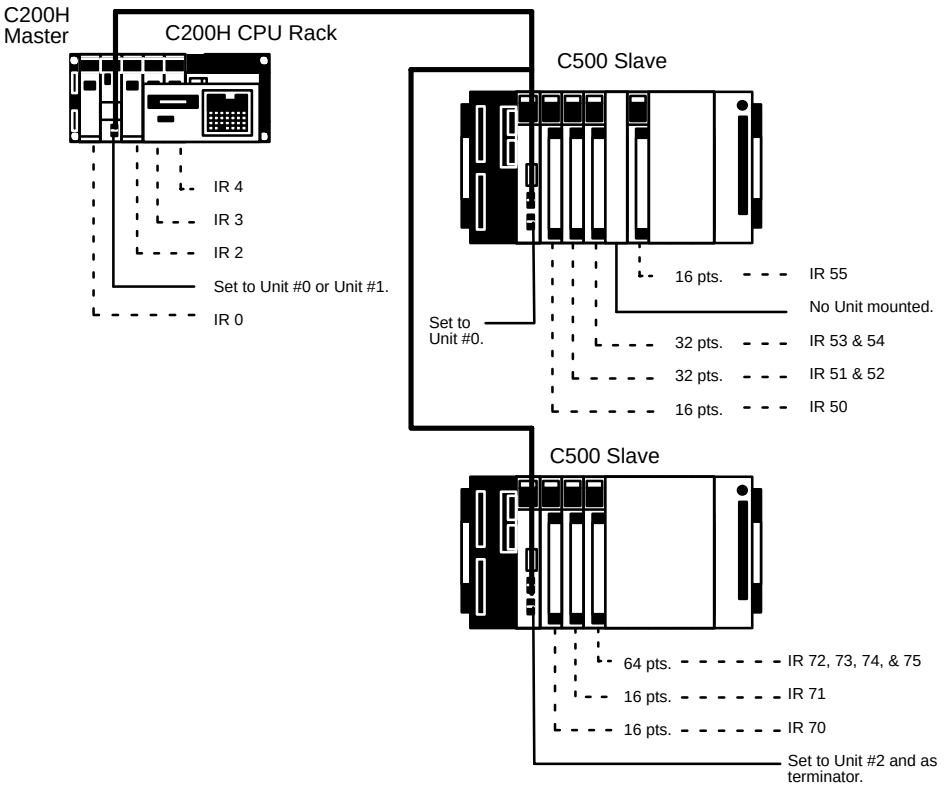
C500 Slaves connected to C200H Masters must be counted as two Slaves in counting the maximum possible Slaves connected to the Master. Each C500 Slave Rack is allocated the words shown in the following table. Word allocations overlap for consecutive unit numbers. Be sure that word allocations are not duplicated. Note that unit number 4 cannot be designated. Words will be allocated according to the C500 System, i.e., not according to slot words, but left to right to actually mounted I/O Units. The total number of words used by the Units mounted to a C500 Slave Rack must not exceed 20. Expansion I/O Racks cannot be connected to C500 Slave Racks.

Unit number	Allocated words
0	50 to 69
1	60 to 79
2	70 to 89
3	80 to 99

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Example

The following example shows the maximum number of C500 Slaves that can be connected to a C200H Master. Note that a C200H Slave could be connected to this System, either to another Master or in the present Master Subsystem, to bring the total number of Slaves controlled by the PC to 5 (C500 Slaves count as 2).



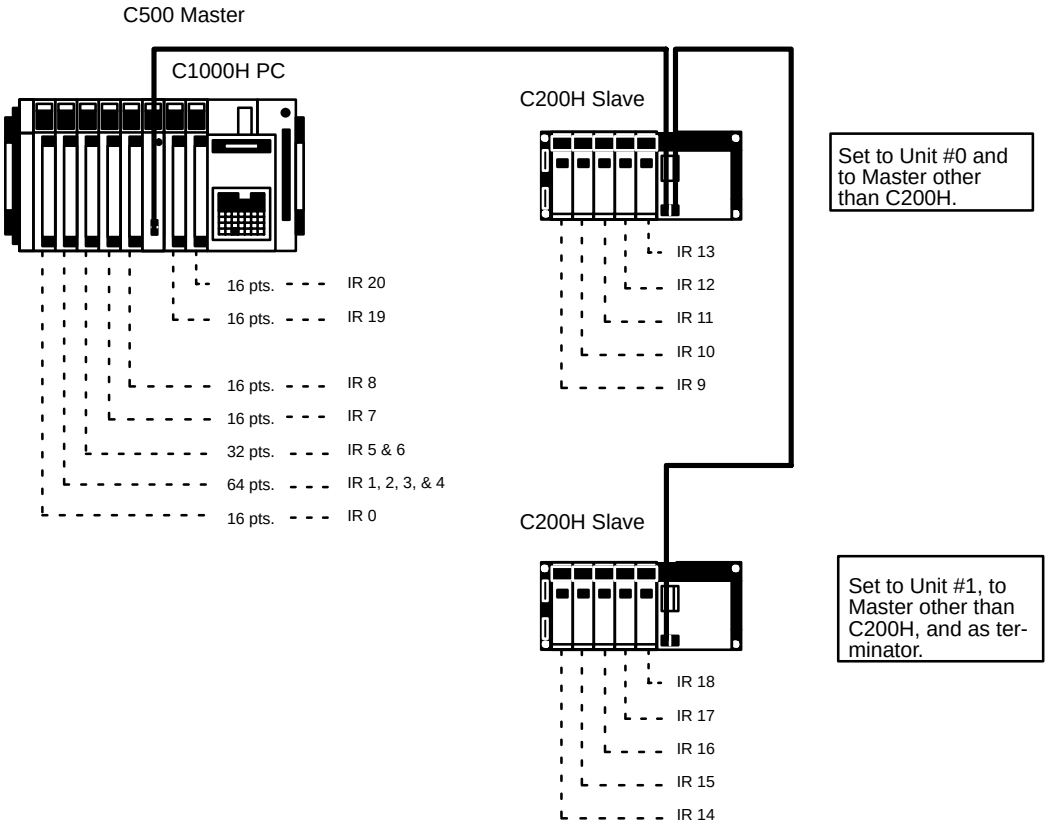
C500 Masters and C200H Slaves

When C200H Slaves are attached to C500 Masters mounted on a C-Series PC, the normal limits for the number of various Units controllable from the PC apply (see *2-1 Basic System)*. Here the type of Master setting on the C200H Slaves must designate a Master other than C200H. Word allocations will be according to the C500 System, i.e., not according to slot words, but left to right to actually mounted I/O Units. Special I/O Units cannot be mounted to C200H Slave Racks connected to a C500 Master.

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C1000H Example

Restrictions placed on Systems combining C500 Masters and C200H Slaves depend on the PC to which the Master(s) is mounted. Refer to *2-1 Basic System* for details.



Caution When C200H Slave Racks are connected to Masters on PCs other than the C200H/C200HS, all Output Units on these Slave Racks will be treated as having at least 16 output points. disabling the Fuse-burnout and Alarm Detection Bits on Units that normally provide them (e.g., C200H-OD411, C200H-OD213, C200H-OD214, and C200H-OA221).

When using the C200H Backplane for 10 slots as a remote I/O Slave for the CVM1/CV500/CV1000/CV2000, only the 8 slots from the left can be used; the 9th and 10th slots from the left cannot be used.

3-3 Setting Procedure

Set the Units in the following order. This procedure must be carried out whenever Masters, Slaves, or Remote Terminals are added to the System.

1, 2, 3...

1. Turn off the power, set the unit numbers of the Slaves and check the last I/O word being used by the PC. For a C1000H or C2000H System, always set Slave unit numbers in order starting from number 0. (See *Maximum Number of Connectable Units* under *2-1 Basic System.*)
2. Set Remote Terminal words so that no words being used by the PC are used again. Also, do not set more than the available number of words. Doing so will result in an I/O error.
3. Connect the 2-conductor cables starting from each Master and working out to each Unit that will be a terminator. Be sure to connect positive to positive, negative to negative.

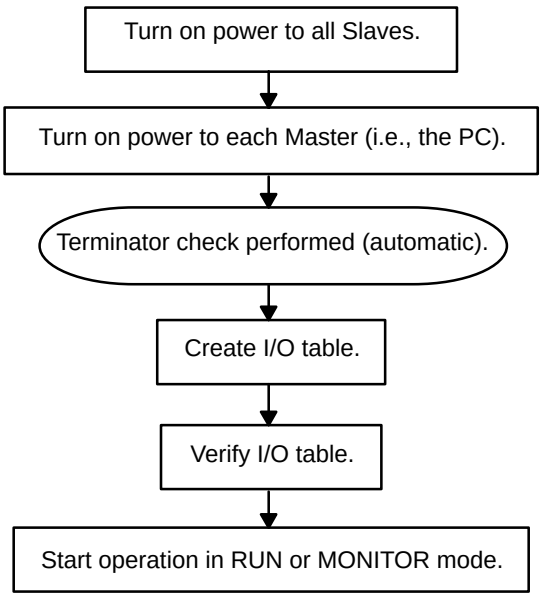
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4. Set the terminator selector to the terminator setting for the last Unit for each Master. Check to confirm that no intermediate Units have been accidentally set as terminators.
5. Apply power to all Units except Masters in any convenient order. Apply power to the Masters last. A terminator check will be automatically executed when power is supplied to each Master. (All Slaves and Remote Terminals turned on after their Master will be ignored in the terminator check and will not be involved in System communications. Refer to *3-4 Delayed Activation of Slaves* for an example program that activates System operation when a Slave is turned on.)
6. After the terminator check indicator(s) on the Master(s) goes out, enter the I/O table (see note 3) through the Programming Console and then verify the I/O table. If a terminator is not found, CPU WAIT'G will be displayed on the Programming Console. Once the I/O table has been entered, it is not necessary to reenter it each time power is turned on, unless there is a change in it.
7. After entering the I/O table, specify the word multipliers if you are using a C1000H and C2000H System. Word multipliers are not necessary in other Systems.
8. Begin operation in RUN or MONITOR mode.

Note

1. Once the I/O table has been generated, it is retained in the memory even while power is turned off. If I/O table creation is not possible following changes to C1000H and C2000H Systems, refer to *7-6 I/O Table Creation Problems*.
2. If the System does not operate properly after following the above procedure, refer to *Section 5 Error Processing.*
3. Although C200H PCs will operate properly even if an I/O table is not created, creating one is highly recommended with a Remote I/O System to enable error messages. If an I/O table is not created, all Slaves turned on after their Master will be ignored in operations.
4. If the Remote I/O System configuration is changed, regenerate the table.
5. Once an I/O table has been created, operations will continue with only the Slaves to which power is being supplied, and any Slave that was originally turned off will be added to operations whenever it is turned on.

The following flowchart illustrates the above procedure.



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Required Settings

The following settings are required before operating the PC System.

Unit	Settings
C500 Masters	CONTINUE/STOP
C500 Slaves	Unit number, terminator, output HOLD/STOP
C200H Masters	Unit number, CONTINUE/STOP
C200H Slaves	Unit number, terminator, output HOLD/STOP, type of Master
Remote Terminals	Word, terminator, output HOLD/STOP

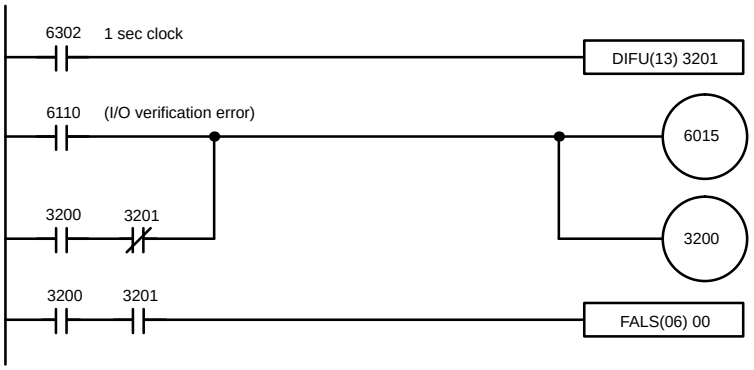
3-4 Delayed Activation of Slaves

The following examples illustrate program sections that can be inserted to start System operation when power to a Slave is turned on after its Master has been turned on. Note, however, that the normal procedure, i.e., turning on all Slaves before their Masters, must be followed when creating the I/O table.

Example 1: Load Cutoff (C500 PCs)

This program section is used when using ladder diagram programming for C500 Systems, and can be inserted at the beginning of the program for normal Systems and at the beginning of the main program for high-speed Systems. When an I/O verification error occurs using this program section, the load is cut off and FALS(06) 00 is executed until the error is cleared.

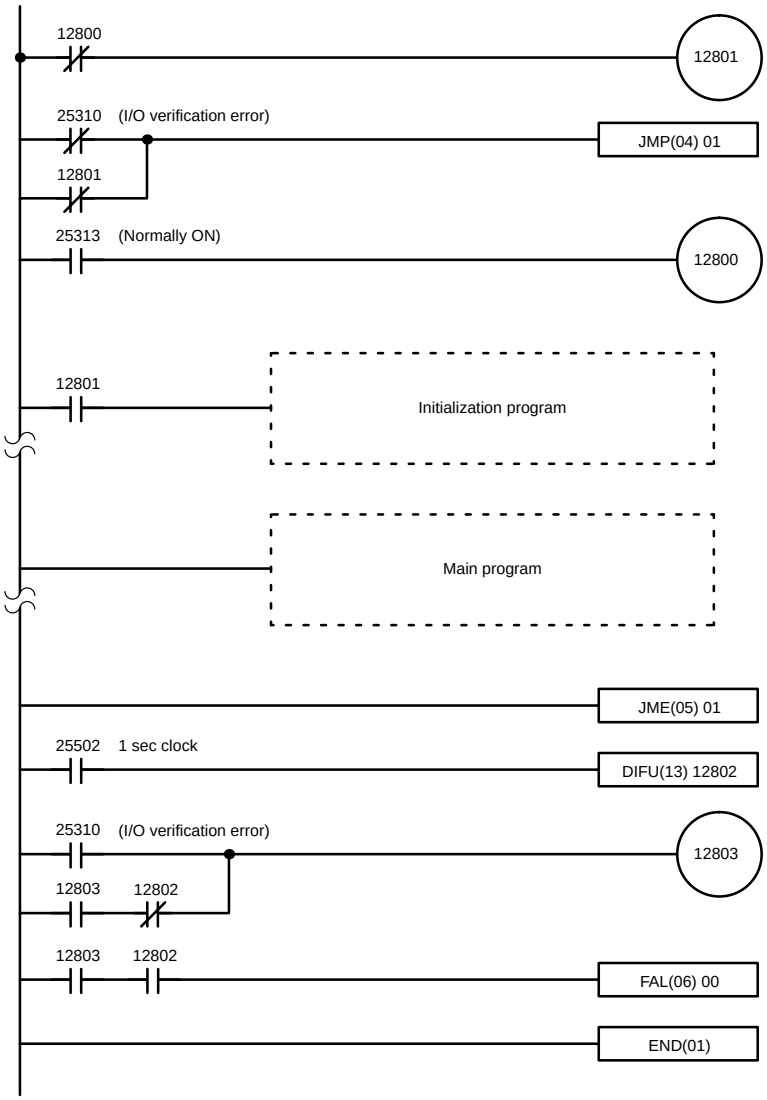
Note All inputs will be refreshed for this program section.



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Example 2: JMP/JME Programming (C1000H and C2000H PCs)

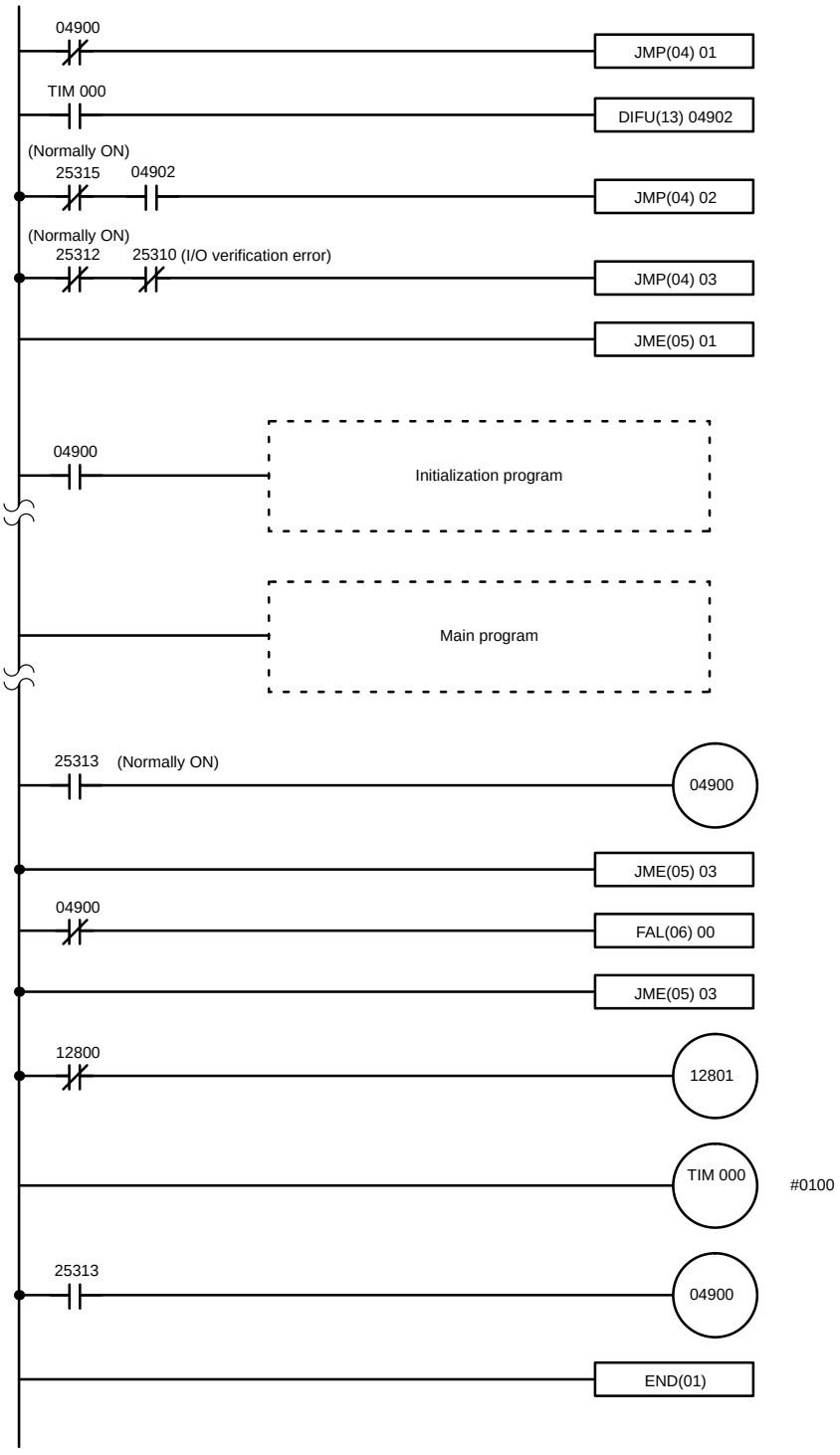
The section of the following program between JMP and JME will not be executed until the I/O verification error is cleared (i.e., until all Slaves are turned on). The initial and main programs will thus be executed only after all Slaves have been turned on.



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Example 4: JMP/JME Programming (C200H PCs)

The initialization and main programs in the following ladder diagram will not be executed until the remote I/O error and I/O verification error have been cleared (i.e., until all Slaves have been turned on). Errors are cleared with FAL(06) 00. The type of programming in this example is only effective after an I/O table has been created.



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SECTION 4
Unit Components and Switch Settings

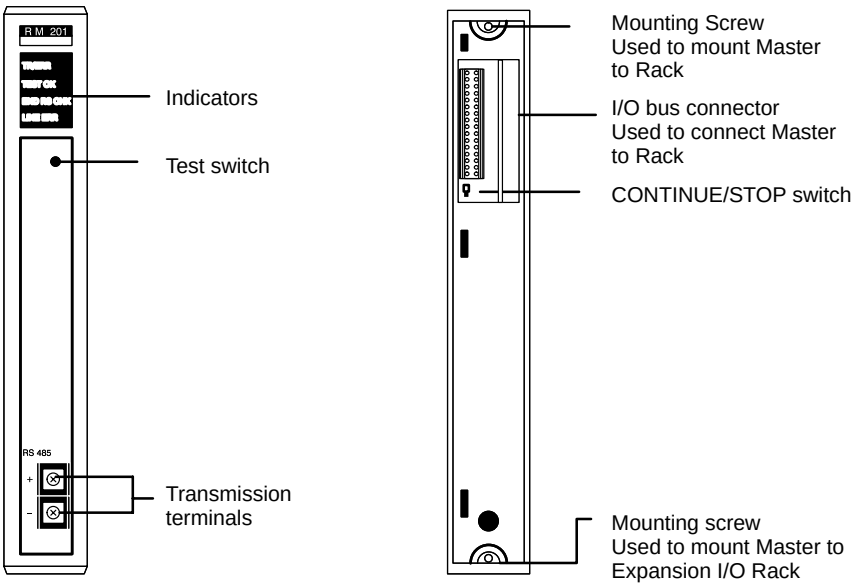
Subsections 4-1 through 4-2 provide the names and functions of the indicators, switches, and selectors of Masters, Slaves, and Remote Terminals.

4-1 Masters and Slaves . . . . .
4-1-1 C500 Master . . . . .
4-1-2 C500 Slave . . . . .
4-1-3 C200H Master . . . . .
4-1-4 C200H Slaves . . . . .
4-2 Remote Terminal . . . . .

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4-1 Masters and Slaves

4-1-1 C500 Master



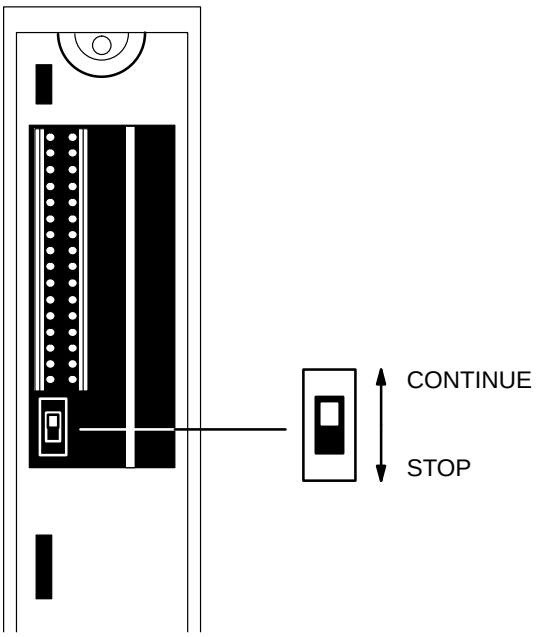
Indicators

TR/ERR	Flashes during normal transmission.
	Lights for transmission errors.
	Goes out for CPU Unit errors (via watchdog timer monitoring) or when waiting for I/O table registration.
TEST OK	Lights for normal endings to transmission line tests executed via TEST switch.
	Remains unlit for errors found in transmission line tests executed via TEST switch.
END RS CHK	Lit until terminator is found.
	Flashes if more than one terminator is found. Refer to *7-7 Slave Unit Numbers with Multiple Terminator*.
	Goes out if one and only one terminator is found.
LINE ERR	Lights for transmission line errors.
	Remains unlit while transmission line remains normal.

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Switches

TEST	Pressed to test the transmission line when the PC is in PROGRAM mode. Test is repeatedly performed while button is held down. This switch is also pressed to clear transmission errors.
CONTINUE/STOP	Used to select whether or not transmission is to be STOP continued for transmission errors or I/O bus errors at Slaves.



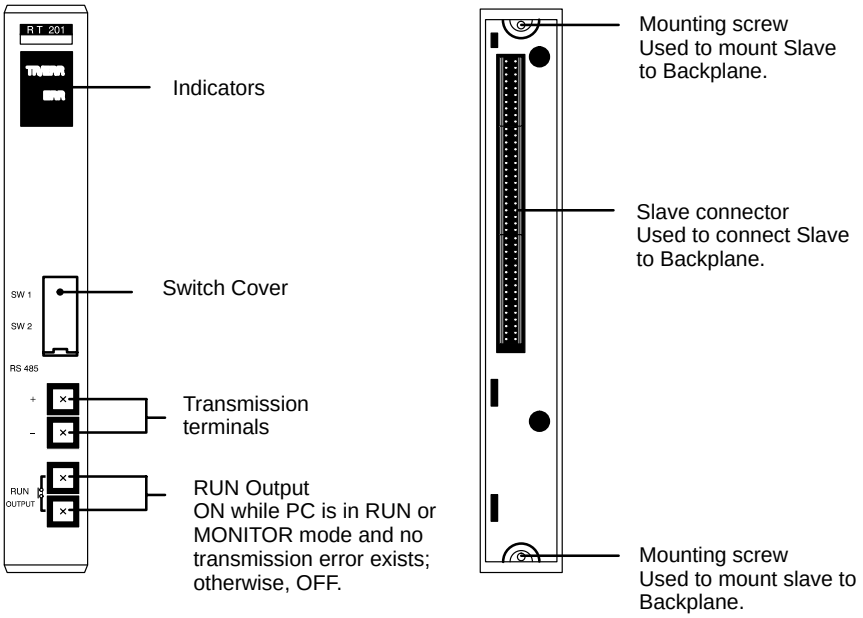
CONTINUE/STOP Switch

This switch is used to set either CONTINUE or STOP mode to designate response to transmission errors. When a transmission error occurs, data transmission to Slaves will continue in CONTINUE mode and stop in STOP mode. Transmission errors for Masters include BCC errors, no-Slave-response errors, and transmission line check errors.

CONTINUE	Communications with Slaves continued for transmission errors. Normal operation continued after error cleared.
STOP	Communications with Slaves discontinued for transmission errors. Refer to *Section 5 Error Processing* for recovery procedure.

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4-1-2 C500 Slave

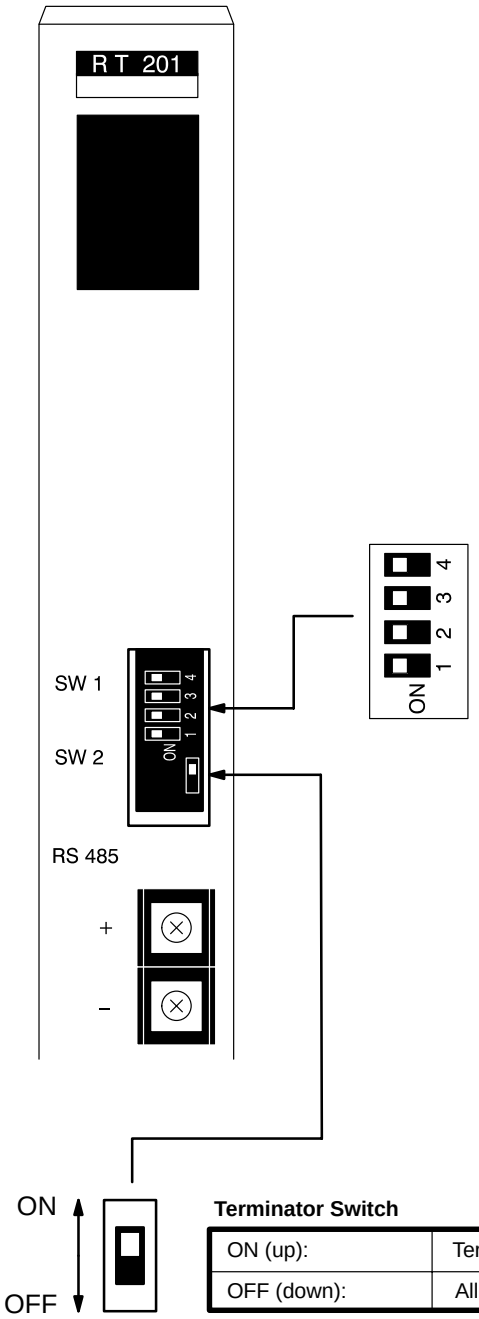


Indicators

TR/ERR	Flashes during normal transmission.
	Lights when on standby or for transmission errors.
	Goes out for CPU Unit errors (via watchdog timer monitoring).
ERR	Lights for I/O bus errors at Slave or when PC detects discrepancy in inputs and outputs connected to Slave.
	Remains unlit during normal Slave I/O operation.

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Remove the switch cover to access the DIP switch and terminator switch. Set these as shown on the following. Setting the terminator switch to ON sets the termination resistance.



Terminator Switch

ON (up):	Terminator
OFF (down):	All other Slaves

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Pins 1 to 3: Unit Number

Unit no.	Pin settings		
	Pin 1	Pin 2	Pin 3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

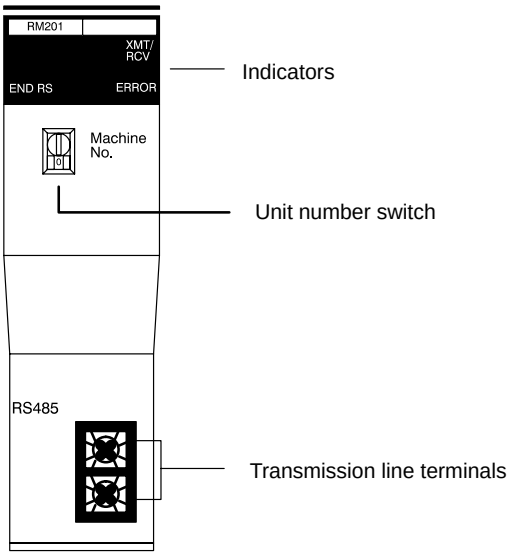
Note Unit numbers 0 through 7 are used in C1000H and C2000H Systems. Use numbers 0 and 2 or numbers 1 and 3 for C500 Slaves attached to a C200H Master (to prevent overlapping word assignments). All other PC Systems use only unit numbers 0 and 1.

Pin 4: Output HOLD/STOP Mode

OFF: STOP mode	All output words set to OFF for transmission errors.
ON: HOLD mode	All output words retain status transmission errors.

Transmission errors for Slaves include errors in data from the Master and no-data errors. Note that HOLD mode is not effective for all errors detected by the CPU Unit.

4-1-3 C200H Master



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Indicators

LINE ERROR	Lights for transmission line errors. Remains unlit while transmission line remains normal.	
XMT/RCT	Setting of 0 or 1 on unit number switch	Flashes when any of the Slaves or Remote Terminals in the Master Subsystem are transmitting normally. Goes out if all Slaves and Remote Terminals are abnormal or for errors occurring in the CPU Unit refresh cycle.
	Setting of 2 or 3 on unit number switch	Goes out if an error occurs in any Slave or Remote Terminal transmitting data or for errors occurring in the CPU Unit refresh cycle. All transmissions will be stopped when this indicator goes out.
ERROR	Lights if an error occurs in any Slave or Remote Terminal transmitting data or for errors occurring in the refresh cycle. Remains unlit as long as all Slaves and Remote Terminals transmitting data are normal.	
END RS	Lights at the beginning of operation until a terminator is detected. Flashes if more than one terminator is found. Refer to *7-7 Slave Unit Numbers with Multiple Terminator*.	

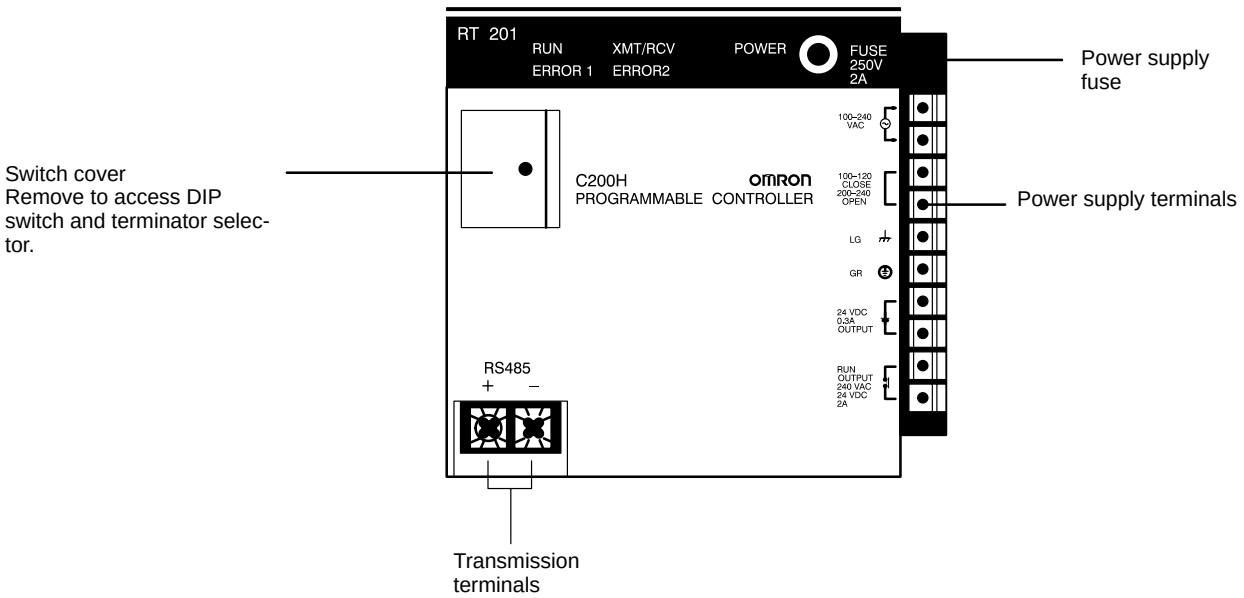
Switches and Selectors

Unit Number (“Machine No.”)	Set to 0 or 2 to set Unit #0; 1 or 3 to set Unit #1. If 0 or 1 is used, transmission will continue even if a transmission error occurs. If 2 or 3 is used, transmission to all Slaves will be interrupted if a transmission error occurs.

The only setting necessary for C200H Masters is the unit number. Power to the PC must be turned off when setting Master unit numbers. The unit number determines AR area Error flags and Restart bits (see *7-2 Error Codes and Monitoring*).

4-1-4 C200H Slaves

Two models of C200H Slave are available: C200H-RT201 and C200H-RT202. They differ only in the power supply. The C200H-RT201 is switchable between 100/110 VAC and 200/220 VAC; the C200H-RT202 uses 24 VDC. Indicators and switches are the same for both. The RT201 is shown below.



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Indicators

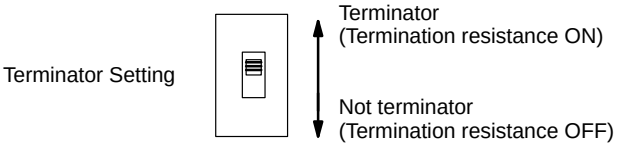
C200H Slaves indicators function together to show the status of the System. The RUN indicator is controlled by the mode setting on the CPU Unit.

XMT/RCV	ERROR1	ERROR2	RUN	Status	Meaning
not lit	not lit	not lit	not lit	System not started or power off.	Master is still testing System or power off. Power has not yet been turned on.
flash	not lit	not lit	---	Normal transmission	Normal transmissions are occurring between Slave and Master.
---	lit	---	not lit	Transmission error	Error has occurred in transmissions with Master.
---	lit	lit	not lit	I/O bus error	Error has occurred in I/O bus connecting Slaves to I/O Units.
flash	flash	lit	---	I/O verification error	An I/O Unit configuration of Slave Rack has changed.
flash	lit	lit	not lit	I/O setting error	An I/O Unit designation on the Slave Rack is wrong.
flash	lit	flash	---	Expansion I/O Rack missing.	An Expansion I/O Rack connected to the Slave Rack with I/O Connecting Cable cannot be confirmed by the PC.

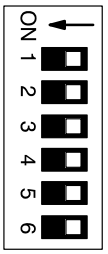
C200H Slave Switches

The DIP switch and terminator selectors are accessed by removing the switch cover on the front of the Slave. Use a regular screwdriver to open the cover if necessary. Always be sure that the PC and Slave power are turned off before setting the switches.

Terminator Selector



DIP Switch



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Pins 1 through 3: Unit Number

Unit number*	Pin 1	2	3
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

*Unit numbers 0 and 1 can be set for C120 and C500 Systems; unit numbers 0 through 4 for C200H Systems; and 0 through 7 for C1000H and C2000H Systems.

Pin 4: Type of Master

ON	Master other than C200H
OFF	C200H Master

Pin 5: Output HOLD/STOP Mode

ON	HOLD mode, i.e, all output words retain status in for transmission errors.
OFF	STOP mode, i.e., all output words set to OFF for transmission errors.

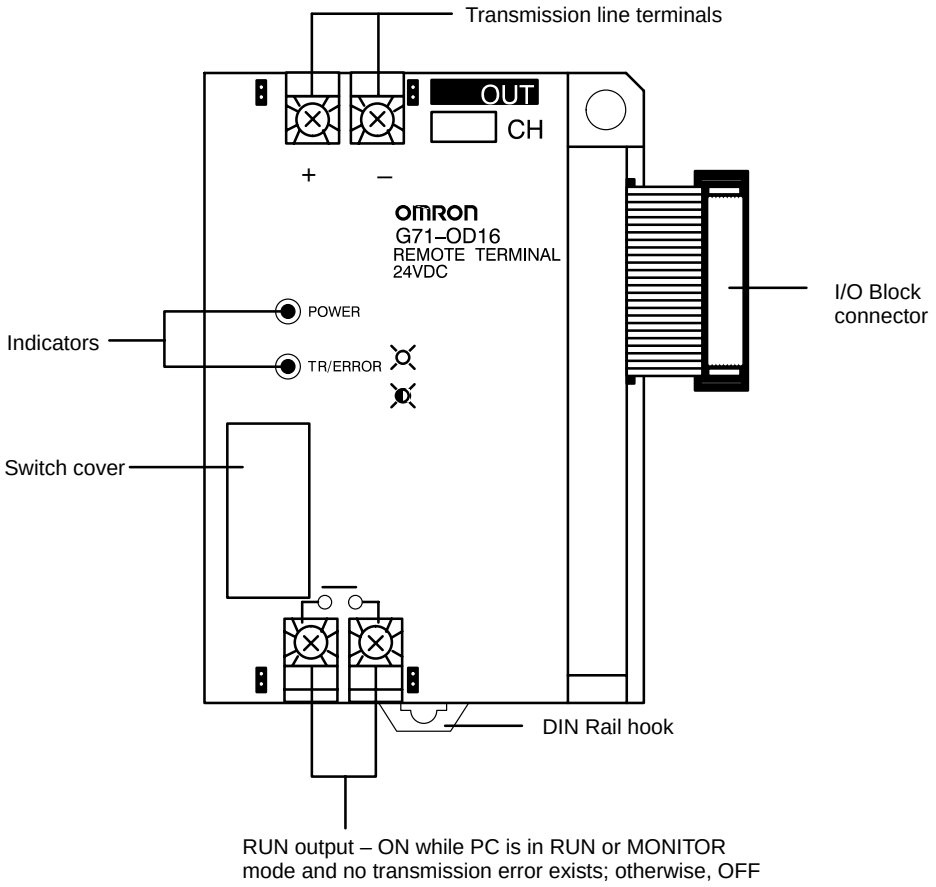
Pin 6:

Pin 6 should always be set to OFF.

4-2 Remote Terminal

The procedure for setting the switches in the Remote Interface is exactly the same as in the Remote Terminals. Only a Remote Interface is shown below.

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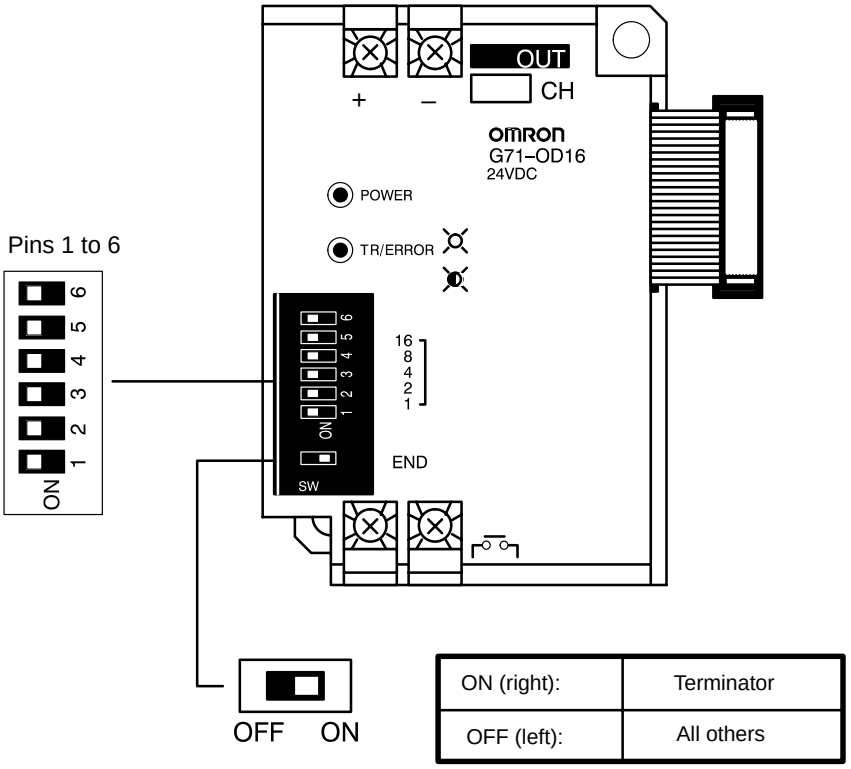
Indicators

POWER	Lit when power is supplied and Remote Terminal is operational.Not lit for power irregularities.
TR/ERROR	Flashes during normal transmission. Lights when on standby or for transmission errors. Goes out for CPU Unit errors (via watchdog timer monitoring).

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Switches

Remove the switch cover to access the DIP switch and terminator switch. Set these as shown below. The switch cover is in a slightly different position on G72C Remote Terminals.



ON (right):	Terminator
OFF (left):	All others

Pins 1 to 5: Word Setting

Word numbers are computed as binary numbers with pins 1 through 5 representing the one's place though the 16's place. For example, turning on all five pins would set word 31, i.e., $2^0 + 2^1 + 2^2 + 2^3 + 2^4 = 1 + 2 + 4 + 8 + 16 = 31$. Pin 5 must be set OFF for all Remote Terminals, in C120 Systems, i.e., the highest word that can be set is 15.

The word actually allocated to a Remote Terminal depends on the PC that controls it and is computed as shown in the following table.

PC	Allocated word
C120 and C500	Same as switch setting
C1000H and C2000H	32 x word multiplier of Master + switch setting
C200H	Switch setting + 200

Pin 6: Output HOLD/STOP Mode

OFF: STOP mode	All output words set to OFF for transmission errors.
ON: HOLD mode	All output words retain status for transmission errors.

Transmission errors for Remote Terminals are the same as those for Slaves.

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SECTION 5
System Installation

This section explains how to install Wired I/O Systems and includes information on dimensions, differences between some of the Units, and wiring.

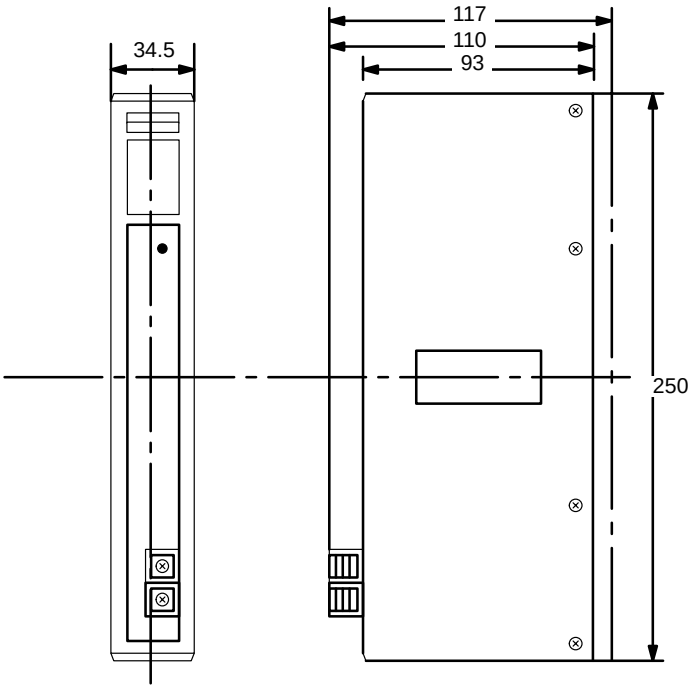
5-1 Dimensions . . . . .
5-1-1 Masters and Slaves . . . . .
5-1-2 Remote Interface (Unit: mm) . . . . .
5-1-3 I/O Blocks . . . . .
5-1-4 G72C Remote Terminals (Unit: mm) . . . . .
5-1-5 Link Adapters . . . . .
5-2 Differentiating Units . . . . .
5-3 I/O Block Connections . . . . .
5-4 Mounting and Wiring Precautions . . . . .
5-5 Wiring . . . . .

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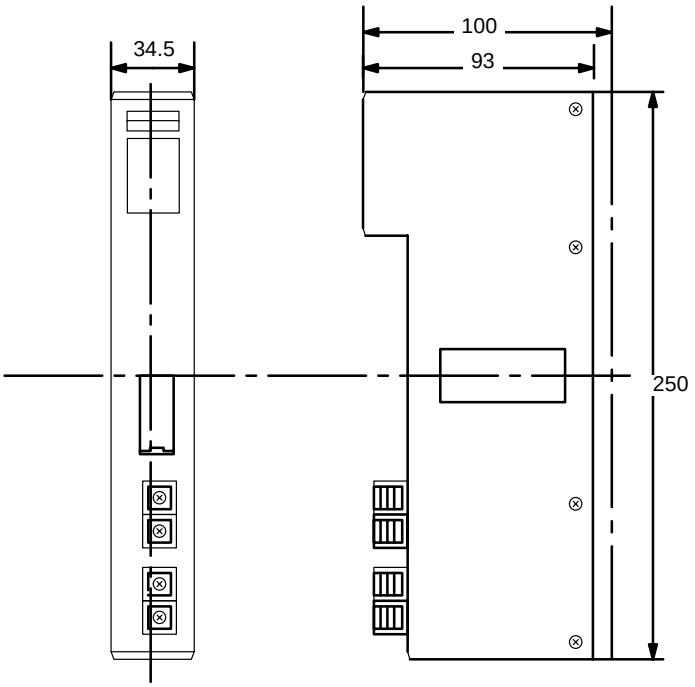
5-1 Dimensions

5-1-1 Masters and Slaves

C500 Master (Unit: mm)

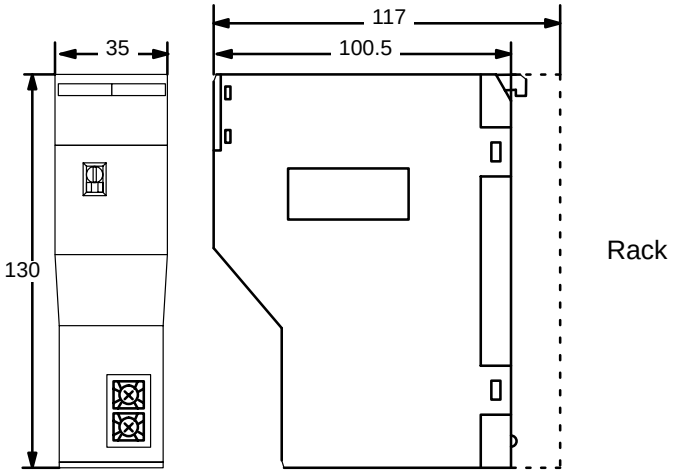


C500 Slave (Unit: mm)

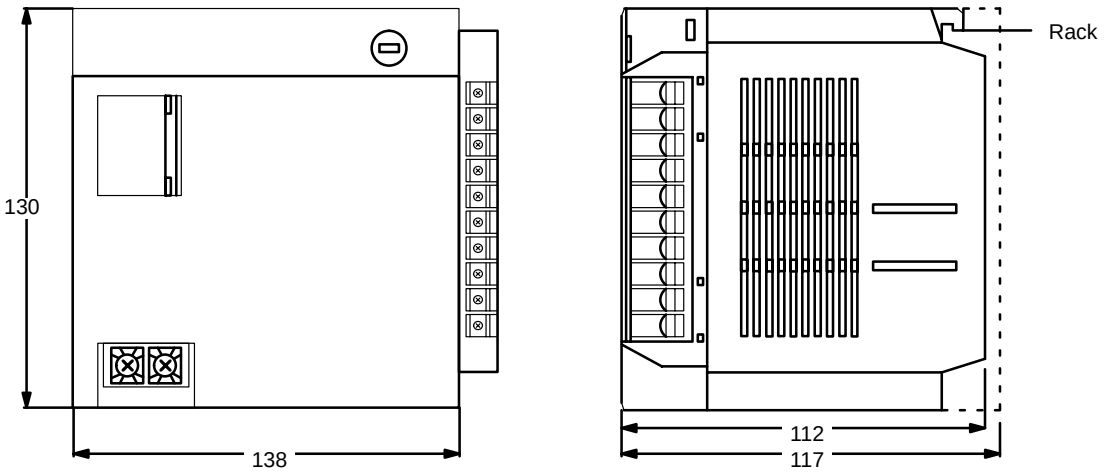


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C200H Master (Unit: mm)



C200H Slave (Unit: mm)



C200H Racks

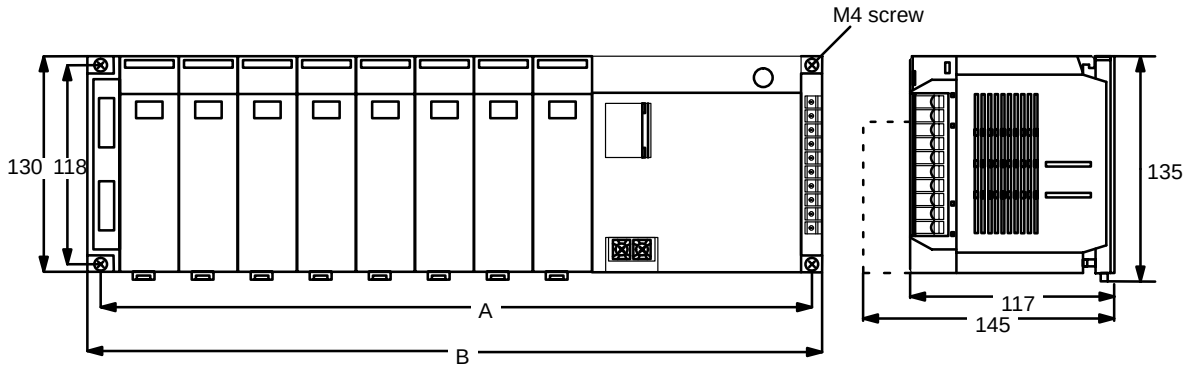
C200H Racks provide either 3, 5, 8, or 10 slots and are used to mount the C200H PC (CPU Racks), Slaves and other Units (Slave Racks), or other Units without a Slave (Expansion I/O Racks). The appearance and parts of the Rack are shown below. Rack and Slave model numbers are as follows:

C200H Slaves	100 to 120/200 to 240 VAC (switchable)	C200H-RT201
	24 VDC	C200H-RT202
Racks	3 slots	C200H-BC031-V2
	5 slots	C200H-BC051-V2
	8 slots	C200H-BC081-V2
	10 slots	C200H-BC101-V2

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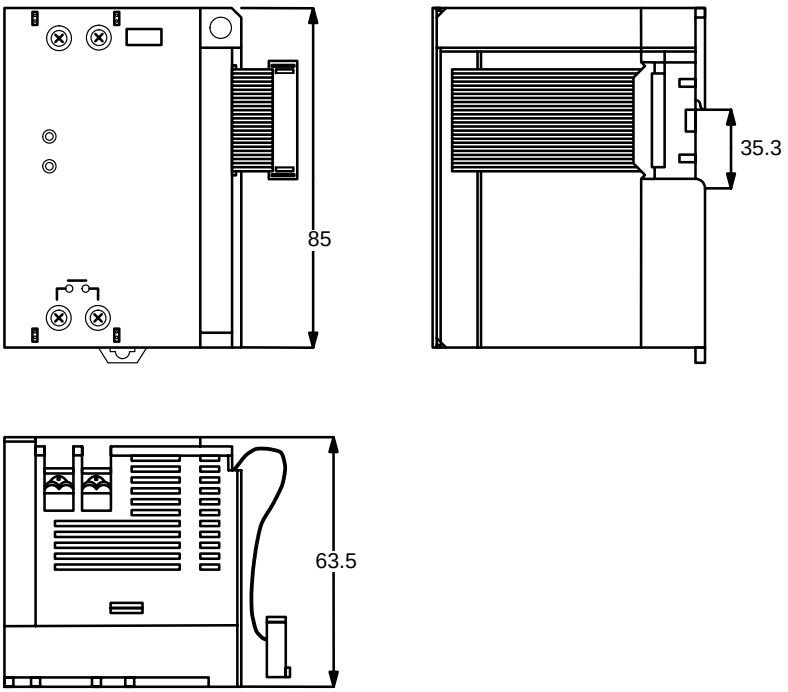
C200H Rack (Unit: mm)

Dimensions for mounting holes in the following diagram have 0.2 mm tolerances.



Rack Lengths	A	B
C200H-BC031-V2	246	260
C200H-BC051-V2	316	340
C200H-BC081-V2	421	435
C200H-BC101-V2	491	505

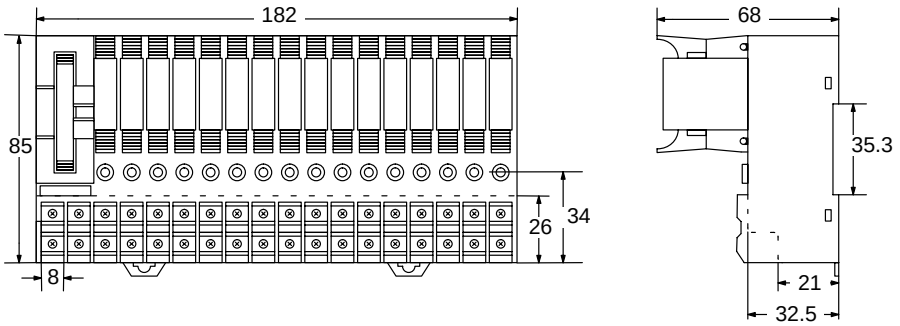
5-1-2 Remote Interface (Unit: mm)



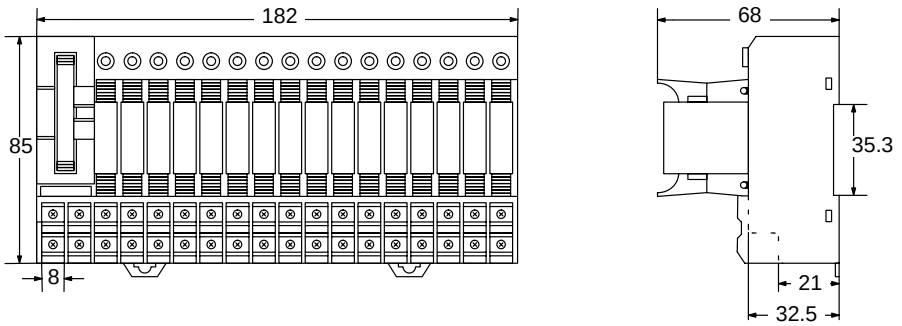
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5-1-3 I/O Blocks

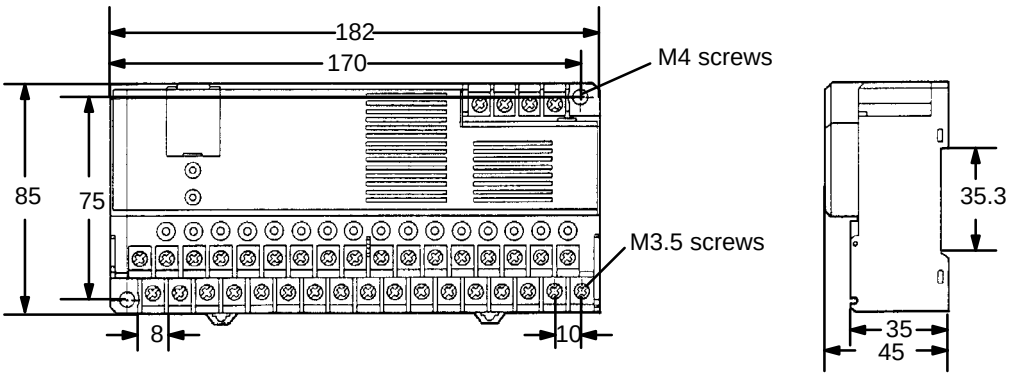
Input Block (Unit: mm)



Output Block (Unit: mm)

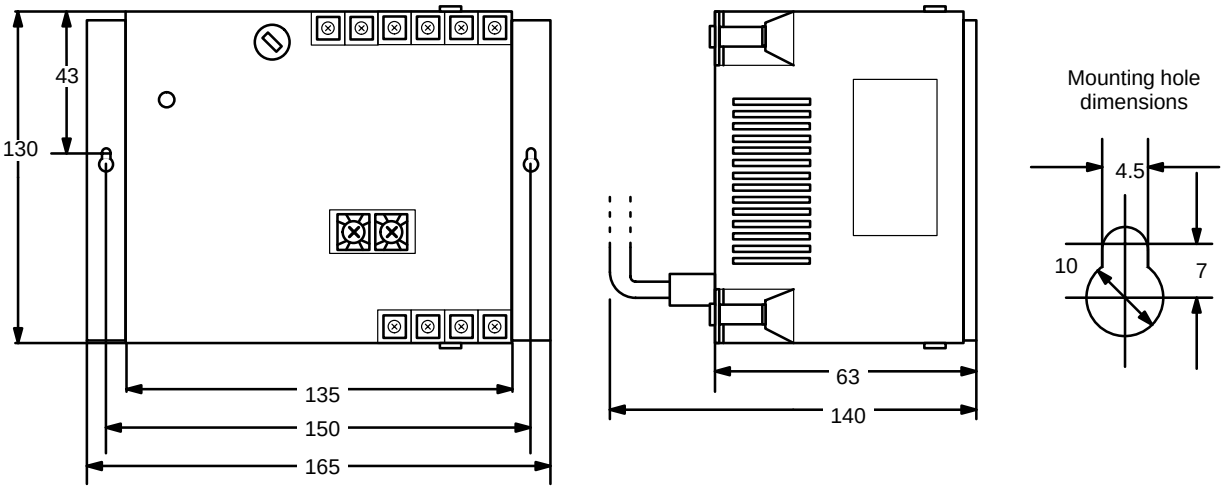


5-1-4 G72C Remote Terminals (Unit: mm)



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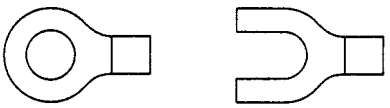
5-1-5 Link Adapters



Power Supply Wiring Precautions

Use thick cables (1.25 mm^2 min.) to prevent against voltage drops.

M4 self-rising terminals screws are used for the terminal block. When wiring to the terminal block, use crimp terminals for M4 screws. Do not connect stranded wires directly to the terminal block.



Tighten the screws on the terminal block to a torque of 1.2 N • m.

5-2 Differentiating Units

Nameplate, LED, and relay case colors are used to differentiate between Input and Output Blocks and between AC and DC Input Blocks as shown in the following table.

---		Nameplate	LEDs	Relay Case
Input Blocks	**(DC)**	Red	Green	Green
	(AC)	Red	Red	Red
Output Block	**(DC)**	Yellow	Green	Clear

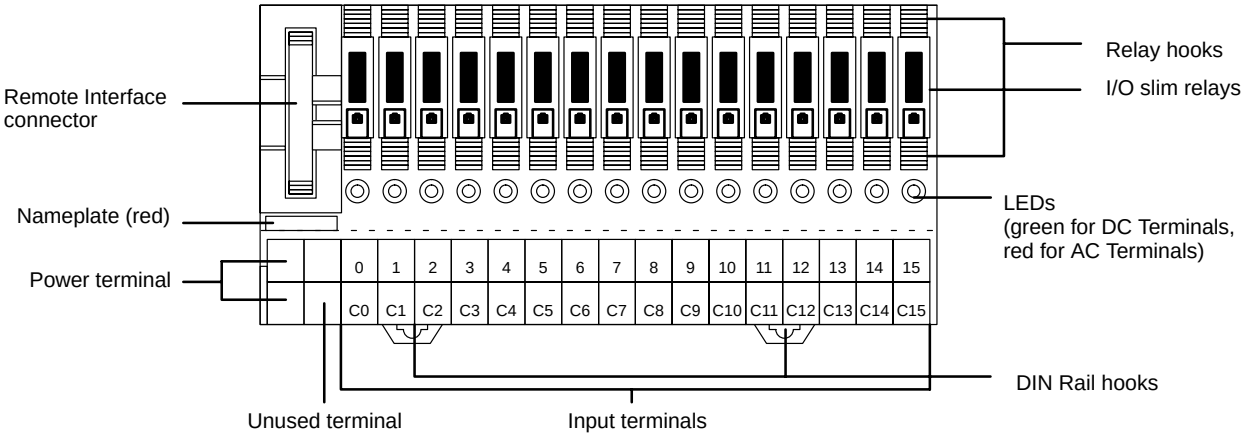
I/O Block nameplates are color matched with PC I/O Units.

LED positions and relay orientation also differ between Input and Output Blocks and can be used to differentiate between them. Relays are also positioned to assist in following signal flow.

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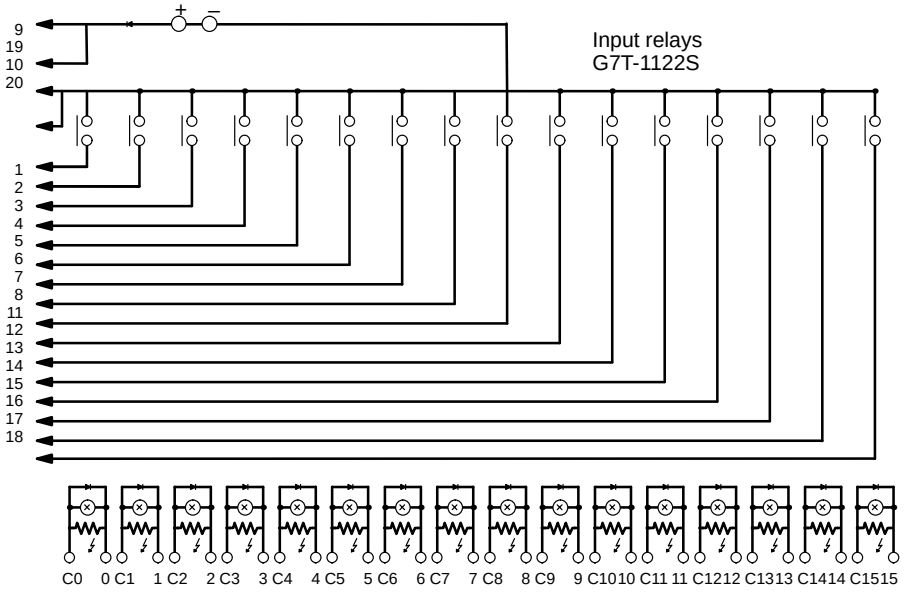
5-3 I/O Block Connections

Input Block

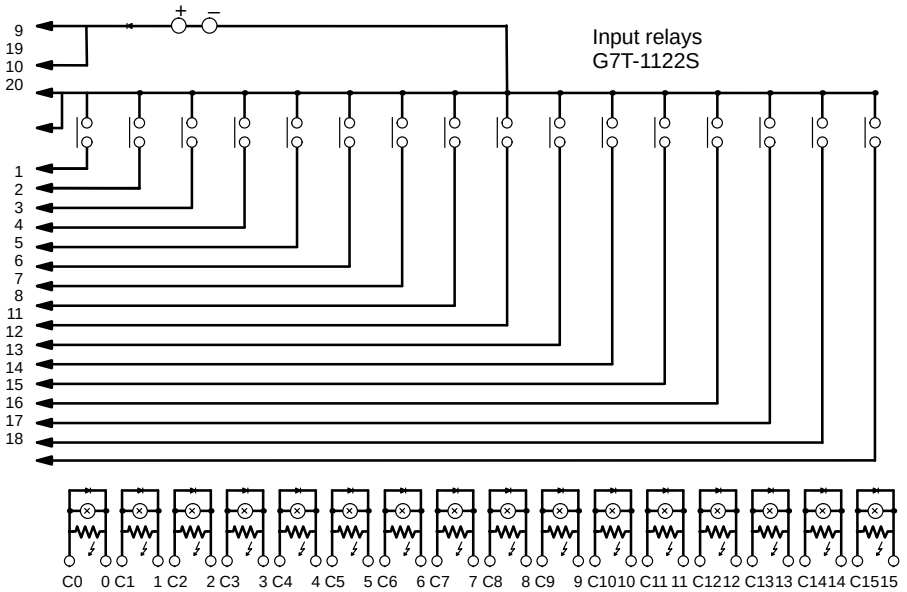


Internal Connections

G7TC-ID16 (for DC input)

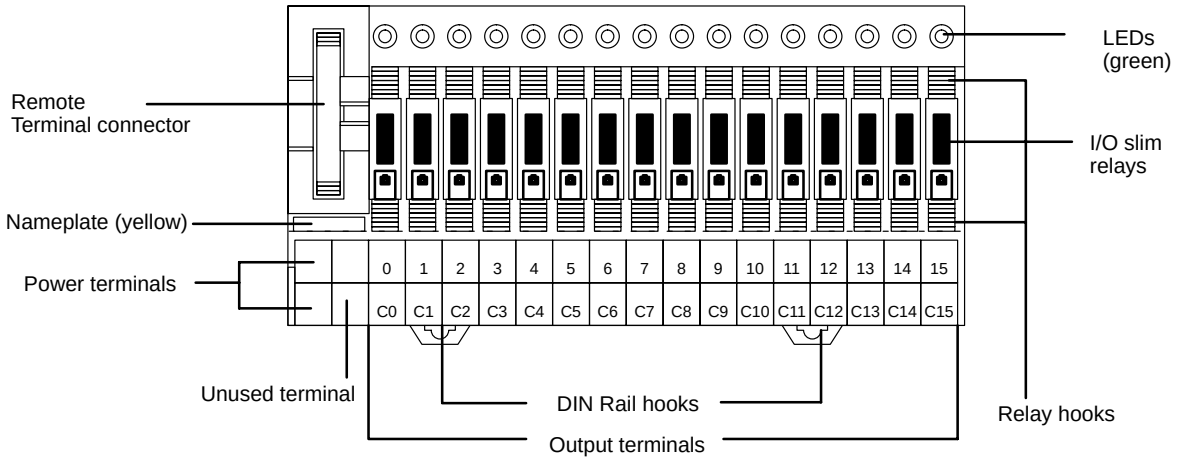


G7TC-IA16 (for AC input)

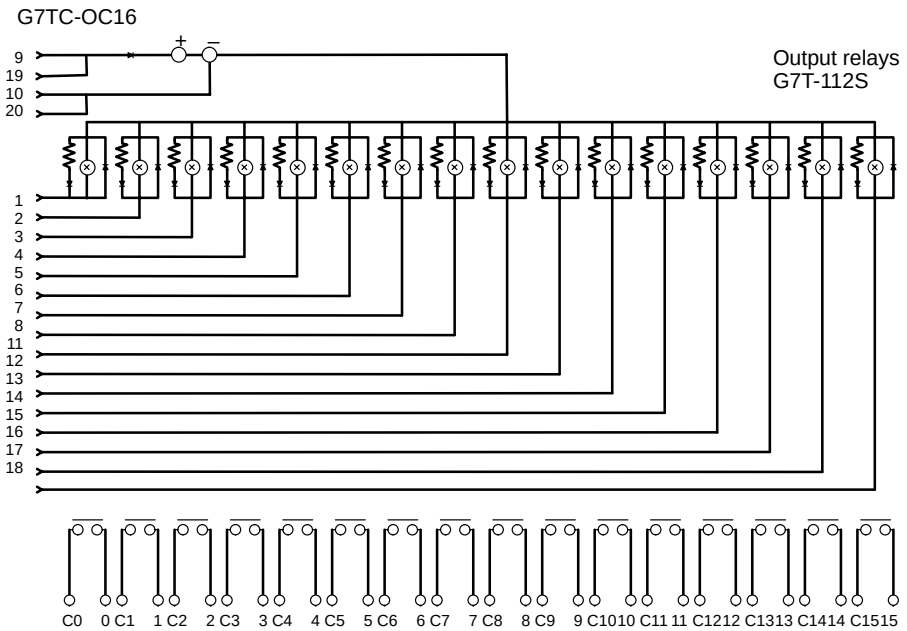


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Output Block



Internal Connections



5-4 Mounting and Wiring Precautions

Mounting Remote Interface and I/O Blocks

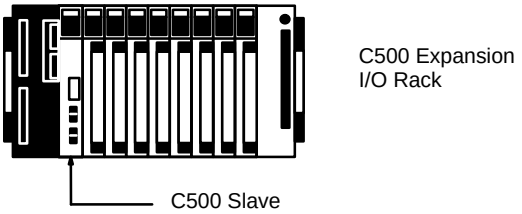
Remote Interface and I/O Blocks are generally mounted to DIN Rail using two End Plates (model number PFP-M). Four short bars are provided for common points. Output capacity limits the number of common point to four. For outputs, do not connect the same terminal to more than one other terminal. Input terminals can be connected to more than one other terminal as necessary.

Press firmly on the front of relays until the hooks are completely engaged. Improper engagement can cause errors or overheating.

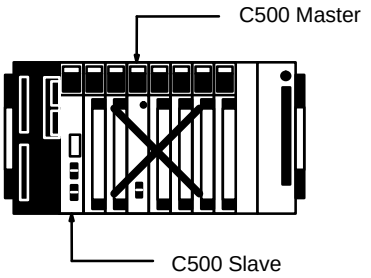
Unlabeled terminals have no electrical connections; use them for repeater terminals.

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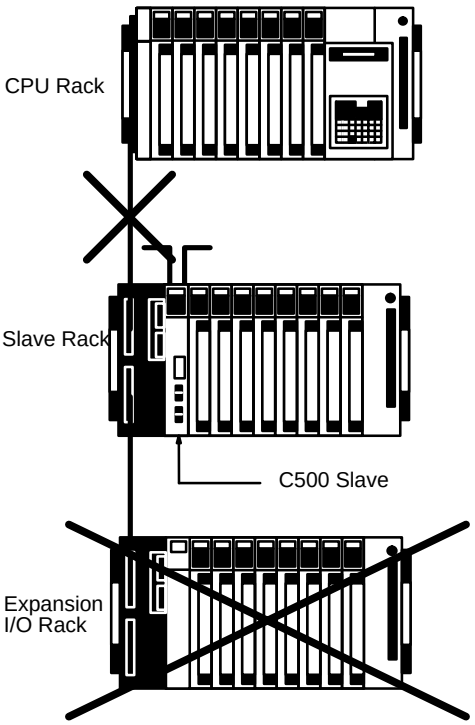
C500 Remote I/O Units



A Master and a Slave cannot be mounted to the same Rack



A CPU Rack cannot be connected directly to a Slave Rack; i.e., any Slave Rack containing a Slave must be connected through the Slave. An Expansion I/O Rack cannot be connected to a Slave Rack.



C200H Remote I/O Units

1, 2, 3...

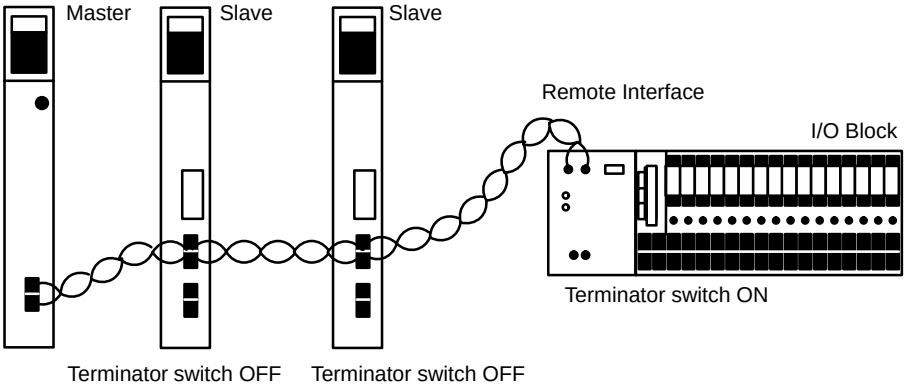
1. Do not mount the C200H Master to either of the rightmost two slots on the CPU Rack. Doing so will prevent mounting devices directly to the CPU Unit.
2. Do not mount the C200H Master to a Slave Rack or to an Expansion I/O Rack connected to a Slave Rack.
3. Slaves must be connected directly to the Master or another Slave. Do not connect the Slave Rack with I/O Connecting Cable.
4. Special I/O Units cannot be used on C200H Slave Rack connected to any Master other than a C200H Master.

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5-5 Wiring

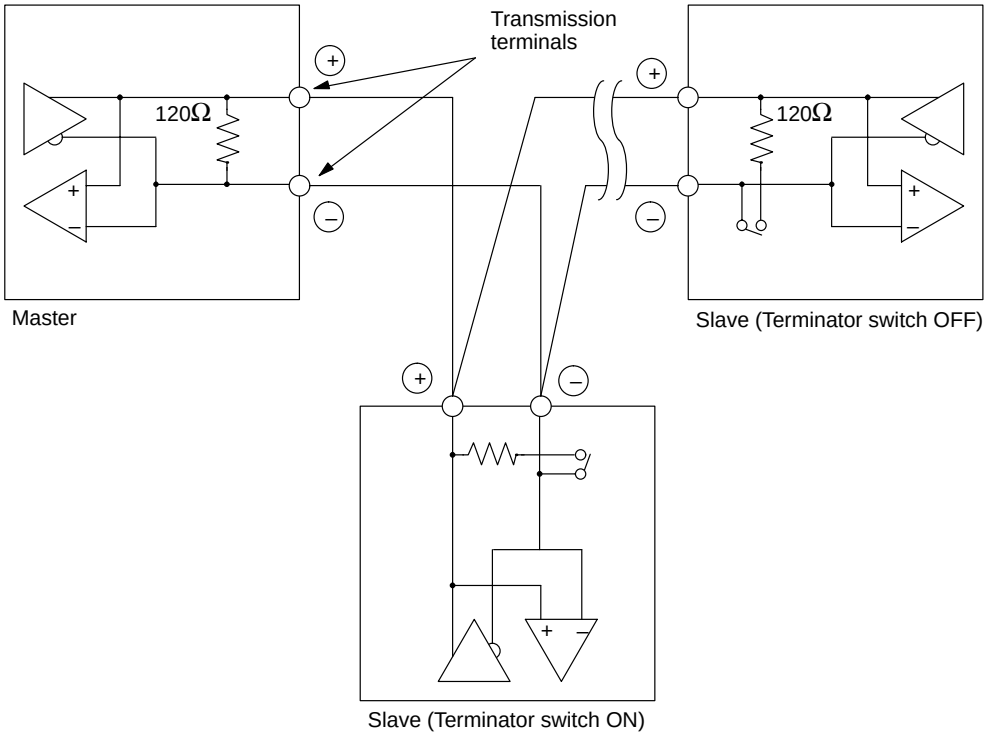
Transmission Lines

Masters, Slaves and Remote Interfaces are connected using 2-conductor cable in the manner shown below.



1, 2, 3...

1. All 2-conductor cable used for connections must be 0.75 mm VCTF (vinyl cabtire fiber cable).
2. Connect positive to positive, negative to negative.
3. Do not wire a Master directly to more than one other Unit; i.e., start wiring at each Master and continue in order through the last Unit at the other end of each line.
4. Set the last Unit as the terminator.
5. Do not branch the wiring at a Slave; i.e., wire a Slave in series to a maximum of two other Units, one before it and one following it.
6. The total cable length must be 200 meters or less from each Master to its terminator.
7. Do not run transmission lines parallel to or in the vicinity of high-voltage or high-current lines. (Running transmission lines with normal I/O lines or normal power lines presents no problem.)
8. RS-485 interfaces are used for transmission lines, as shown below.

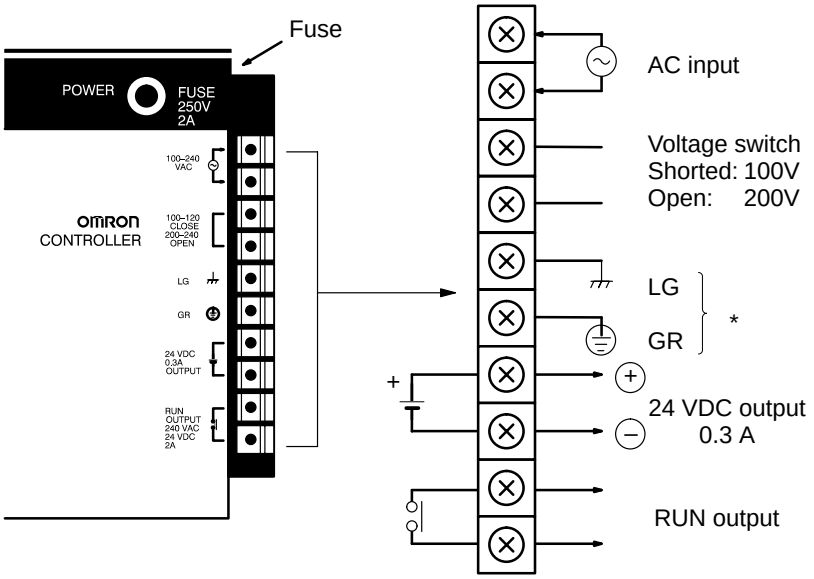


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C200H Slave Connectors

C200H Slaves use a 2-piece connector. When attaching this connector, press down firmly until you hear it lock into place, and then confirm that the lock lever is in place. The connectors are wired as shown below.

C200H-RT201



Power supplied at either 100 to 120 VDC or 200 to 240 VDC

Use enclosed device to short for 100-V power supply. When using 200-V power supply, verify that circuit is open.

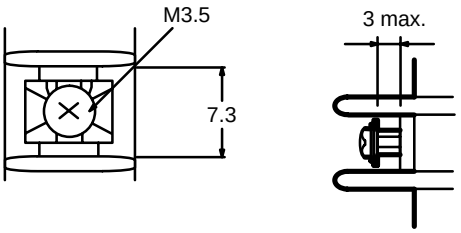
Connect to independent ground to reduce noise interference and prevent shock.

Connect to independent ground to prevent shock.
Use to power DC Input Units. Use a separate power supply if exceeding 3.0 A. If 3.0 A is exceeded, PC may detect error and stop operation.

ON in RUN mode. Use for accessing signals from PC in RUN mode.

* The LG and GR terminals are connected internally.

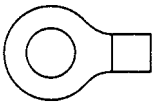
Terminals



AC Power Supply Wiring Precautions

Use thick cables (1.25 mm^2 min.) to prevent against voltage drops.

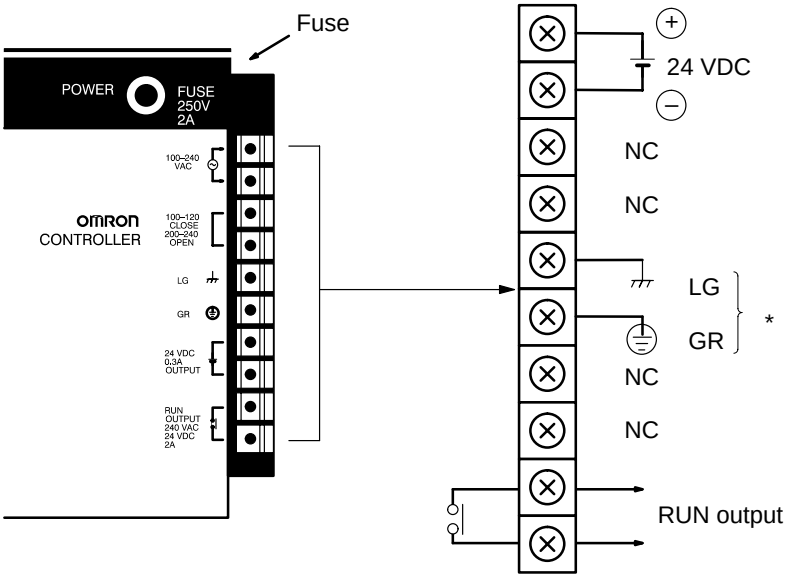
M3.5 self-rising terminals screws are used for the terminal block. When wiring to the terminal block, use round crimp terminals with the M3.5 screws. Do not connect stranded wires directly to the terminal block.



⚠ Caution Tighten the screws on the terminal block of the AC Power Supply Unit to a torque of 0.8 N • m. Loose screws may result in short-circuiting, malfunction, or burning.

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C200H-RT202



Use a 24-VDC power supply.

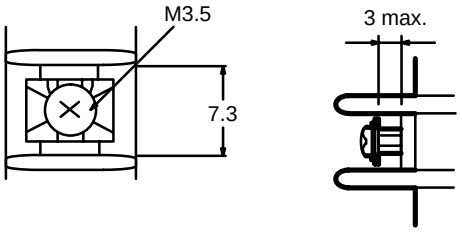
Connect to independent ground to reduce noise interference and prevent shock.

Connect to independent ground to prevent shock.

ON while the system is operating.

* The LG and GR terminals are connected internally.

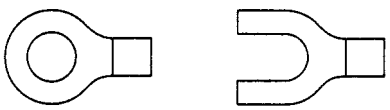
Terminals



Power Supply Wiring Precautions

Use thick cables (1.25 mm^2 min.) to prevent against voltage drops.

M3.5 self-rising terminals screws are used for the terminal block. When wiring to the terminal block, use crimp terminals for M3.5 screws. Do not connect stranded wires directly to the terminal block.



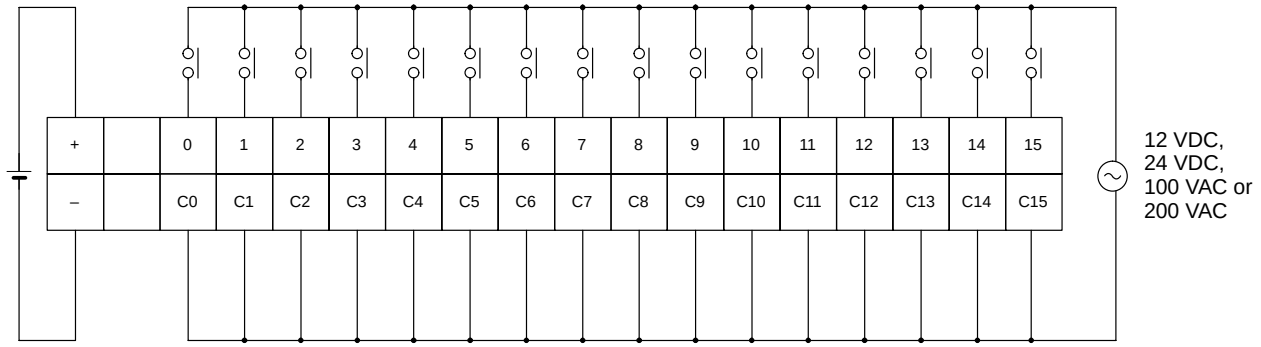
Tighten the screws on the terminal block to a torque of 0.8 N • m.

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Wiring I/O Blocks

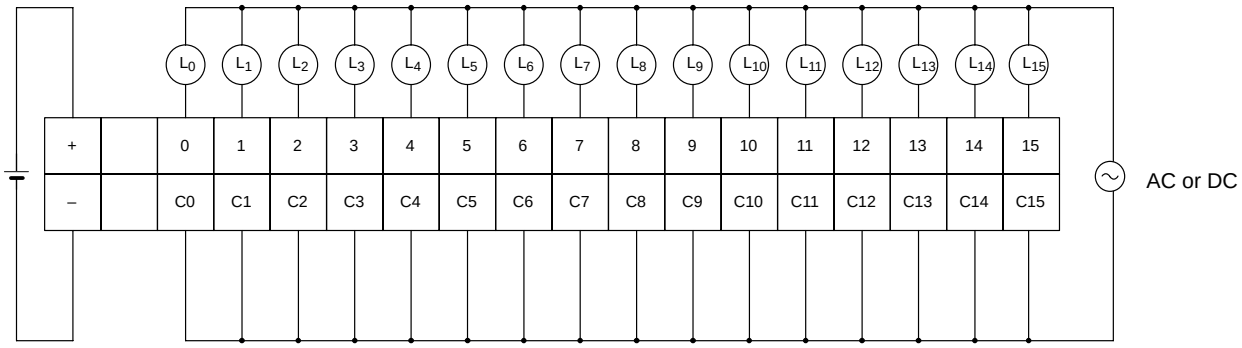
Wire I/O Blocks according to the following diagrams. Wire to either one power supply or several power supplies according to Unit specifications.

Input Blocks



24 VDC or 12 VDC

Output Blocks



24 VDC or 12 VDC

Power Supply

Both Output and Input Blocks must be provided with an external power supply. (They do not contain built-in power supplies.) For Output Blocks, the relay drive power supply must be connected to the positive and negative terminals. On the load side (points 0 through 15), power supplies must be provided to drive the loads. For Input Blocks, power must be connected to the positive and negative terminals, and the relay drive power supply must be provided to individual input points (points 0 through 15).

Use the connecting cable to supply power from each I/O Block power terminal to its Remote Interface. Do not supply power to the I/O Block until it has been connected to its Remote Interface.

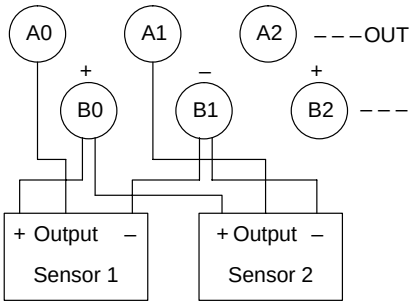
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G72C Remote Terminals

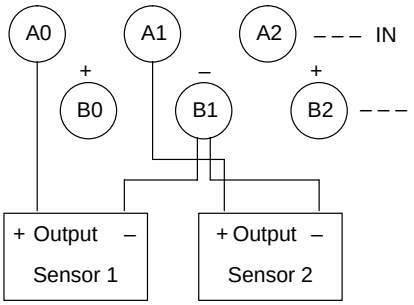
The following examples show various wiring possibilities for G72C Remote Terminals.

Input Terminals

Three-wire



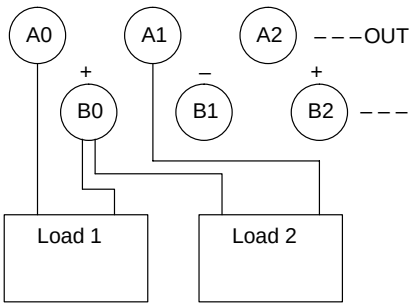
Two-wire



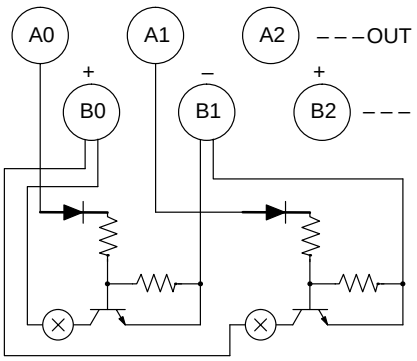
Output Terminals

When connecting outputs to logic external circuits, the external circuits must be designed to be compatible with the output specifications of the Output Terminal (pull-up resistance: 4.3 kΩ; residual voltage: 1.2 V).

Normal Loads



Logic Circuits



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SECTION 6
I/O Response Times

This section provide details on response time computations for different Wired I/O Systems.

6-1 Introduction . . . . . .
6-2 C500 Systems . . . . . .
6-3 C1000H and C2000H Systems . . . . . .
6-4 C200H Systems . . . . . .

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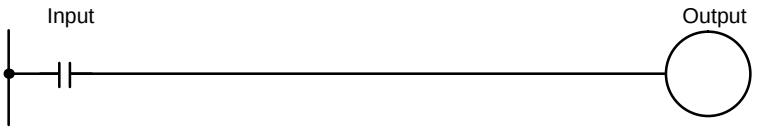
6-1 Introduction

The time required to produce a programmed output to an input within a Remote I/O System varies with the scan time of the PC, the transmission time of the Remote I/O System, and the timing of the input.

The processing that determines and the methods for calculating maximum and minimum response times from input to output are provided in this subsection. Calculations assume that both the input and the output are located on Slave Racks in a Remote I/O System.

Although more precise equations are possible if required, equations used for the following calculations do not consider fractions of a scan.

In looking at the following timing charts, it is important to remember the sequence processing occurs during the PC scan, particular that inputs will not produce programmed-actions until the program has been execution.



⚠ Caution Noise may increase I/O delays.

6-2 C500 Systems

With C500 Remote I/O Systems, both the scan time of the PC and the transmission time required by the Remote I/O System need to be considered in computing the I/O response times.

Remote I/O Transmission Times

The remote I/O transmission time is computed as follows:

T_{RM} = Total Slave transmission time for one Master

= $\Sigma T_{RT} + T_{TT}$

T_{RT} = Transmission time for each Slave

= 1.4 ms + (0.2 ms x n)

Where n = number of I/O words on the Slave Rack

T_{TT} = Remote Terminal transmission time

= 0.2 ms x m

Where m = number of Remote Terminals

Minimum I/O Response Times

The minimum response time occurs when all signals are processed as soon as they are received, meaning only one scan is required to execute the program before the output is made.

Time = Input ON delay + scan time + (T_{RT} or T_{TT}) + output ON delay

Maximum I/O Response Times

The maximum response time occurs when the input just misses both the first remote I/O transmission and the program execution portion of the scan, meaning that processing must wait for the next transmission and then the next scan.

Time = Input ON delay + (scan time x 2) + (T_{RM} x 2) + (T_{RT} or T_{TT}) + output ON delay

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Example Computations

Calculations would be as shown below for input and output ON delays of 10 ms and a scan time of 20 ms. This example uses only one Slave Rack connected to a Master and four words allocated on the Slave Rack. Because there is only one Slave, T_{RM} and T_{RT} are the same.

T_{RT} = 1.4 + (0.2 x 4) = 2.2 ms

T_{RM} = 2.2 ms

Minimum I/O Response Time

Time = 10 ms + 20 ms + 2.2 ms + 10 ms

= 42.2 ms

Maximum I/O Response Time

Time = 10 ms + (20 ms x 2) + (2.2 ms x 2) + 2.2 ms + 10 ms

= 66.6 ms

Transmission Time for Remote I/O Errors

The above computations assume that there is no remote I/O error (including power interruptions). If an error occurs for a Slave, the response time would be increased by 20 ms for each Slave connected to the same Master as the Slave where the error occurred. If an error occurs for a Remote Terminal, the overall delay time would be increased by 5 ms for each Remote Terminal connected to the same Master as the Remote Terminal where the error occurred.

6-3 C1000H and C2000H Systems

With C1000H and C2000H Remote I/O Systems, both the scan time of the PC and the transmission time required by the Remote I/O System need to be considered in computing the I/O response times.

Remote I/O Transmission Times

The remote I/O transmission time is computed as follows:

T_{RM} = Total Slave transmission time for one Master

= $\Sigma T_{RT} + T_{TT}$

T_{RT} = Transmission time for each Slave

= 1.4 ms + (0.2 ms x n)

Where n = number of I/O words on the Slave Rack

T_{TT} = Remote Terminal transmission time

= 0.2 ms x m

Where m = number of Remote Terminals

Minimum I/O Response Times

The minimum response time occurs when all signals are processed as soon as they are received. Because remote I/O processing is handled in parallel with program execution, two scans are required so that the program is executed.

Time = Input ON delay + (scan time x 2) + (T_{RT} or T_{TT}) + output ON delay

Maximum I/O Response Times

The maximum response time occurs when the input just misses both the first remote I/O transmission and the program execution portion of the scan, meaning that processing must wait for the next transmission and then the next (i.e., the third) scan.

Time = Input ON delay + (scan time x 3) + (T_{RM} x 2) + (T_{RT} or T_{TT}) + output ON delay

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Example Computations

Calculations would be as shown below for input and output ON delays of 10 ms and a scan time of 20 ms. This example uses a C1000H system with only one Slave Rack connected to a Master and four words allocated on the Slave Rack. Because there is only one Slave, T_{RM} and T_{RT} are the same.

T_{RT} = 1.4 + (0.2 x 4) = 2.2 ms

T_{RM} = 2.2 ms

Minimum I/O Response Time

Time = 10 ms + 20 ms x 2 + 2.2 ms + 10 ms

= 62.2 ms

Maximum I/O Response Time

Time = 10 ms + (20 ms x 3) + (2.2 ms x 2) + 2.2 ms + 10 ms

= 86.6 ms

Transmission Time for Remote I/O Errors

The above computations assume that there is no remote I/O error (including power interruptions). If an error occurs for a Slave, the response time would be increased by 20 ms for each Slave connected to the same Master as the Slave where the error occurred. If an error occurs for a Remote Terminal, the overall delay time would be increased by 5 ms for each Remote Terminal connected to the same Master as the Remote Terminal where the error occurred.

6-4 C200H Systems

With C200H Remote I/O Systems, only the scan time of the PC needs to be considered in computing the I/O response times as long as the remote I/O transmission time is negligible and smaller than the scan time. The scan time, however, is increased by the presence of the Remote I/O System

Scan Time

The scan time for Remote I/O Systems is increased by the following amount for each Master (approx.):

1.3 ms + 100 μs x (number of 8-pt. Units controlled through the Master + (number of 16-pt. Units controlled through Master x 2)) + α

Where,

α = 200 μs x number of words used by Special I/O Units

A more detailed explanation of scan time operation and calculations is available in the *C200H PC Operation Manuals*.

Minimum I/O Response Times

The minimum response time occurs when all signals are processed as soon as they are received. Here, three scans are required so that the program is executed.

Time = Input ON delay + scan time x 3 + output ON delay

Maximum I/O Response Times

The maximum response time occurs when the input just misses the program execution portion of the scan, meaning that processing must wait for the next transmission and then the next (i.e., the fourth) scan.

Time = Input ON delay + scan time x 4 + output ON delay

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Example Computations

Calculations would be as shown below for input and output ON delays of 10 ms and a scan time of 20 ms. This example uses only one Slave Rack connected to a Master and four words allocated on the Slave Rack.

Minimum I/O Response Time

Time = 10 ms + 20 ms x 3 + 10 ms

= 80 ms

Maximum I/O Response Time

Time = 10 ms + 20 ms x 4 + 10 ms

= 100 ms

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SECTION 7
Error Processing

This section covers functions, procedures, and operational differences that are relevant when errors occur in your system. The table of *Section 7-1* provides easy reference to indicator functions, error causes, and appropriate corrective measures. *Section 7-2* shows how to monitor errors through SR words and the Programming Console. The procedures used to locate transmission errors are outlined in *Section 7-3*, while *Section 7-4* provides two tables that illustrate operational differences when errors occur in CONTINUE and STOP modes. Finally, *Section 7-5* gives three possible methods to achieve system recovery for errors in STOP mode.

7-1 Self-Diagnosis . . . . .
7-2 Error Codes and Monitoring . . . . .
7-3 Locating Transmission Errors . . . . .
7-4 CONTINUE and STOP Mode Operation . . . . .
7-5 Recovery in STOP Mode . . . . .
7-6 I/O Table Creation Problems . . . . .
7-7 Slave Unit Numbers with Multiple Terminators . . . . .
7-7-1 Applicable Products . . . . .
7-7-2 Notification Method for Multiple Terminators . . . . .

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7-1 Self-Diagnosis

C-series systems have self-diagnostic features to aid in the event of error. These features are divided into hardware diagnosis and system diagnosis. In either case, the error message or FAL number is read through the Programming Console. Some errors are also monitored by SR bits and can be programmed to indicate errors through external alarms. The SR bits can also be programmed to stop PC operation in the event of specific errors.

Error Processing Charts are provided on the following pages. In these charts, "——" indicates that the status of that LED is not relevant under the given conditions. If operation is not possible for LED indications other than those given, connect one Slave, then two Slaves, etc., checking operations after connecting each Slave until the error is discovered. All LED indications listed are for Units with errors.

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Error Before Operation: C500 Masters and Slaves

Programming Console LEDs	LEDs on Master				LEDs on Slave		Remote Terminal LEDs		Cause	Correction
	TR/ ERR	TEST OK	END RS CHK	LINE ERR	TR/ ERR	ERR	POWER	TR/ ERR		
CPU WAITING	flash	not lit	lit	not lit	lit	not lit	lit	lit	Terminator not set.	Set farthest Unit from Master as terminator.
									Transmission line broken or wired incorrectly.	Correct transmission line
									Slave and Remote Terminal points exceed 512.	Reduce total number of points.
					not lit	not lit			Power not supplied to terminator Slave.	Supply power to Slave.
					lit	not lit	not lit	not lit	Power not supplied to terminator Remote Terminal.	Supply power to Remote Terminal.
	flash	not lit	flash	not lit	lit	not lit	lit	lit	Multiple terminators set. Refer to *7-7 Slave Unit Numbers with Multiple Terminators*.	Set only one terminator for each Master.
	lit	not lit	not lit	lit	lit	not lit	lit	lit	Transmission line shorted.	Correct transmission line.
CPU WAITING or REMOTE I/O ERR	flash /lit	not lit	---	not lit	lit	not lit	lit	lit	Same unit number or word set twice on Slaves.	Correct settings so same word is not allocated twice.
	lit	not lit	---	not lit	lit	lit	lit	lit	Slave I/O bus error.	Check Slave, I/O Units on Slave, and Slave's Rack.
REMOTE I/O ERR or VER ERR	not lit	not lit	not lit	not lit	lit	not lit	lit	lit	CPU Unit error in Master.	Replace Master.
I/O VER ERR	not lit	not lit	not lit	not lit	lit	not lit	lit	lit	I/O table not written or I/O table inconsistency. (LEDs will go out after TR/ERR LED on Master flashes and terminator LEDs are lit for several seconds.)	Check I/O table on Programming Console and correct if necessary. If I/O table verifies, check all Slaves not set as terminators.

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Non-fatal Errors

Programming Console LEDs	LEDs on Master				LEDs on Slave		Remote Terminal LEDs		Cause	Correction
	TR/ ERR	TEST OK	END RS CHK	LINE ERR	TR/ ERR	ERR	POWER	TR/ ERR		
REMOTE I/O ERR	lit	not lit	lit	not lit	lit	not lit	lit	lit	Transmission line broken.	Correct transmission line.
	lit	not lit	not lit	not lit	not lit	not lit	not lit/lit	not lit	CPU Unit error in Slave or Remote Terminal.	Replace Slave or Remote Terminal.
	lit	not lit	---	not lit	lit	lit	lit	lit	Master or Slave I/O bus error.	Check Slave I/O units on Slave and Rack.
	not lit	not lit	not lit	not lit	lit	not lit	lit	lit	CPU Unit error in Master.	Replace Master.
	lit	not lit	---	lit	lit	not lit	lit	lit	Transmission line shorted.	Correct transmission line.
	lit	---	---	not lit	not lit	not lit	---	---	Power not supplied to Slave.	Supply power to Slave.
	lit	---	---	not lit	---	---	not lit	not lit	Power not supplied to Remote Terminal.	Supply power to Remote.
I/O VER ERR	flash	not lit	not lit	not lit	flash	not lit	lit	---	I/O Unit added to or removed from Master, Slave, or Remote Terminal.	Check I/O table on Programming Console and correct if necessary. If I/O table is Ok, correct I/O configuration.
	flash /not lit	not lit	---	not lit	lit	litt	lit	lit	Remote Terminal using same word as PC. Same Slave unit number or same Remote Terminal word number set twice.	

Fatal Errors

Programming Console LEDs	LEDs on Master				LEDs on Slave		Remote Terminal LEDs		Cause	Correction
	TR/ ERR	TEST OK	END RS CHK	LINE ERR	TR/ ERR	ERR	POWER	TR/ ERR		
I/O SET ERR	flash /lit	not lit	---	not lit	lit	lit	lit	lit	Input and Output specifications are incorrect for I/O Units on Slave Racks or for Remote Terminals.	Check I/O table on Programming Console and correct if necessary. If I/O table is OK, correct I/O Unit configuration.

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C200H Remote I/O Systems

Item	Programming Console Display	C200H Master LEDs				C200H Slave LEDs				Cause	Correction
		XMT/ RCV	Error	END RS	LINE ERR	XMT/ RCV	Error 1	Error 2	RUN		
Prior to system operation	Master not detected	not lit	not lit	not lit	not lit	---	---	---	---	CPU Unit doesn't detect the Master. Master not mount properly or CPU Unit error.	Check mounting of Master; turn power back ON. If error cannot be cleared replace Master.
	CPU Waiting or Remote I/O errors	not lit	not lit	lit	not lit	---	---	---	---	Slave power OFF or I/O bus line broken. Terminator not set.	Turn on power to the Slaves and connected Units. Check transmission cables. Set the Unit farthest removed from Master as the terminator.
		not lit	lit	lit	not lit	---	lit	lit	not lit	Slave I/O bus error.	Replace faulty unit.
					not lit	---	---	---	not lit	Transmission error in I/O bus.	Check transmission cables.
					lit	---	---	---	not lit	Transmission line shorted	Check transmission cables.
					not lit	flash	---	---	not lit	System configuration incorrect.	Check unit numbers of I/O Units. Confirm that the same word number or unit number is not allocated twice. Check to see if the maximum number of words is not exceeded.
		not lit	not lit	flash	not lit	---	---	---	not lit	Two or more terminators have been designated. Refer to *7-7 Slave Unit Numbers with Multiple Terminators*.	Make sure only 1 Unit has been set as the terminator.
	Too many I/O points	not lit	lit	not lit	not lit	not lit	---	---	not lit	Same word multiplier used for more than one Master.	Check word multipliers and correct any that are redundant
		flash	not lit	not lit	lit	flash	---	---	not lit	Same unit number assigned more than once.	Check AR 02 through AR 06 for the redundant unit numbers and correct them.

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Item	Programming Console Display	C200H Master LEDs				C200H Slave LEDs				Cause	Correction
		XMT/ RCV	Error	END RS	LINE ERR	XMT/ RCV	Error 1	Error 2	RUN		
Remote I/O System operation failure	Slave not confirmed	flash	not lit	not lit	not lit	not lit	not lit	not lit	not lit	Slave not verified.	Check Slave Units and turn power back ON. Then, turn CPU Unit power supply back ON or restart Master.
	Expansion I/O Rack not confirmed					flash	lit	flash	---	Expansion I/O Unit connected via I/O connecting cable not recognized by CPU Unit.	Check I/O Connecting Cable connections. Check Expansion I/O Rack words and the system configuration. If an I/O table is being used, reference it on the Programming Console, and restore the system configuration or recreate the I/O table.
Remote I/O error (after starting system)	Remote I/O System operation failure	flash/ lit	lit	not lit	not lit	not lit	not lit	not lit	not lit	I/O bus line break or CPU Unit error.	Check optical fiber cable. If the cause is removed, recovery will be automatic. Otherwise replace unit.
	Transmission error					not lit	lit	not lit	not lit	I/O bus transmission line break or error.	
	I/O bus error					flash	lit	lit	not lit	Slave I/O bus error.	Check all Slaves and Slave Racks. Replace faulty units.
	I/O verification error					flash	flash	lit	---	I/O Unit on Slave Rack removed or added.	Reference the I/O table on the Programming Console, and reset I/O or recreate the I/O table.
	I/O setting error					flash	lit	lit	not lit	Input and Output Units reversed on Slave Rack.	Reference the I/O on the Programming Console, and restore the I/O Unit word allocations
	Transmission error				lit	not lit	lit	not lit	not lit	Transmission line shorted.	Check transmission cables.

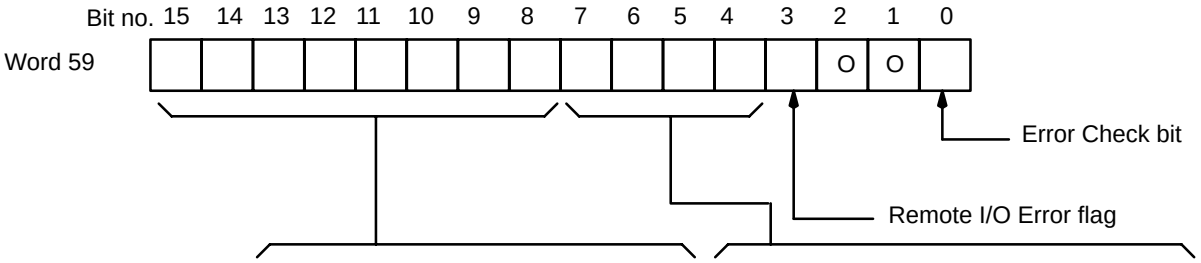
Note I/O verification errors and I/O setting errors occur when an I/O table is used or when the power supply to a Slave is turned off and I/O Unit settings are changed during CPU Unit operation.

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7-2 Error Codes and Monitoring

The following show how it is possible to monitor errors using SR words.

C120 Systems



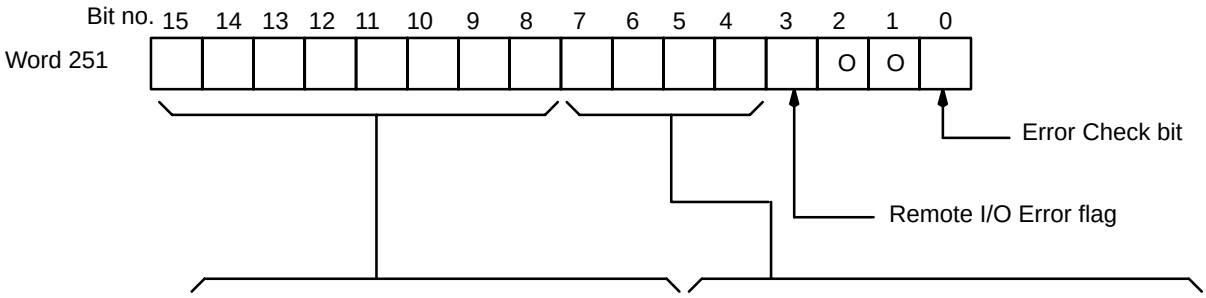
Error Location	Bits 8 to 15	Definition	Bits 4 to 7	Definition
Master or Slave	B0 to B3	Indicates the Master by mounting location. B0 is the leftmost Master on the Rack.	8	Indicates a failure in the Master.
			0	Indicates a failure in Slave #0.
			1	Indicates a failure in Slave #1.
Remote Terminal	00 to 31	Refers to the Remote Terminal word number.	0, 1	Indicates a failure in the Remote Terminal.

The Error Check bit can be turned ON and OFF to read errors when they have occurred in more than one Unit.

The Remote I/O Error flag indicates that an error has occurred in one of the Remote Units. This flag also turns ON for errors in optical Remote I/O Subsystems.

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C1000H and C2000H Systems



Error Location	Bits 8 to 15	Definition	Bits 4 to 7	Definition
Master or Slave	B0 to B7	The codes (Remote Nos.) on the right are assigned to Masters on CPU or Expansion I/O Rack from the least significant word.	0 to 7	Indicates a failure in Slaves #0 to #7.
			8	Indicates a failure in Master.
Remote Terminal	00 to 31	Indicates word no. of Remote Terminal	0, 1	Multiplier 0
			2, 3	Multiplier 1
			4, 5	Multiplier 2
			6, 7	Multiplier 3

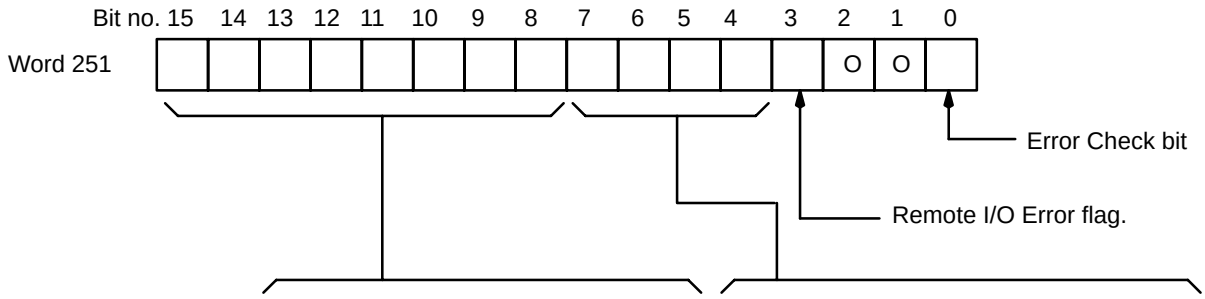
The Error Check bit can be turned ON and OFF to read errors when they have occurred in more than one Unit.

The Remote I/O Error flag indicates that an error has occurred in one of the Remote Units.

Note The number of the word that is actually allocated to a Remote Terminal is calculated using this formula:

Word no. = (Word no. listed in the above table) +
(Word Multiplier listed in the above table) x 32

C200H Systems



Error Location	Bits 8 to 15	Definition	Bits 4 to 7	Definition
Master or Slave	B0 to B1	Indicates B + the unit number of the Master.	0 to 4	Indicates the unit number of the Slave.
Remote Terminal	00 to 31	Indicates words no. set on Remote Terminal.	0 or 1	Either indicate the Remote Terminal.

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The Error Check bit can be turned ON and OFF to read errors when they have occurred in more than one Unit. The Remote I/O Error flag indicates that an error has occurred in a Remote I/O Slave Unit or Remote Terminal. When a remote I/O error has occurred, bit 25312 also turns ON.

Error Codes and SR/AR Bits

Whenever an error listed in the C200H table under *7-1 Self-Diagnosis* occurs, error information can be accessed in the following SR and AR bits and words.

Word/bit	Information
AR 0014/0015	Unit number of Master with error.
AR 02	Unit number of Slave with error at beginning of operations
AR 03 to AR 06	Word number of Remote Terminal with error at beginning of operations.
SR 251	Unit number or word number of unit with error after beginning of operations.

Master Error Flags and Restart Bits

Error flags and Restart bits for Masters are listed below. Restart bits can be turned ON and then OFF to restart a Master after first removing the cause of the error. Error flags are ON when an error has occurred.

Bit	Function
AR 0014	Master #1 Error flag
AR 0015	Master #0 Error flag
AR 0114	Master #1 Restart bit
AR 0115	Master #0 Restart bit

Unit Number and Word Error Information Before Operation

The following bits can be used for error processing and debugging when establishing a new system.

Slaves

The following Error flags will be turned on when the same unit number has been set for two different Slaves.

Bit	Function
AR 0200	Unit #0 Error flag
AR 0201	Unit #1 Error flag
AR 0202	Unit #2 Error flag
AR 0203	Unit #3 Error flag
AR 0204	Unit #4 Error flag

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Remote Terminals

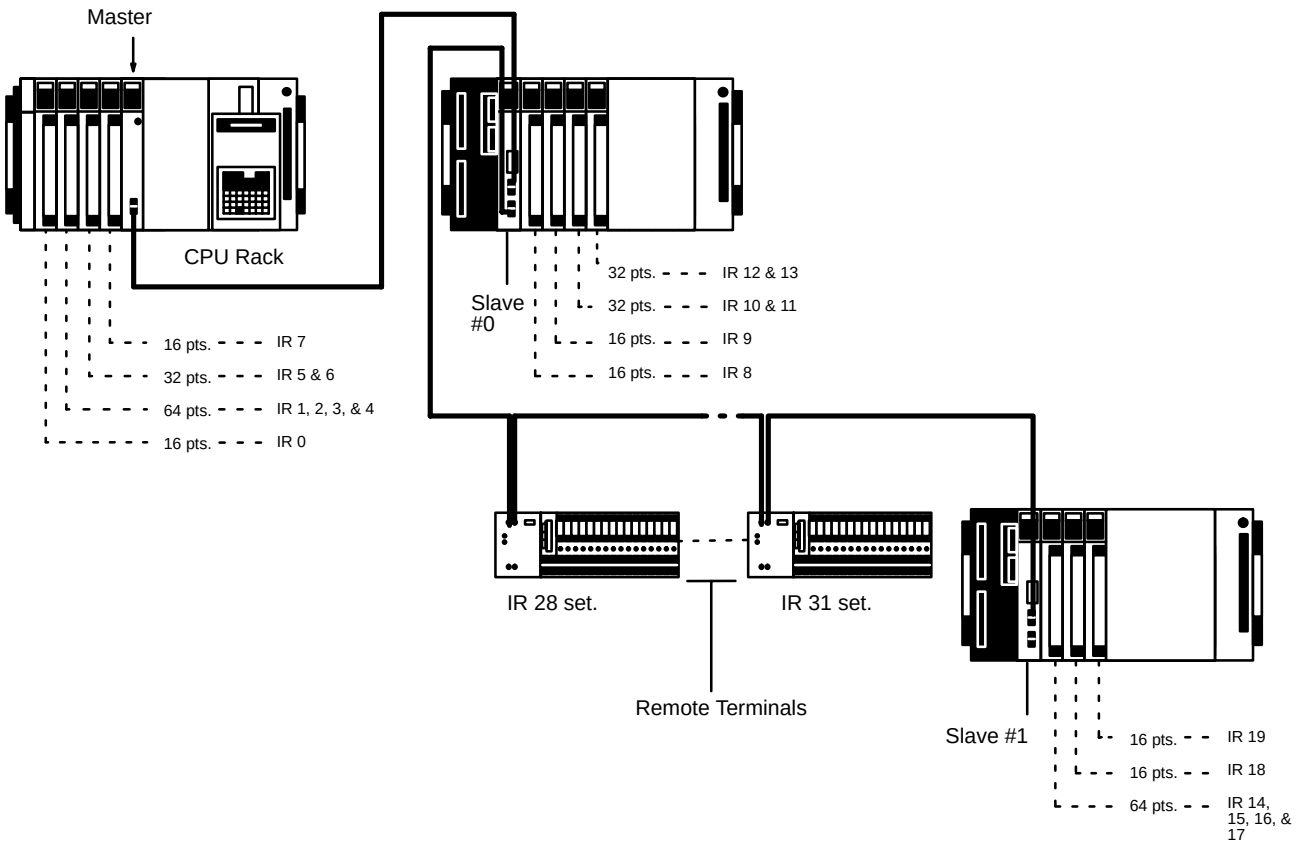
The following error flags (both bits) will be turned on when the same word has been allocated for two different Remote Terminals.

Bit	Function
AR 0300/0301	Error flags for Terminal set to word 0
AR 0302/0303	Error flags for Terminal set to word 1
AR 0304/0305	Error flags for Terminal set to word 2
AR 0306/0307	Error flags for Terminal set to word 3
AR 0308/0309	Error flags for Terminal set to word 4
AR 0310/0311	Error flags for Terminal set to word 5
AR 0312/0313	Error flags for Terminal set to word 6
AR 0314/0315	Error flags for Terminal set to word 7
AR 0400/0401	Error flags for Terminal set to word 8
AR 0402/0403	Error flags for Terminal set to word 9
AR 0404/0405	Error flags for Terminal set to word 10
AR 0406/0407	Error flags for Terminal set to word 11
AR 0408/0409	Error flags for Terminal set to word 12
AR 0410/0411	Error flags for Terminal set to word 13
AR 0412/0413	Error flags for Terminal set to word 14
AR 0414/0415	Error flags for Terminal set to word 15
AR 0500/0501	Error flags for Terminal set to word 16
AR 0502/0503	Error flags for Terminal set to word 17
AR 0504/0505	Error flags for Terminal set to word 18
AR 0506/0507	Error flags for Terminal set to word 19
AR 0508/0509	Error flags for Terminal set to word 20
AR 0510/0511	Error flags for Terminal set to word 21
AR 0512/0513	Error flags for Terminal set to word 22
AR 0514/0515	Error flags for Terminal set to word 23
AR 0600/0601	Error flags for Terminal set to word 24
AR 0602/0603	Error flags for Terminal set to word 25
AR 0604/0605	Error flags for Terminal set to word 26
AR 0606/0607	Error flags for Terminal set to word 27
AR 0608/0609	Error flags for Terminal set to word 28
AR 0610/0611	Error flags for Terminal set to word 29
AR 0612/0613	Error flags for Terminal set to word 30
AR 0614/0615	Error flags for Terminal set to word 31

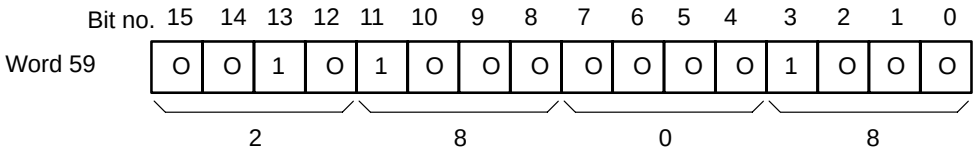
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Locating Errors: C120 and C500 Systems

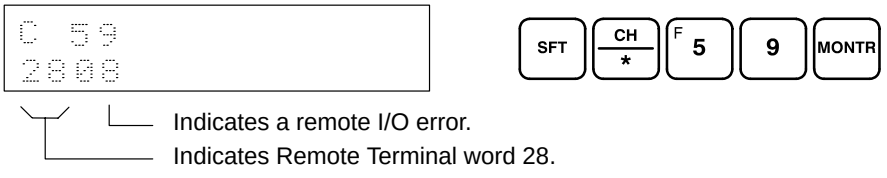
Using the following system, let's assume an error has occurred in word 28 and that word 28 has been allocated to a Remote Terminal.



Word 59 shows the following data.

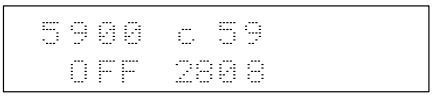


Monitoring word 59 with the Programming Console reveals the following data.

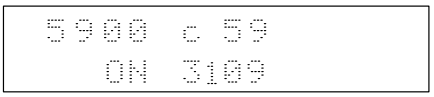


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To check for other errors, monitor 5900 and force-set the system. This causes the next error word to be displayed.









Incremented one by the Error Check flag.

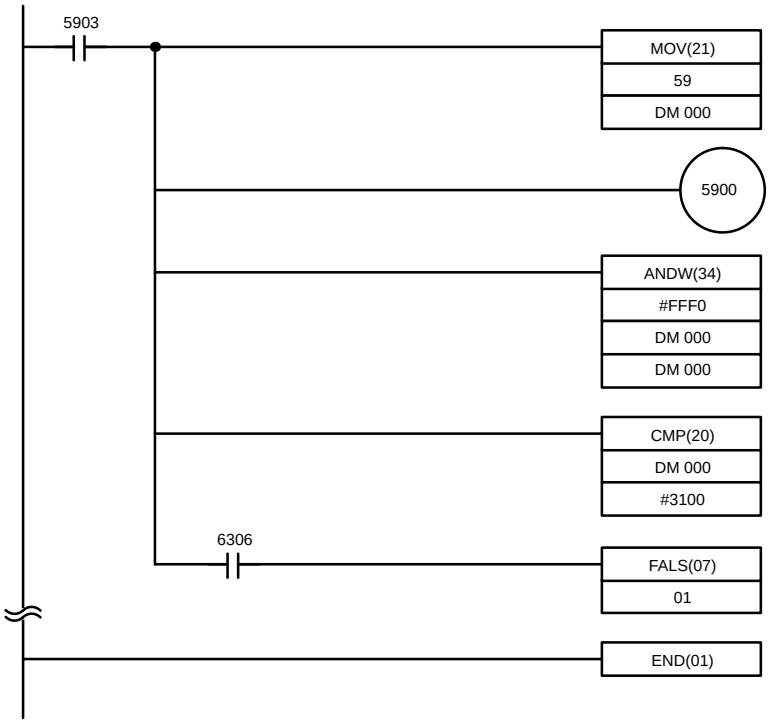
Indicates Remote Terminal word 31.

To read the next error, reset the Error Check bit, then set it again. If the left-most Master has an error, the following is displayed. Errors in the Slaves cannot be read if there is an error in the Master.



Master number

This is an example program to stop PC operation if an error occurs in the Remote Terminal allocated word 31. Operation can be restarted by first removing the cause of the error, then setting and resetting the Error Check bit until the contents of word 59 goes to 0000, and finally clearing the error via the Programming Console.



Remote I/O Error flag turns ON when there is an error. The first step is thus to move IR 59 to DM 000.

The next error is read and its word number displayed. If there is not another error, all 0s will be displayed.

Bits 0 to 3 are masked.

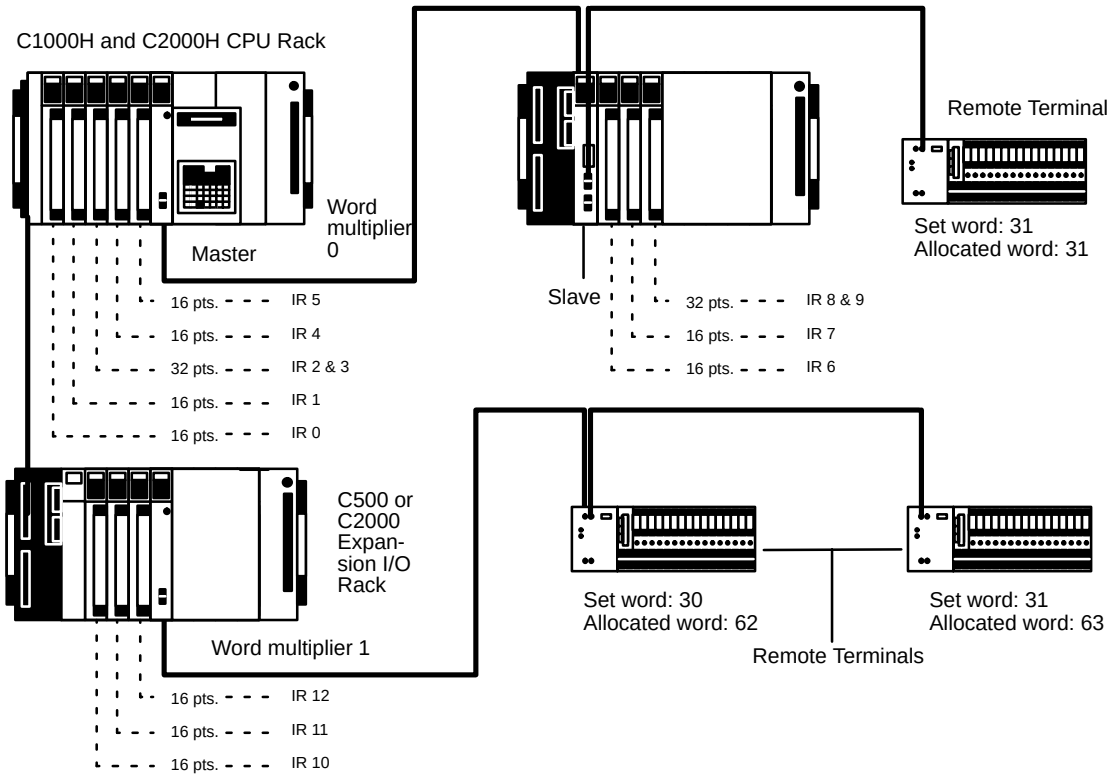
Data from DM 000 is compared with #3100.

If data matches, there is an error in the Unit allocated word 31 and the CPU Unit stops.

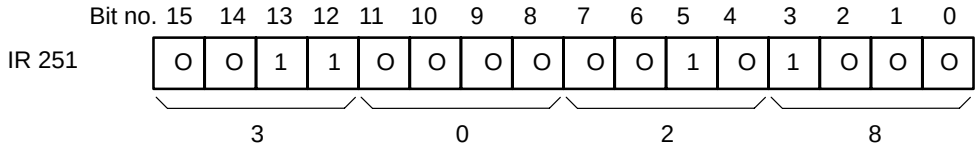
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Locating Errors: C1000H and C2000H Systems

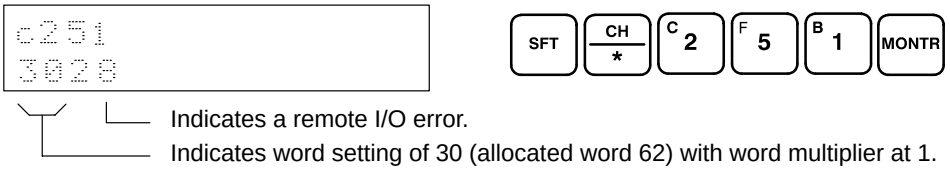
Using the following System, let's assume an error has occurred in word 62, that this word has been allocated to a Remote Terminal (word 30 in the Sub-system of the Master with a word multiplier of 1), and the Master is set in CONTINUE mode.



Word 251 shows the following data.

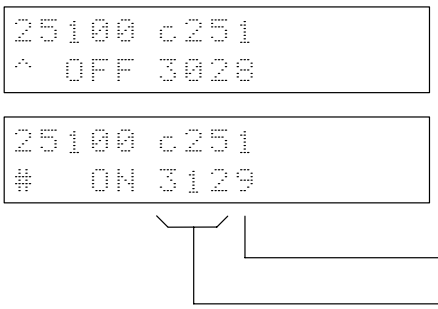


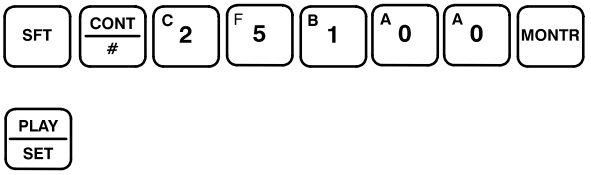
Monitoring word 251 with the Programming Console produces the following display.



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To check for other errors, monitor 25100 and force-set the system. This causes the next error word to be displayed.

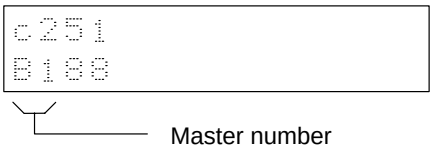




Incremented one by the Error Check flag.

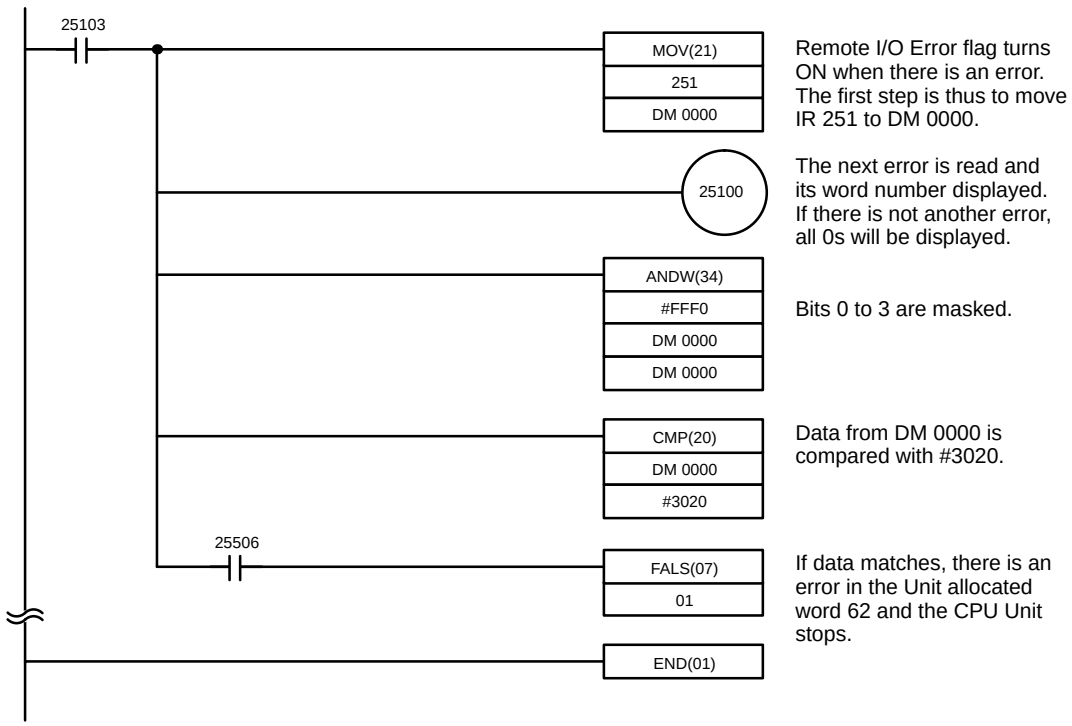
Indicates word setting of 31 (allocated word 63) with word multiplier at 1.

To read the next error, reset the Error Check bit and then set it. If the leftmost Master has an error, the following is displayed. Errors in the Slaves cannot be read if there is an error in the Master.



Master number

This is an example program to stop PC operation if an error occurs in the Remote Terminal allocated word 62 (word 30 under Master with word multiplier of 1). Operation can be restarted by first removing the cause of the error, then setting and resetting the Error Check bit until the contents of IR 251 goes to 0000, and finally clearing the error via the Programming Console.



Remote I/O Error flag turns ON when there is an error. The first step is thus to move IR 251 to DM 0000.

The next error is read and its word number displayed. If there is not another error, all 0s will be displayed.

Bits 0 to 3 are masked.

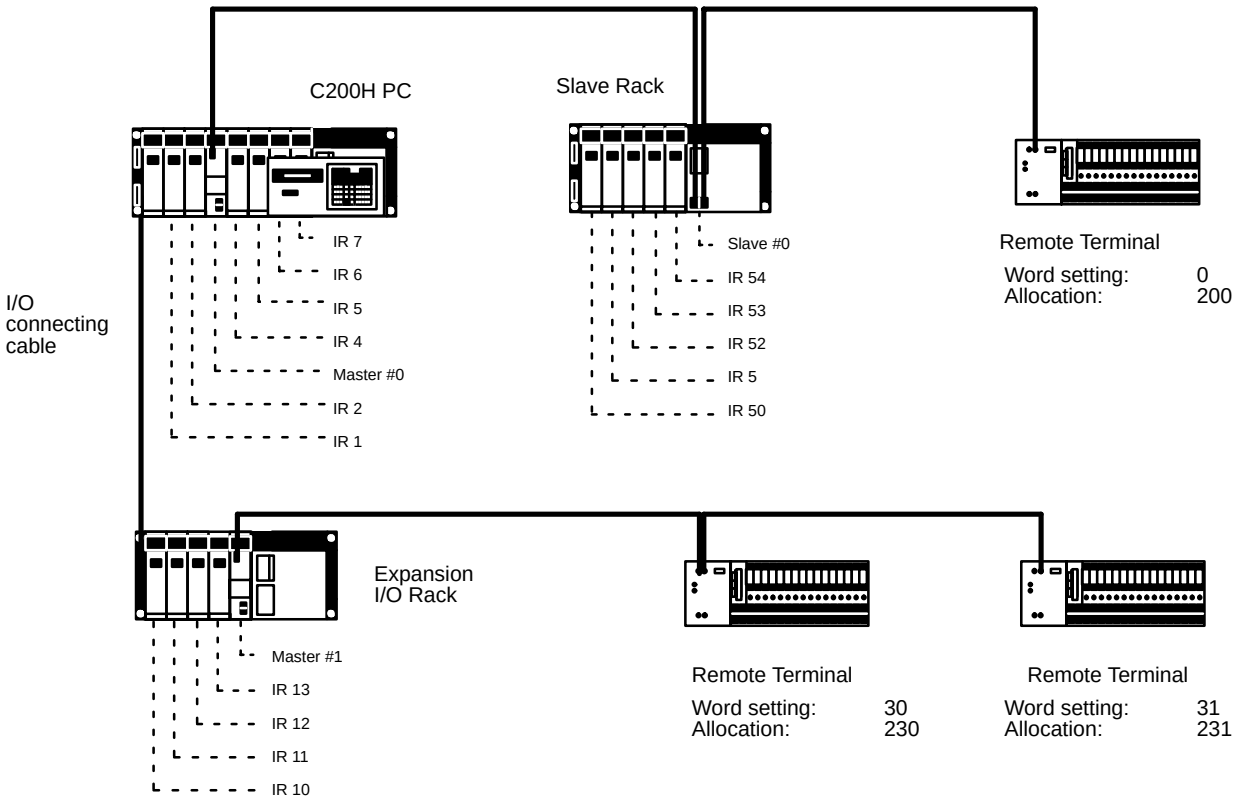
Data from DM 0000 is compared with #3020.

If data matches, there is an error in the Unit allocated word 62 and the CPU Unit stops.

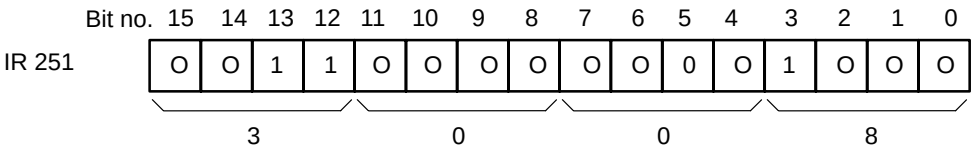
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Locating Errors: C200H Systems

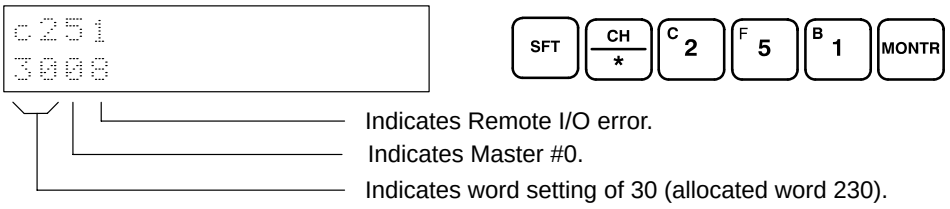
Using the following system, let's assume errors have occurred in words 230 and 231 (word settings 30 and 31) and that words 230 and 231 have been allocated to Remote Terminals.



Word 251 contains the following data.

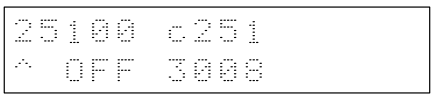


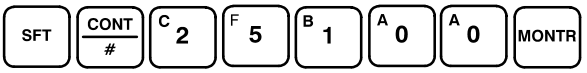
Monitoring word 59 with the Programming Console produces the following display.

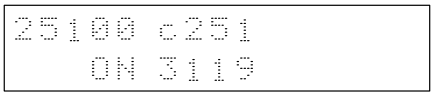


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To check for other errors, monitor 25100 and force-set the system. This causes the next error word to be displayed.









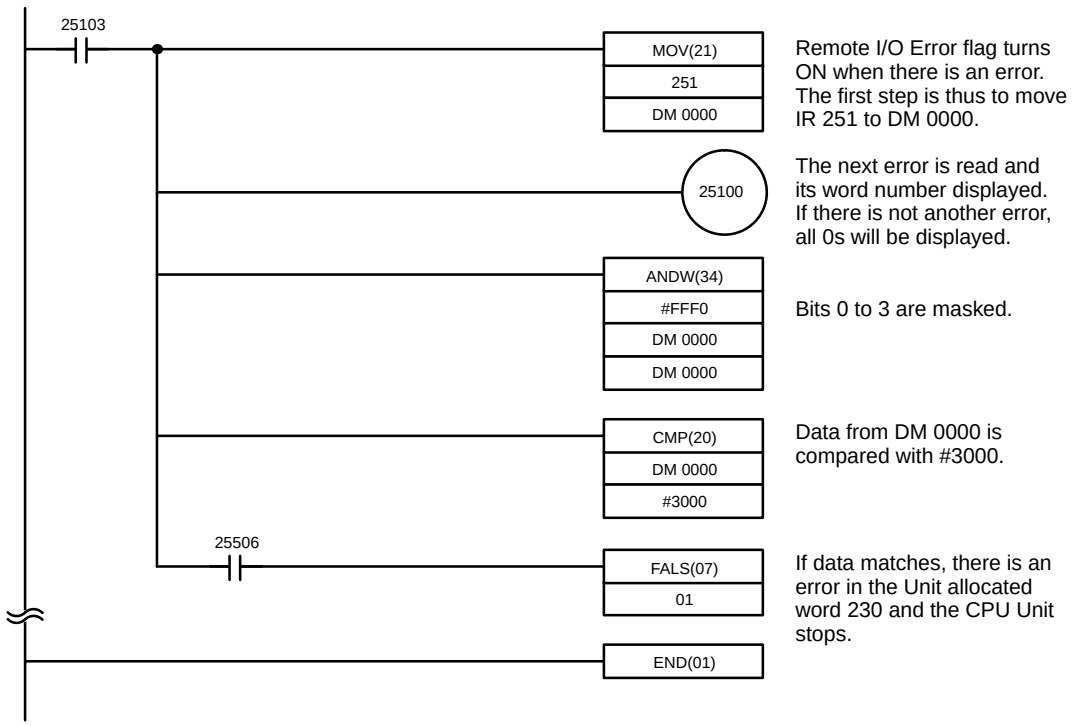
Incremented one by the Error Check flag.
Indicates Master #1.
Indicates word setting of 31 (allocated word 231).

To read the next error, reset the Error Check bit, then set it again. If Slave #1 connected to Master #1 has as error, the following display will appear.



Indicates Slave number.
Indicates Master number.

This is an example program to stop PC operation if an error occurs in the Remote Terminal allocated word 230. Operation can be restarted by first removing the cause of the error, then setting and resetting the Error Check bit until the contents of word 251 goes to 0000 and then clearing the error via the Programming Console.



Remote I/O Error flag turns ON when there is an error. The first step is thus to move IR 251 to DM 0000.

The next error is read and its word number displayed. If there is not another error, all 0s will be displayed.

Bits 0 to 3 are masked.

Data from DM 0000 is compared with #3000.

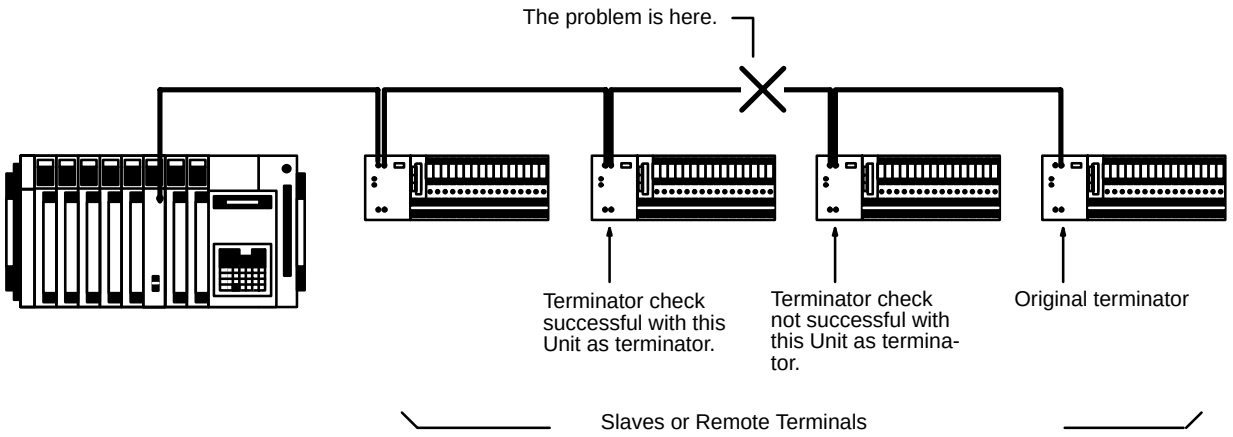
If data matches, there is an error in the Unit allocated word 230 and the CPU Unit stops.

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7-3 Locating Transmission Errors

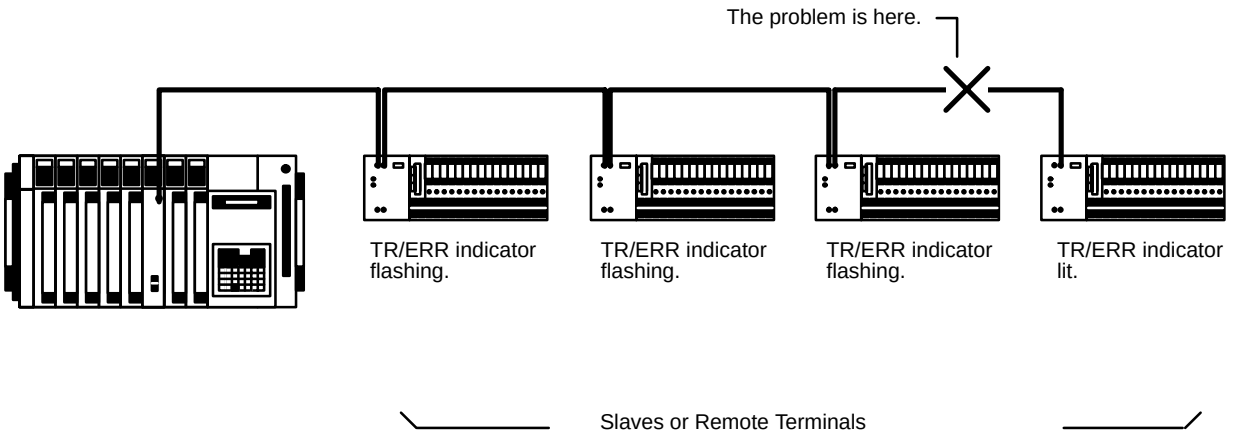
Before Terminator Acknowledgement

The TR/ERR indicator may indicate an error before the END RS CHK indicator goes off. If it does, the line may be disconnected or wired incorrectly, or the power to one of the Units in the line may be off. To locate the problem, set the Unit just before the end as the terminator, disconnect the cable to the last Unit, and test the System again. Continue moving the terminator up one Unit at a time until the Master is able to acknowledge a terminator. This will let you know what section of the line the problem is in. Check the power supply and data transmission line connections for that section and test the System again.



After Terminator Acknowledgement

Check the TR/ERR indicator of each Unit in the line to determine where the error has occurred. The problem can then be corrected by repairing the transmission line between the last Unit with the TR/ERR indicator flashing, indicating normal transmission, and the first Unit with the TR/ERR indicator lit, indicating an error.



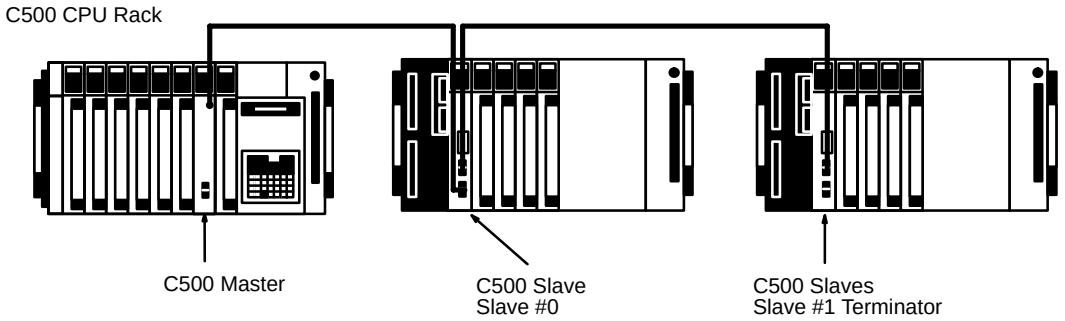
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7-4 CONTINUE and STOP Mode Operation

The following tables can be compared and contrasted to understand differences between CONTINUE and STOP mode operation. These modes are set on Masters. Refer to *Subsection 4-1* for setting details.

Operations in CONTINUE Mode

The following configuration and table will be used to show LED indications when power to Slave #0 is interrupted in CONTINUE mode. Refer to *Section 2* for details on indicator operation.

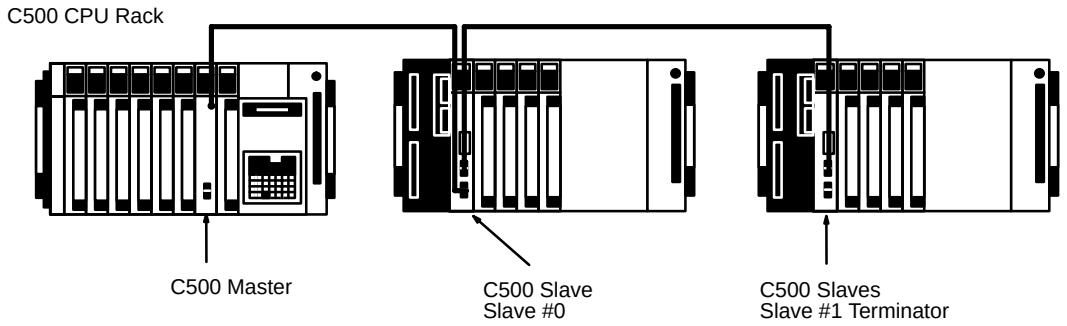


Condition	C500 LEDs					LEDs on Master				LEDs on Slave #0		LEDs on Slave #1	
	POWER	RUN	ERROR	ALARM	OUT IN	TR/ ERR	TEST OK	END RS CHECK	LINE ERR	TR/ ERR	ERR	TR/ ERR	ERR
Normal operation	lit	lit	not lit	not lit	not lit	flash	not lit	not lit	not lit	flash	not lit	flash	not lit
Power interruption to Slave #0	lit	lit	not lit	lit	not lit	lit	not lit	not lit	not lit	not lit	not lit	flash	not lit
	Remote I/O error occurs; operation continues. Word 59 contains "#B008."					Transmission error occurs; transmission to Slave #1 continues.				Power interrupted.		Normal operation.	
Power restored to Slave #0	lit	lit	not lit	lit	not lit	flash	not lit	not lit	not lit	flash	not lit	flash	not lit
	1. All ALARM LEDs turned off by performing recovery operation from Programming Console. 2. Remote I/O Error flag cleared by turning Error Check flag ON, then OFF again.					Normal operation				Normal operation			

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Operations in STOP Mode

The following configuration and table will be used to show LED indications when power to Slave #0 is interrupted in STOP mode Refer to *Section 2* for indicator details.



Condition	C500 LEDs					LEDs on Master				LEDs on Slave #0		LEDs on Slave #1	
	POWER	RUN	ERROR	ALARM	OUT IN	TR/ ERR	TEST OK	END RS CHECK	LINE ERR	TR/ ERR	ERR	TR/ ERR	ERR
Normal operation	lit	lit	not lit	not lit	not lit	flash	not lit	not lit	not lit	flash	not lit	flash	not lit
Power interruption to Slave #0	lit	lit	not lit	lit	not lit	lit	not lit	not lit	not lit	not lit	not lit	lit	not lit
	Remote I/O error occurs; operation continues. Word 59 contains “#B008.”					Transmission error occurs; transmission to both Slaves stopped.				Power interrupted.		Transmission error	
Power restored to Slave #0	lit	lit	not lit	lit	not lit	lit	not lit	not lit	not lit	lit	not lit	lit	not lit
	Remote I/O error.					Transmission error; no transmission to Slaves				Not functioning.		Transmission error; not functioning	

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(Restarting Remote I/O System)

Condition	C500 LEDs					LEDs on Master				LEDs on Slave #0		LEDs on Slave #1	
	POWER	RUN	ERROR	ALARM	OUT IN	TR/ ERR	TEST OK	END RS CHECK	LINE ERR	TR/ ERR	ERR	TR/ ERR	ERR
I/O table created (PROGRAM mode).	lit	lit	not lit	not lit	not lit	flash	not lit	not lit	not lit	flash	not lit	flash	not lit
	1. Create I/O table in PROGRAM mode and then set into RUN or MONITOR mode. 2. Error flag is cleared when I/O table is created.					1. Transmissions with Slave started when I/O table is created. 2. PC operation begins when RUN or MONITOR mode is entered.				Transmissions started when I/O table is created.		Transmissions started when I/O table is created. All outputs are turned off if the Slave is set in HOLD mode.	
TEST switch pressed (any mode).	lit	lit	not lit	lit	not lit	flash	not lit	not lit	not lit	flash	not lit	flash	not lit
	1. All ALARM LEDs turned off by performing recovery operation from Programming Console. 2. Remote I/O error flag cleared by turning error check flag OFF, ON, then OFF again.					1. Transmissions with Slave started when TEST switch is pressed. 2. If TEST switch is pressed in PROGRAM mode, transmissions will start when the TEST switch is pressed, but operation (i.e., refreshing Slave I/O) begins when RUN or MONITOR mode is entered.				Transmissions started when TEST switch is pressed.			

(Restarting Remote I/O System, Continued)

Condition	C500 LEDs					LEDs on Master				LEDs on Slave #0		LEDs on Slave #1	
	POWER	RUN	ERROR	ALARM	OUT IN	TR/ ERR	TEST OK	END RS CHECK	LINE ERR	TR/ ERR	ERR	TR/ ERR	ERR
Power to system turned back on.	lit	lit	not lit	not lit	not lit	flash	not lit	not lit	not lit	flash	not lit	flash	not lit
	Normal operation					Normal operation				Normal operation			

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7-5 Recovery in STOP Mode

When an error occurs in STOP mode, operational recovery is achieved through any one of the following steps after the cause of the error has been removed.

C500 Master

1, 2, 3...

1. Press the TEST switch on the Master.
2. Re-register the I/O table in PROGRAM mode.
3. Turn the power to the Rack to which the Master is mounted off and then back on.

C200H Master

1, 2, 3...

1. Turn the Master's Restart Bit ON and then back OFF.
2. Turn the power to the Rack to which the Master is mounted off and then back on.
3. Re-register the I/O table in PROGRAM mode.

7-6 I/O Table Creation Problems

It is sometimes not possible to enter the I/O table directly following changes to the number of Masters or Slaves. If table creation is not immediately possible, use the procedure given below for your PC. Before proceeding, be sure that you have not exceeded the maximum number of Units allowed in a Remote I/O System or Subsystem.

C200H

Clear the table and then recreate it. For all others remove the Masters.

Other PCs

1, 2, 3...

1. Turn off power to the PC(s).
2. Remove all Masters from their Racks.
3. Turn on the power to the PC(s), and enter the I/O table in PROGRAM mode.
4. Turn off the power to the PC(s), and mount all Masters.
5. Turn on the power to all Slaves.
6. Turn on the power to the PC(s).
7. Enter the I/O table.

7-7 Slave Unit Numbers with Multiple Terminators

7-7-1 Applicable Products

A feature enabling Slave unit numbers to be obtained when more than one terminator has been set has been added to the C500-RM201 and C200H-RM201 Remote I/O Master Units. This feature is available for products manufactured on or after June 3, 1999 (confirm using the lot number; see note).

Note The date of manufacture can be confirmed using the lot number. The first two digits on the left indicate the day (01 to 31), the third digit indicates the month (1 to 9, X (October), Y (November), Z (December)), and the fourth digit indicates the last digit of the year.
Example
Lot number 0369 → Manufactured on June 3, 1999.

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7-7-2 Notification Method for Multiple Terminators

C120/C500

Display

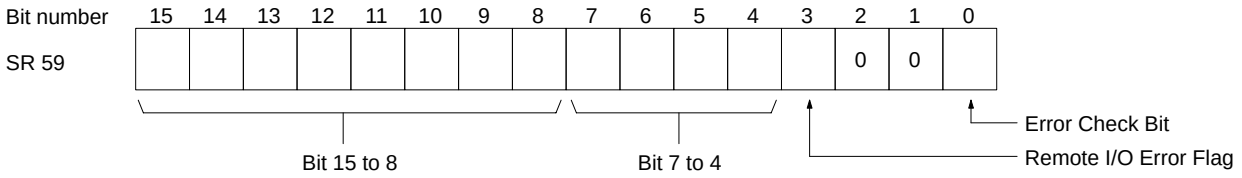
CPU Unit

Remote I/O errors are not indicated on the CPU Unit.

Master Unit

Display		Function
END RS CHK (Terminator check)	Lit	Lit until a terminator is found.
	Flashing	Flashes if multiple terminators are set.
	Unlit	Turns OFF if one and only one terminator is found.

SR Area



Location of error	Bit 15 to 8	Meaning	Bit 7 to 4	Meaning
Remote I/O Master Unit or Remote I/O Slave Unit	B0 Hex to B3 Hex	The digit on the right (0 to 3) indicates the mounting order of the Master of the Remote I/O Subsystem involved.	8 (BCD)	Indicates error in Remote I/O Master Unit.
			0 (BCD)	Indicates error in Remote I/O Slave Unit with unit number #0.
			1 (BCD)	Indicates error in Remote I/O Slave Unit with unit number #1.
Remote Terminal	00 (BCD) to 31 (BCD)	Indicates the word address setting for the Remote Terminal.	0, 1 (BCD)	Either 0 or 1 indicates error in Remote Terminal.

Error Check Bit

If there are errors in more than one Slave, or multiple terminators have been set, data for the Units can be accessed in order by turning this bit ON and OFF.

Remote I/O Error Flag

This flag indicates that an error has occurred in a Remote I/O Slave Unit or a Remote Terminal (or an Optical I/O Unit or I/O Link Unit). It also turns ON where there is more than one terminator set.

Summary

Multiple terminators are detected as follows:

- The “END RS CHK” indicator on the Remote I/O Master (RM) Unit flashes.
- By turning SR 5900 ON and OFF, the Slaves set as terminators can be read in order.

C1000H/C2000H/C2000

Display

CPU Unit

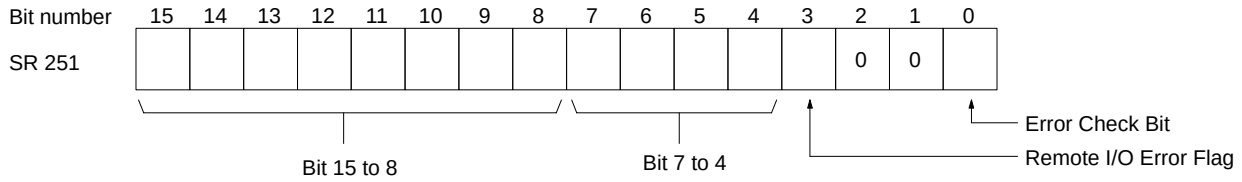
Remote I/O errors are not indicated at the CPU Unit.

Master Unit

Display		Function
END RS CHK (Terminator check)	Lit	Lit until a terminator is found.
	Flashing	Flashes if multiple terminators are set.
	Unlit	Turns OFF if one and only one terminator is found.

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SR Area



Location of error	Bit 15 to 8	Meaning	Bit 7 to 4	Meaning
Remote I/O Master Unit or Remote I/O Slave Unit	B0 Hex to B7 Hex	The digit on the right (0 to 7) indicates the mounting order of the Master of the Remote I/O Subsystem involved.	0 to 7 (BCD)	Indicate error in Remote I/O Slave Unit with unit numbers #0 to #7. (C2000: #0 and #1 only.)
			8 (BCD)	Indicates error in the Remote I/O Master Unit.
Remote Terminal	00 (BCD) to 31 (BCD)	Indicates the word address setting for the Remote Terminal.	0, 1 (BCD)	Remote Terminal on Remote I/O Subsystem of Master with word multiplier 0.
			2, 3 (BCD)	Remote Terminal on Remote I/O Subsystem of Master with word multiplier 1.
			4, 5 (BCD)	Remote Terminal on Remote I/O Subsystem of Master with word multiplier 2.
			6, 7 (BCD)	Remote Terminal on Remote I/O Subsystem of Master with word multiplier 3.

Error Check Bit

If there are errors in more than one Slave or multiple terminators have been set, data for the Units can be accessed in order by turning this bit ON and OFF.

Remote I/O Error Flag

This flag indicates that an error has occurred in a Remote I/O Slave Unit or a Remote Terminal. It also turns ON where there is more than one terminator set.

Summary

Multiple terminators are detected as follows:

- The “END RS CHK” indicator on the Remote I/O Master (RM) Unit flashes.
- Turn SR 25100 ON and OFF to read the terminators in order.

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CVM1/CV

Display

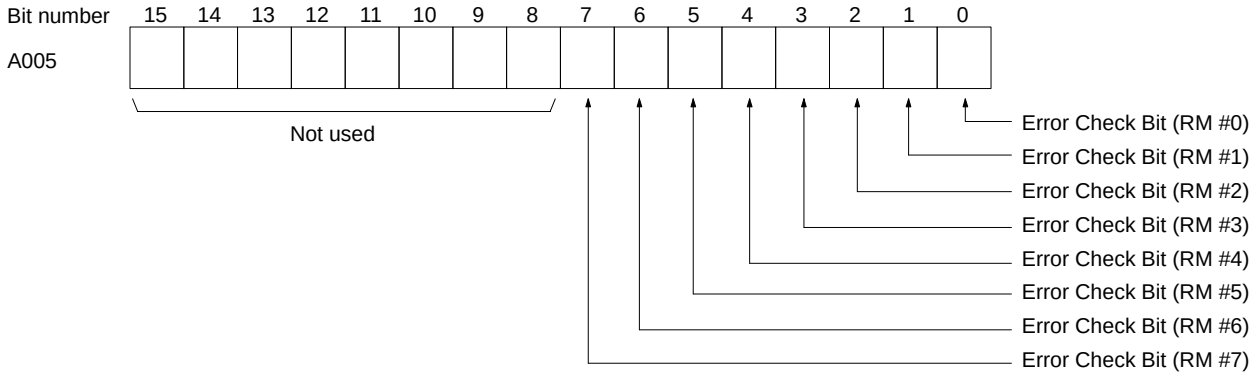
CPU Unit

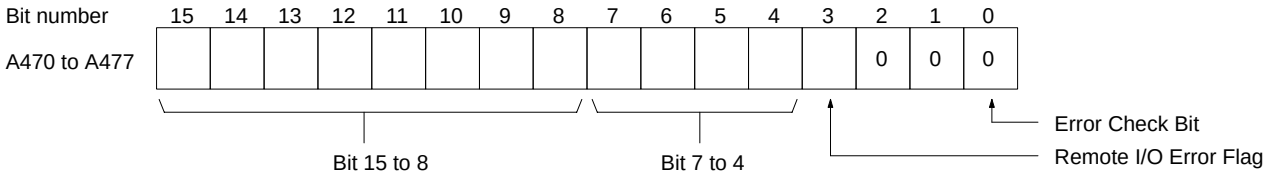
Remote I/O errors are not indicated at the CPU Unit.

Master Unit

Display		Function
END RS CHK (Terminator check)	Lit	Lit until a terminator is found.
	Flashing	Flashes if multiple terminators are set.
	Unlit	Turns OFF if one and only one terminator is found.

Auxiliary Area





Location of error	Bit 15 to 8	Meaning	Bit 7 to 4	Meaning
Remote I/O Master Unit or Remote I/O Slave Unit	B0 Hex to B7 Hex	The digit on the right (0 to 7) indicates the mounting order of the Master of the Remote I/O Subsystem involved.	0 to 7 (BCD)	Indicate error in Remote I/O Slave Unit with unit numbers #0 to #7.
			8 (BCD)	Indicates error in the Remote I/O Master Unit.
Optical I/O Unit	00 (BCD) to 31 (BCD)	Indicates the address of the Optical I/O Unit where the error has occurred.	0 (BCD)	Indicates an even word.
			1 (BCD)	Indicates an odd word.
I/O Link Unit or Remote Terminal	00 (BCD) to 31 (BCD)	Indicates the address of the I/O Link Unit or Remote Terminal where the error has occurred.	---	

Error Check Bit

If there are errors in more than one Slave, or multiple terminators have been set, data for the Units can be accessed in order by turning these bits ON (after the data is read, the bit automatically turns OFF). Bits A00500 to A00507 correspond to Masters #0 to #7.

Remote I/O Error Flag

This flag indicates that an error has occurred in a Remote I/O Slave Unit, an I/O Link Unit, or a Remote Terminal. It also turns ON where there is more than one terminator set.

Summary

Multiple terminators are detected as follows:

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- The “END RS CHK” indicator on the Remote I/O Master (RM) Unit flashes.
- By turning ON A00500 to A00507, the terminators can be read in order.

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C200H/C200HS/C200HX/C200HG/C200HE(-Z)

Display

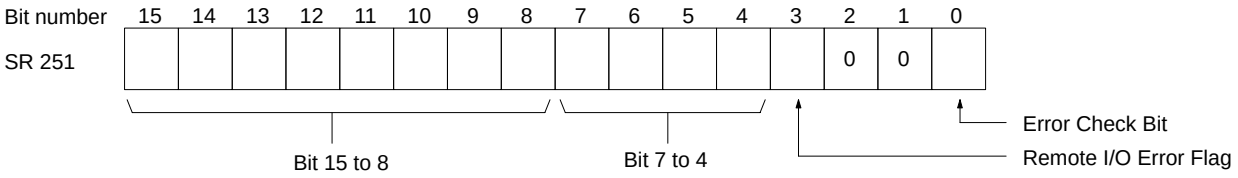
CPU Unit

Remote I/O errors are not indicated at the CPU Unit.

Master Unit

Display		Function
END RS (Terminator check)	Lit	Lit until a terminator is found.
	Flashing	Flashes if multiple terminators are set.
	Unlit	Turns OFF if one and only one terminator is found.

SR Area



Location of error	Bit 15 to 8	Meaning	Bit 7 to 4	Meaning
Remote I/O Slave Unit	B0 Hex to B1 Hex	The digit on the right indicates the unit number of the Remote I/O Master Unit (#0 or #1).	0 to 4 (BCD)	Indicates the unit number of the Remote I/O Slave Unit.
Remote Terminal	00 (BCD) to 31 (BCD)	Indicates the word address setting for the Remote Terminal.	0, 1 (BCD)	Either 0 or 1 indicates error in Remote Terminal.

Error Check Bit

If there are errors in more than one Slave, or multiple terminators have been set, data for the Units can be accessed in order by turning this bit OFF and ON.

Remote I/O Error Flag

This flag indicates that an error has occurred in a Remote I/O Slave Unit or a Remote Terminal. It also turns ON where there is more than one terminator set.

Summary

Multiple terminators are detected as follows:

- The “END RS” indicator on the Remote I/O Master (RM) Unit flashes.
- By turning SR 25100 ON and OFF, the terminators can be read in order.

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Appendix A
Standard Models

Masters and Slaves

Name	Specifications	Model Number
C500 Master	All but C200H PCs	C500-RM201
C500 Slave	---	C500-RT201
C200H Master	C200H PCs only 100/120 or 200/240 VAC (switchable) 50/60 Hz	C200H-RM201
C200H Slave	100 to 120V/200 to 240 VAC (switchable) 50/60 Hz	C200H-RT201
	24 VDC	C200H-RT202
C500H Slave Backplane	Can only be used for Slave Racks	C500-BL061
		C500-BL041

Remote Interfaces, I/O Blocks, and Remote Terminals

Name	Specifications		Model number
Remote Interface	Specify 12 VDC or 24 VDC	Input	G71-IC16
		Output	G71-OD16
I/O Block	Specify 12 VDC or 24 VDC	DC input	G7TC-ID16
	Specify 100 VAC or 200 VAC	AC input	G7TC-IA16
	Specify 12 VDC or 24 VDC.	Relay output	G7TC-OC16
Remote Terminal	Specify 12 VDC or 24 VDC	Transistor input	G72C-ID16
		Transistor output	G72C-OD16

Note See *Section 3* for details on pairing Remote Terminals and I/O Blocks.

DIN Rail and Other Accessories

Name	Specifications	Model Number
DIN Rail	Length: 50 cm, Height: 7.3 mm	PFP-50N
	Length: 1 m, Height: 7.3 mm	PFP-100N
	Length: 1 m, Height: 16 mm	PFP-100N2
End Plate	---	PFP-M
Spacer	---	PFP-S
Shorting Plate	To connect 4 terminals	G78-04
I/O Relays (replacements)	Input Designate 12 VDC, 24 VDC, 100 VAC, or 200 VAC.	G7T-1122S
	Output Designate 12 VDC or 24 VDC.	G7T-1112S

Link Adapters

Name	Specifications	Model Number
Link Adapter	Optical (APF/PCF) one connector, RS-485 one connector For Wired Remote I/O Units only, used in pairs	B500-AL007-P

Remote I/O Unit Connecting Cable

The user can purchase the following recommended RS-485 cable from an independent source.

Remote I/O Unit connecting cable	RS-485	VCTF 2-conductor x 0.75 mm (JIS)

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All Plastic Optical Fiber Cable

Model numbers with the suffix -P can be connected to up to 20 m of APF cable.

Product	Specifications	Model Number
Plastic optical fiber cable	Cable only (w/o connector) Order in multiples of 5 m from 5 to 100 m, or in lengths of 200 m or 500 m	3G5A2-PF002
Optical connector A	2 optical connectors (brown) For plastic optical fiber cable 10 m long or shorter	3G5A2-CO001
Optical connector B	2 optical connectors (black) For plastic optical fiber cable 8 to 20 m long	3G5A2-CO002
Plastic optical fiber set	1 m cable with connector A attached to both ends	3G5A2-PF101
Optical connector puller		3G5A2-TL001

Plastic-Clad Optical Fiber Cable

Model numbers with the suffix -P can be connected to up to 200 m of PCF cable.

Product	Description		Model Number
Optical fiber cable (indoor)	0.1 m, w/ connector	Operating temperature –10° to 70° C	3G5A2-OF011
	1 m, w/ connector		3G5A2-OF101
	2 m, w/ connector		3G5A2-OF201
	3 m, w/ connector		3G5A2-OF301
	5 m, w/ connector		3G5A2-OF501
	10 m, w/ connector		3G5A2-OF111
	20 m, w/ connector		3G5A2-OF211
	30 m, w/ connector		3G5A2-OF311
	40 m, w/ connector		3G5A2-OF411
	50 m, w/ connector		3G5A2-OF511
Optical fiber cable (indoor/outdoor)	1 to 500 m, w/ connector (order in multiples of 1 m)	Operating temperature –10° to 70° C	3G5A2-OF002
	501 to 800 m, w/ connector (order in multiples of 1 m)	Operating temperature 0° to 55° C (Do not expose to direct sunlight.)	

Note Since optical fiber cable cannot be spliced as easily as ordinary cables when cut or extended, be sure to order an adequate length. The cable length does not include connectors.

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Appendix B
Specifications

General Ratings

Conform to C-series ratings.

Characteristics

Common Characteristics

Communication	Two-line, half-duplex
Synchronization	Start-stop
Transmission lines	2-conductor (VCTF 0.75 mm recommended.)
Interface	RS-485
Transmission speed	187.5 kbps
Transmission distance	200 m (total length per Master)

C500 Remote I/O Master Unit (C500-RM201)

Power consumption	300 mA max. at 5 V
Weight	500 g max.
Diagnostic functions	Transmission error checks BCC and reversed transmission verification CPU Unit error monitoring Transmission line short check

C500 Remote I/O Slave Unit (C500-RT201)

Power consumption	500 mA max. at 5 V
Weight	500 g max.
RUN Output	OMRON G6B relay (closed during operation) Contact capacity: 2 A max. at 250 VAC or 24 VDC (cos ϕ = 1)
Diagnostic functions	Transmission error checks BCC and reversed transmission verification CPU Unit error monitoring

C200H Remote I/O Master Unit (C200H-RM201)

Power consumption	200 mA max. at 5 V
Weight	350 g max.
Diagnostic functions	Transmission error checks CPU Unit error monitoring Transmission line short check

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C200H Remote I/O Slave Units

---	**C200H-RT201**	**C200H-RT202**
Power supply voltage	100/110 or 200/240 VAC (switchable) 50/60 Hz	24 VDC
Allowable fluctuations in supply voltage.	85 to 132 or 170 to 264 VAC	20.4 to 26.4 VDC
DC output terminal	24 VDC +10%/–20%, 0.3 A max.	None
Power consumption	100 VA max.	80 W max.
Weight	1.3 kg max.	1.3 kg max.
RUN Output	Closed during operation Contact capacity: 2 A max. at 250 VAC (cos ϕ = 1) 0.5 A max. at 250 VAC (cos ϕ = 0.4) 2 A max. at 24 VDC	
Power output capacity	3 A max. at 5 VDC (actual output to I/O Units: 2.7 A max.)	
Number of transmission words	10 per Slave	

Remote Terminals

Power consumption**	200 mA input/500 mA output max. at 24 VDC 250 mA input/800 mA output max. at 12 VDC
Weight	250 g max.
RUN Output	G6B relay (closed during operation) Contact capacity: 2 A max. at 250 VAC or 24 VDC (cos ϕ = 1)
Diagnostic functions	Transmission error checks BCC and reversed transmission verification CPU Unit error monitoring

**Power consumption is given with all Remote Terminal and I/O Block points ON.

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Remote Terminals

G72C-ID16 (Input)

Rated input voltage	24 VDC	12 VDC
Rated input current	9.7 mA/point	10.9 mA/point
ON voltage	15 VDC min.	8 VDC min.
OFF voltage	5.6 VDC max.	3.5 VDC max.
ON response time	1.5 ms max.	
OFF response time	1.5 ms max.	
Number of circuits	16 points/common	
Insulation method	Photocoupler insulation	
Input indicator	LED indicator (green)	
RUN output	G6B 1a contact relay (closed during operation) Contact capacity: 2 A max. at 250 VAC or 24 VDC (cos ϕ =1)	
Diagnostic functions	Transmission error checks BCC and reversed transmission verification CPU Unit error monitoring	
Power consumption	200 mA max.	300 mA max.
Weight	400 g max.	

G72C-OD16 (Output)

Rated output voltage	24 VDC	12 VDC
Rated output current	0.3A/point, 2.4 A/Unit	
Residual voltage	1.2 V max.	
Leakage current	100 µA max.	
Number of circuits	16 points/common	
Insulation method	Photocoupler insulation	
Output indicator	LED indicator (green)	
RUN Output	G6G 1a contact relay (closed during operation) Contact capacity: 2A max. at 250 VAC or 24 VDC (cos ϕ =1)	
Diagnostic functions	Transmission error checks (BCC and reversed transmission verification) CPU Unit error monitoring	
Power consumption	200 mA max.	300 mA max.
Weight	400 g max.	

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I/O Blocks

---	**G7TC-ID16 or G7TC-IA16**		**G7TC-OC16**	
Load	Resistive (cos ϕ = 1)	Inductive (cos ϕ = 0.4, L/R = 7 ms)	Resistive (cos ϕ = 1)	Inductive (cos ϕ = 0.4, L/R = 7 ms)
Rated load	1 A, 24 VDC	0.5 A, 24 VDC	5 A, 24 VDC 5 A, 220 VAC	2 A, 24 VDC 1 A, 220VAC
Rated current flow	1 A		5 A	
Max. contact voltage	250 VAC, 125 VDC			
Max. contact current	1 A	0.5 A	5 A	2 A
Max. activation capacity	24 W (DC)	12 W (DC)	120 W (DC) 440 VA (AC)	48 W (DC) 220 VA (AC)
Min. load (Preference value)	1 V, 100 mA		5 V, 100 mA	
Electrical life	10 million operations at 5 mA; 50,000 at 1 A	2.5 million operations at 10 mA; 20,000 at 1 A	1 million operations	1 million operations
Mechanical life	1 million operations			
Ambient temp. range	–0° to 55°C			
Ambient humidity range	35% to 85%			
Weight	800 g max.			

Relay Coils

Rated voltage	100/110 VAC	200/220 VAC	12 VDC	24 VDC
Rated current (mA)	50 Hz: 8.2 60 Hz: 7	50 Hz: 4.1 60 Hz: 3.5	42	21
Coil resistance (L)	8,700	33,300	290	1,150
Operating voltage	80% max.	80% max.	80% max.	80% max.
Reset voltage	30% min.	30% min.	10% min.	10% min.
Max. allowable voltage	110%	110&	110%	110%
Power consumption **Per contact:**	0.7 VA	0.7 VA	0.5 W	0.5 W
16 contacts:	11 VA	11 VA	approx. 8 W	approx. 8 W

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Appendix C
When Using CS1-series PCs

Overview

With CS1-series PCs, Slaves are connected to the PC using a C200H-RM201 SYSMAC BUS Wired Remote I/O Master Unit (2-wire). Words in the SYSMAC BUS Area or the I/O Terminal Area are allocated for inputs and outputs.

Differences in Memory Areas

When using CS1-series PCs, the following areas are affected by differences in memory allocation. (Details given in *Data Configuration* below.)

- SYSMAC BUS Area
- I/O Terminal Area

Data Configuration

SYSMAC BUS Area (Slave Rack Allocation)

CIO 3000 to CIO 3049 are allocated to C200H Remote I/O Slave Units based on their unit number settings (0 to 4) in 10-word blocks. From each 10-word block, 16 bits are allocated to each slot (even if the slot is not used) of the Slave Rack starting from the left (the slot farthest from the Slave Unit).

Note 1. The words are allocated according to unit numbers even when two Master Units are being used.

2. If C500 Remote I/O Slave Racks (C500-RT201) are used, the word allocation for each Slave Rack will be twice (i.e., 20 words) that of C200H Slaves. Unit numbers #0 to #3 can be set (although consecutive unit numbers cannot be set.)

Unit number of Slave Unit	CS1	C200H/HX/HG/HE/HS
0	CIO 3000 to CIO 3009	IR 050 to IR 059
1	CIO 3010 to CIO 3019	IR 060 to IR 069
2	CIO 3020 to CIO 3029	IR 070 to IR 079
3	CIO 3030 to CIO 3039	IR 080 to IR 089
4	CIO 3040 to CIO 3049	IR 090 to IR 099

I/O Terminal Area (Allocation for Slaves Other than Slave Racks)

Each Slave is allocated 1 word based on its unit number setting (0 to 31) except for Optical I/O Units, which are allocated 2 words each.

Note The words are allocated according to unit numbers even when two Master Units are being used.

Unit number	CS1	C200H/HX/HG/HE/HS
0	CIO 3100	IR 200
1	CIO 3101	IR 201
to	to	to
31	CIO 3131	IR 231

Note When using two Masters, ensure that the word allocations do not overlap.

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Auxiliary Area

Name	CS1	Description	Corresponding bits in C200H/HX/HG/HE/HS
SYSMAC BUS Error Flag (Non-fatal error)	A40205	On when a transmission error occurs in a data transfer in the SYSMAC BUS system. The number of the Master involved is indicated with bits A40500 and A40501.	SR 25312
SYSMAC BUS Master Error Flags	A40500 to A40501	When an error occurs in the SYSMAC BUS system, the flag for the affected Master Unit will be turned ON. A40500: Flag for Master Unit #0 A40501: Flag for Master Unit #0	SR 25104 to SR 25115
Slave Number of SYSMAC BUS Error After Startup	A42504 to A42506	When there is an error in a Slave Rack, these bits contain the slave's unit number.	AR 0200 to AR 0204 correspond to unit numbers #0 to #4.
	A42504 only	When there is an error in an Optical I/O Unit (excluding Slave Racks), the status of A42504 (0 or 1) indicates whether the Unit is low or high.	SR 25103 Whether the Unit is low or high is indicated in AR 03 to AR 06.
	A42508 to A42515	When there is an error in a Slave Rack, this byte contains the 2-digit hexadecimal unit number of the Master to which the Slave is connected. (B0 Hex: Master Unit 0; B1 Hex: Master Unit 1)	AR 0015: Error in unit number #0 AR 0014: Error in unit number #1
		When there is an error in an Optical I/O Unit, this byte contains the 2-digit hexadecimal unit number. (00 to 1F hexadecimal, or 0 to 31 decimal)	AR 03 to AR 06: These flags turn ON when there is an error in the Unit with corresponding unit number and status (L/H).
SYSMAC BUS Slave Number Refresh Bit	A50900	Turn this bit ON to refresh the error information in A425 (unit number of Slave where error occurred after startup).	SR 25100

Allocations in the CIO Area

No CIO Area words are used.

Allocations in the DM Area

No DM Area words are used.

Hardware Setup

1, 2, 3...

1. Mount a Remote I/O Master Unit to a CS1 CPU Rack, a C200H I/O Expansion Rack, or a CS1 Expansion Rack (not a SYSMAC BUS Remote I/O Slave Rack). Up to two Masters can be mounted for a basic system. (There are no restrictions on the mounting position.)
2. Set the unit number of the Master using the unit number switch on the front, and set the CONTINUE/STOP switch as required.
3. Set the unit number, the Output HOLD/STOP Mode, and the type of master for each of the Slave Units.
4. Set the unit numbers for Slaves other than Slave Units.
5. Perform connections using 2-conductor cable.
6. Set the terminator.
7. Connect a Programming Device to the PC.

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8. Turn ON power for all of the Slaves.
9. Turn ON power for the PC.
10. Create the I/O tables.

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Glossary

Backplane	A base to which Units are mounted to form a Rack. Backplanes provide a series of connectors for these Units along with wiring to connect them to the CPU Unit. Backplanes also provide connectors used to connect them to other Backplanes. In some Systems, different Backplanes are used for different Racks; in other Systems, Racks differ only by the Units mounted to them.
basic Link System	A control system that includes only one of the following systems: Remote I/O System, PC Link System, Host Link System, or Net Link System.
branch line	A communications line leading from a Link Adapter to any but the terminators in a Link System.
Branching Link Adapter	A Link Adapter used to branch connections to Units in a Link System. Used either to prevent the entire System from shutting down for an interruption at only one point in the System or to enable connecting more than two Units in one System when each Unit supports only one connector.
building-block PC	A PC that is constructed from individual components, or “building blocks.” With building-block PCs, there is no one Unit that is independently identifiable as a PC. The PC is rather a functional assembly of components.
combined Link System	A control system that includes more than one of the following systems: Remote I/O System, PC Link System, Host Link System, or Net Link System.
Control System	All of the hardware and software components used to control other devices. A Control System includes the PC System, the PC programs, and all I/O devices that are used to control or obtain feedback from the controlled system.
controlled system	The devices that are being controlled by a PC System.
Converting Link Adapter	A Link Adapter used to convert between different types of optical fiber cable, different types of wire cable, or between optical fiber cable and wire cable. Such conversion is necessary to connect Units that use different forms of communication.
CPU Unit	An acronym for central processing unit. In a PC System, the CPU Unit executes the program, processes I/O signals, communicates with external devices, etc.
CPU Backplane	A Backplane used to create a CPU Rack.
CPU Rack	Part of a building-block PC, the CPU Rack contains the CPU Unit, a Power Supply, and other Units. With most PCs, the CPU Rack is the only Rack that provides linkable slots.
data area	An area in the PC’s memory that is designed to hold a specific type of data, e.g., the LR area is designed for to hold common data in a PC Link System.
distributed control	A automation concept in which control of each portion of an automated system is located near the devices actually being control, i.e., control is decentralized and ‘distributed’ over the system. Distributed control is a concept basic to PC Systems.

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electrical noise Electrical ‘static’ that can disturb electronic communications. The ‘snow’ that can appear on a TV screen is an example of the effects of electrical noise.

Expansion I/O Backplane A Backplane used to create an Expansion I/O Rack.

Expansion I/O Rack Part of a building-block PC, an Expansion I/O Rack is connected to either a CPU Rack or Slave Rack to increase the number of slots available for mounting Units.

I/O Block Either an Input Block or an Output Block. It provides mounting positions for replaceable relays.

I/O capacity The number of inputs and outputs that a PC is able to handle. This number ranges from around one-hundred for smaller PCs to two-thousand for the largest ones.

I/O Control Unit A Unit mounted to the CPU Rack in certain PCs to monitor and control I/O points on Expansion I/O Units.

I/O devices The devices to which terminals on I/O Units, Special I/O Units, or Intelligent I/O Units are connected. I/O devices may be either part of the Control System, if they function to help control other devices, or they may be part of the controlled system.

I/O Interface Unit A Unit mounted to an Expansion I/O Rack in certain PCs to interface the Expansion I/O Rack to the CPU Rack.

I/O Link Created in an Optical Remote I/O System to enable input/output of one or two IR words directly between PCs. The words are input/output between the PC controlling the Master and a PC connected to the Remote I/O System through an I/O Link Unit or an I/O Link Rack.

I/O Link Rack A Rack used with certain PCs (e.g., C120) to mount an I/O Link Unit.

I/O Link Unit A Unit used with certain PCs to create an I/O Link in an Optical Remote I/O System.

I/O point The place at which an input signal enters the PC System or an output signal leaves the PC System. In physical terms, an I/O point corresponds to terminals or connector pins on a Unit; in terms of programming, an I/O point corresponds to an I/O bit in the IR area.

I/O Unit The most basic type of Unit mounted to a backplane to create a Rack. I/O Units include Input Units and Output Units, each of which is available in a range of specifications. I/O Units do not include Special I/O Units, Link Units, etc.

Input Block A Unit used in combination with a Modular Remote Terminal. An Input Block provides mounting positions for replaceable relays. Each relay can be selected according to specific input requirements.

Input Remote Terminal A Remote Terminal that provides input points.

Link Adapter A Unit used to connect communications lines, either to branch the lines or to convert between different types of cable. There are two types of Link Adapter: Branching Link Adapters and Converting Link Adapters.

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link	A hardware or software connection formed between two Units. “Link” can refer either to a part of the physical connection between two Units (e.g., optical links in Wired Remote I/O Systems) or a software connection created to data existing at another location (Network Data Links).
linkable slot	A slot on either a CPU or Expansion I/O Backplane to which a Link Unit can be mounted. Backplanes differ in the slots to which Link Units can be mounted.
Link System	A system that includes one or more of the following systems: Remote I/O System, PC Link System, Host Link System, or Net Link System.
Link Unit	Any of the Units used to connect a PC to a Link System. These are Remote I/O Units, I/O Link Units, PC Link Units, Host Link Units, and Net Link Units.
main line	n a Link System connected through Branching Link Adapters, the communications cable that runs from the Unit at each end of the System through the Link Adapters.
Master	Short for Remote I/O Master Unit.
noise interference	Disturbances in signals caused by electrical noise.
Optical Slave Rack	A Slave Rack connected through an Optical Remote I/O Slave Unit.
Optical I/O Unit	A Unit that is connected in an Optical Remote I/O System to provide 8 I/O points. Optical I/O Units are not mounted to a Rack.
optical cable link	In a Wired Remote I/O System, an optical cable connecting two Converting Link Adapters. Specified because the System otherwise uses wire communications.
optical communications	A communications method in which signals are sent over optical fiber cable to prevent noise interference and increase transmission distance.
optical fiber cable	Cable made from light conducting filaments used to transmit signals.
Output Block	A Unit used in combination with a Modular Remote Terminal. An Output Block provides mounting positions for replaceable relays. Each relay can be selected according to specific output requirements.
Output Remote Terminal	A Remote Terminal that provides output points.
PC	An acronym for Programmable Controller.
PC System	With building-block PCs, all of the Racks and independent Units connected directly to them up to, but not including the I/O devices. The limits of the PC System on the upper end is the PC and the program in its CPU Unit and on the lower end, I/O Units, Special I/O Units, Optical I/O Units, Remote Terminals, etc.
peripheral device	Devices connected to a PC System to aid in system operation. Peripheral devices include printers, programming devices, external storage media, etc.
printed circuit board	A board onto which electrical circuits are printed for mounting into a computer or electrical device.

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Programmable Controller — A computerized device that can accept inputs from external devices and generate outputs to external devices according to a program held in memory. Programmable Controllers are used to automate control of external devices. Although single-unit Programmable Controllers are available, building-block Programmable Controllers are constructed from separate components. Such Programmable Controllers are formed only when enough of these separate components are assembled to form a functional assembly, i.e., there is no one individual Unit called a PC.

programming device — A peripheral device used to input a program into a PC or to alter or monitor a program already held in the PC. There are dedicated programming devices, such as Programming Consoles, and there are non-dedicated devices, such as a host computer.

Rack — An assembly of various Units on a Backplane that forms a functional unit in a building-block PC System. Racks include CPU Racks, Expansion I/O Racks, I/O Racks, and Slave Racks.

relay-based control — The forerunner of PCs. In relay-based control, groups of relays are wired to each other to form control circuits. In a PC, these are replaced by programmable circuits.

Remote I/O Master Unit — The Unit in a Remote I/O System through which signals are sent to all other Remote I/O Units. The Remote I/O Master Unit is mounted either to a CPU Rack or an Expansion I/O Rack connected to the CPU Rack. Remote I/O Master Unit is generally abbreviated to simply “Master.”

Remote I/O Slave Unit — A Unit mounted to a Backplane to form a Slave Rack. Remote I/O Slave Unit is generally abbreviated to simply “Slave.”

Remote I/O Subsystem — A Master and all of the Remote I/O Units connected in series to it. A Remote I/O Subsystem exists when more than one Master is mounted to a PC. If Subsystems exist, the System is considered a Multilevel Remote I/O System.

Remote I/O System — A system in which remote I/O points are controlled through a Master mounted to a CPU Rack or an Expansion I/O Rack connected to the CPU Rack.

Remote I/O Unit — Any of the Units in a Remote I/O System. Remote I/O Units include Masters, Slaves, Optical I/O Units, I/O Link Units, and Remote Terminals.

Remote Terminal — A Remote I/O Unit connected in a Wired Remote I/O System to provide up to sixteen I/O points at one location. There are two types of Remote Terminals: G72C Remote Terminals which feature fixed transistor inputs and outputs and Remote Terminals constructed by combining a Remote Interface and I/O Block. I/O Blocks feature replaceable relays that can be individually changed to meet specific I/O requirements.

series — A wiring method in which Units are wired consecutively in a string. In Link Systems wired through Link Adapters, the Units are still functionally wired in series, even though Units are placed on branch lines.

Slave — Short for Remote I/O Slave Unit.

Slave Rack — A Rack containing a Remote I/O Slave Unit and controlled through a Remote I/O Master Unit. Slave Racks are generally located away from the CPU Rack.

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slot	A position on a Rack (Backplane) to which a Unit can be mounted.
Special I/O Unit	A dedicated Unit that is designed for a specific purpose. Special I/O Units include Position Control Units, High-Speed Counter Units, Analog I/O Units, etc.
switching capacity	The voltage/current that a relay can switch on and off.
system configuration	The arrangement in which Units in a System are connected.
transmission distance	The distance that a signal can be transmitted.
Unit	In OMRON PC terminology, the word Unit is capitalized to indicate any product sold for a PC System. Though most of the names of these products end with the word Unit, not all do, e.g., a Remote Terminal is referred to in a collective sense as a Unit. Context generally makes any limitations of this word clear.
unit number	A number assigned to some Link Units and Special I/O Units to assign words and sometimes other operating parameters to it.
wire communications	A communications method in which signals are sent over wire cable. Although noise resistance and transmission distance can sometimes be a problem with wire communications, they are still the cheapest and the most common, and perfectly adequate for many applications.
Wired Slave Rack	A Slave Rack connected through a Wired Remote I/O Slave Unit.
work word	A word that can be used for data calculation or other manipulation in programming, e.g., LR words not used in a PC Link or Net Link System.

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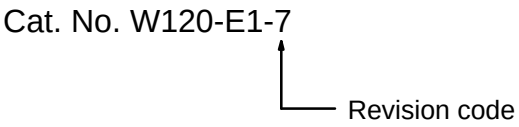
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Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
2	November 1989	Complete reorganization and rewrite. C200H Slave Backplanes added. I/O Terminals added. Minor additions to pages 70, 93, and 95.
4	September 1990	Definition of Remote Terminals changed. Minor additions to pages 70, 93, and 95.
4A	January 1995	**Pages 68, 69:** Minimum and maximum response times computations corrected. **Pages 16, 37:** Caution added.
5	July 1997	**Page 8:** CPU Rack models added to the diagram. **Page 9:** PC models added to the table in *Maximum Number of Connectable Remote I/O Units*. Note rewritten. **Page 23:** CPU Unit models added to the diagram. **Page 52:** Changes to *Terminator Selector* and *DIP Switch*. **Pages 57, 58:** Changes and additions made to the C200H Rack information. **Page 63:** C500 Slave location corrected in the bottom diagram. **Pages 65, 66:** Wiring precautions added.
6	June 1999	*Precautions* section added before Section 1. **Pages 16, 39:** Additional information related to CVM1/CV500/CV1000/CV2000 added to *Caution*. **Page 60:** *Power Supply Wiring Precautions* added to *5-1-5 Link Adapters*. **Page 65:** Terminal dimensions added. **Pages 77, 79:** Error messages corrected.
7	May 2000	Changes were made on the following pages. **Page 14:** Note added to “Mounting Locations.” **Pages 46, 51, 77, 79:** References added. **Pages 65, 66:** Minor changes to graphics. **Page 84:** Minor change to top paragraph. **Page 95:** Subsection on duplicated terminator settings added. *Appendix C* added.

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