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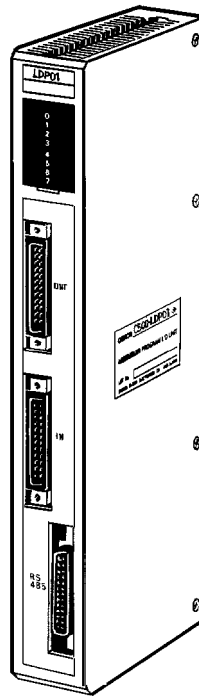
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



C500-LDP01-V1 Ladder Program I/O Unit

Operation Manual

Revised January 1992



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 warnings in this manual. Always heed the information provided with them.

Caution Indicates information that, if not heeded, could result in minor injury or damage to the product.

DANGER! Indicates information that, if not heeded, could result in loss of life or serious injury.

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 installation and operation of the C500-LD01-V1 Ladder Program I/O Unit and includes the sections described below.

Please read this manual completely and be sure you understand the information provide before attempting to install and operation the Ladder Program I/O Unit.

Section 1 introduces the Unit and describes its components and the way it fits into a PC system. A comparison of the C500-LD01-V1 and the C500-LD01 is also provided.

Section 2 provides information on switch settings and how certain switch settings affect indicator operation. These switch must be set before mounting and operating the Unit.

Section 3 describes the data areas available for use in programming the Unit.

Section 4 provides information related to programming and operating the Unit. A list of programming instructions is provided in *Appendix C Programming Instructions*. Details on programming can be found in the *C500 Operation Manual*.

Section 5 describes the scan of the Unit and how the operating mode affects it. It also describes scan time and I/O response time calculations and provides tables of instruction execution times.

Section 6 provides basic troubleshooting steps, error messages provided by the indicators, and the fuse replacement procedure.

SECTION 1

Introduction

This section introduces the main features and applications of the Ladder Program I/O Unit and describes how it relates to I/O devices and Programming Devices. It also provides a table that describes additions made to the V1 version of the Unit and provides the names and locations of the various parts of the Unit.

1-1	Features	2
1-2	System Configuration	2
1-3	Comparing the C500-LDP01 and the C500-LDP01-V1	3
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1-1 Features

The C500-LDP01-V1 Ladder Program I/O Unit executes a ladder program to control external I/O independently of the PC. The ladder program contained in the Unit is written by the user.

The C500-LDP01-V1 Ladder Program I/O Unit can be used with the following SYSMAC C-series PCs: C500, C1000H, C2000H.

Applications Examples

- External I/O can be controlled by the Ladder Program I/O Unit instead of the PC.
- The Ladder Program I/O Unit can be used as a timer.
- The Ladder Program I/O Unit can be used as a high-speed input unit.
- By controlling external inputs and outputs, the Ladder Program I/O Unit can reduce the processing load handled by the PC.

C500 Instructions

The Ladder Program I/O Unit uses the same instructions as the C500, so ladder programs can be constructed in the same way. A total of 49 different instructions is available. (Not all C500 instructions are supported.)

External I/O Points: 16 Input/16 Output

The 16 DC inputs and 16 transistor outputs can be connected to external I/O devices so the Unit can be used as for normal I/O operation. Of the 16 DC inputs, 8 inputs (2 groups of 4) can be set for high-speed inputs with a minimum pulse width of 0.5 ms, so inputs shorter than the scan time can be detected.

PC I/O Points: 16 Input and 16 Output

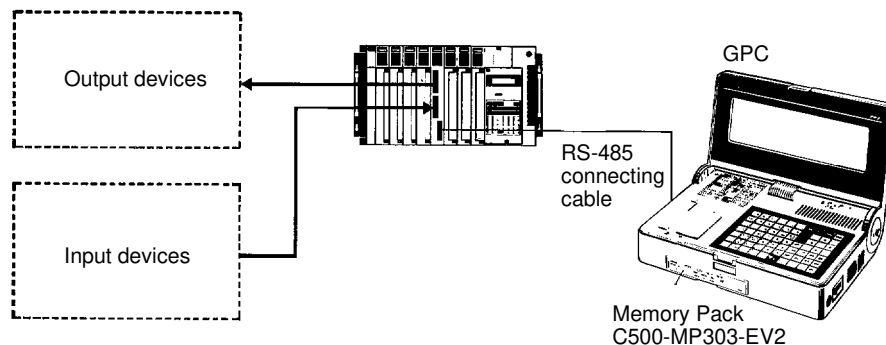
The Unit connects to the PC through 16 input points and 16 output points, so control signals can be passed back and forth between the PC and the Unit. Furthermore, when the I/O WRITE and I/O READ (WRIT(87)/READ(88)) instructions are executed in the PC program, up to 32 words of data can be transferred to or from the Unit.

Built-in Realtime Clock

A realtime clock is built into the Unit, so it can act as a timer and manage I/O timing.

1-2 System Configuration

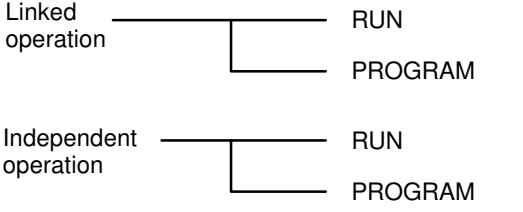
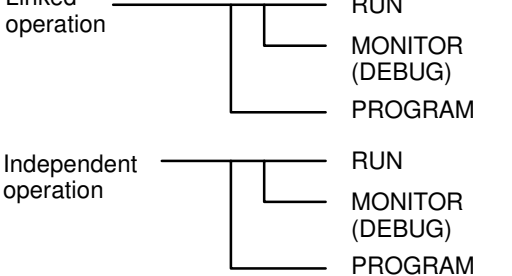
The following figure shows a typical system configuration:



The Unit can be programmed through the GPC with Memory Pack C500-MP303-EV2, through the FIT, or through LSS running on an IBM AT/XT compatible computer. Refer to *Appendix C Programming Instructions* for a list of instructions. Online operations between the Unit and the GPC/FIT/LSS are possible in PROGRAM or MONITOR mode. They are not possible in RUN mode.

1-3 Comparing the C500-LDP01 and the C500-LDP01-V1

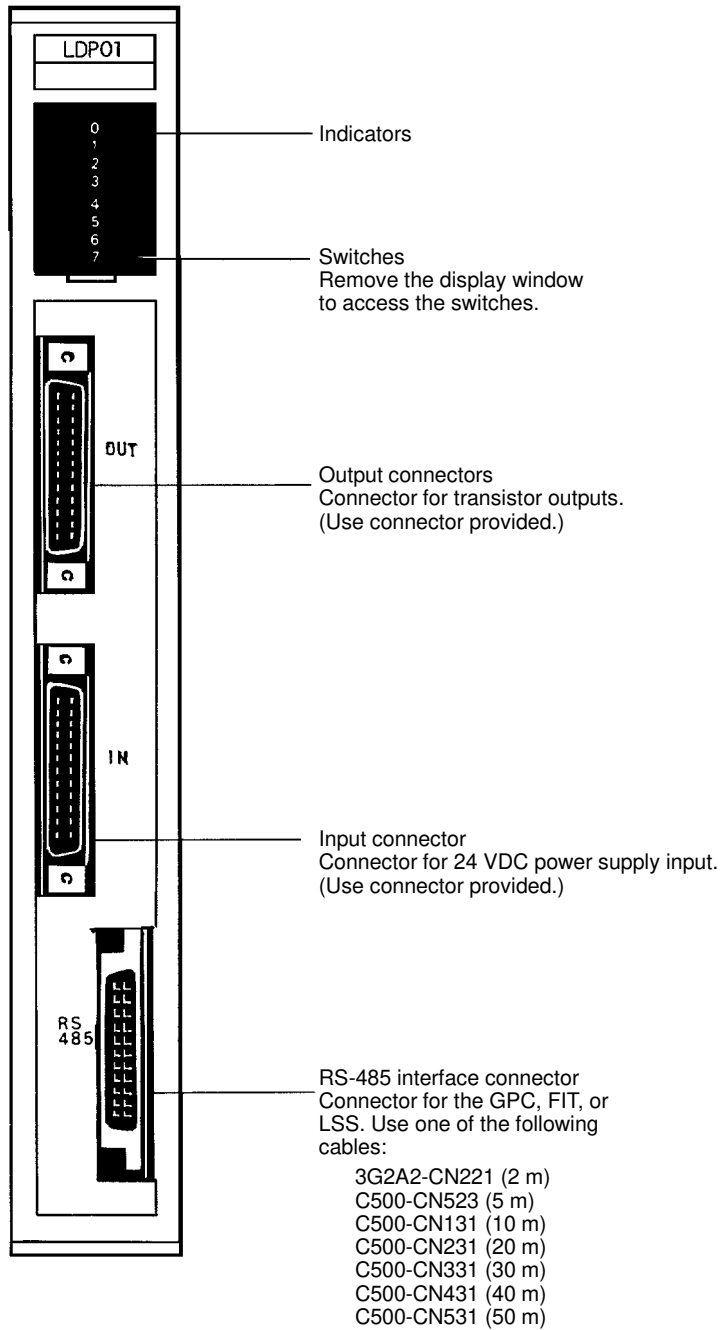
The following table shows the improvements that have been made to create the C500-LDP01-V1.

Item	C500-LDP01	C500-LDP01-V1
Instruction set	40 instructions	The following instructions were added to make a total of 49 instructions. ASL(25): ARITHMETIC SHIFT LEFT ASR(26): ARITHMETIC SHIFT RIGHT ROL(27): ROTATE LEFT ROR(28): ROTATE RIGHT COM(29): COMPLEMENT INC(38): INCREMENT DEC(39): DECREMENT SLD(74): ONE DIGIT SHIFT LEFT SRD(75): ONE DIGIT SHIFT RIGHT
Number of words allocated	2 words 16 PC output bits (0000 through 0015) 16 PC input bits (0100 through 0115) The PC cannot access the Unit using the I/O WRITE and the I/O READ (WRIT(87)/READ(88)) instructions.	2 words 16 PC output bits (0000 through 0015) 16 PC input bits (0100 through 0115) With the proper switch settings, the PC can control the Unit using the I/O WRITE and I/O READ (WRIT(87)/READ(88)) instructions. (Up to 32 words are written or read.)
Operating modes	 <p>The GPC/FIT/LSS* can operate with the Unit in PROGRAM mode only.</p>	 <p>The GPC/FIT/LSS* can operate with the Unit in either PROGRAM or MONITOR (debug) mode.</p>

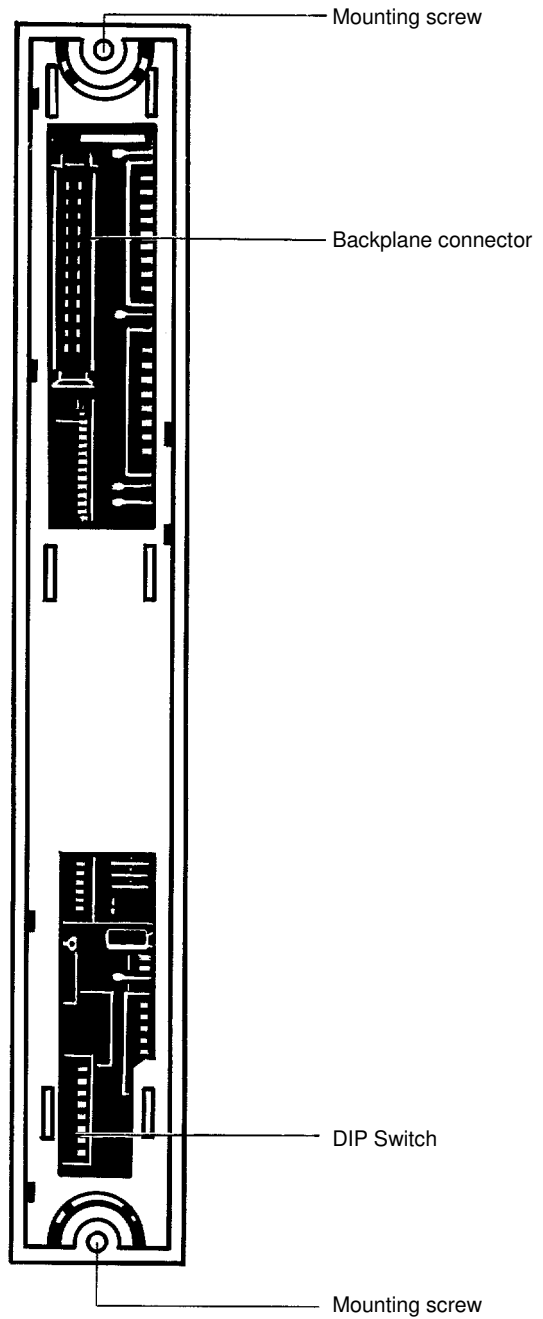
*GPC: Graphic Programming Console
 FIT: Factory Intelligent Terminal
 LSS: Ladder Support Software

1-4 Nomenclature

Front Panel



Back Panel



SECTION 2

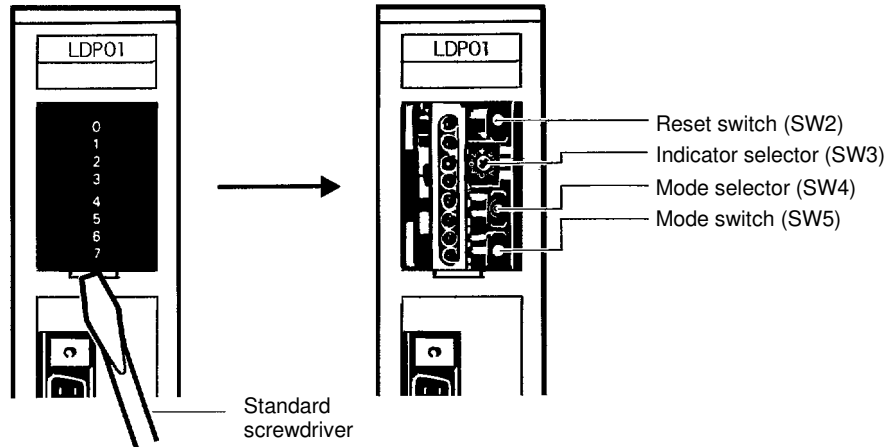
Preparations

This section describes the switch settings required prior to operation. The operation of Unit indicators, which are controlled by a switch setting, is also described.

2-1	Front Panel Switches and Selectors	6
2-2	Back Panel DIP Switch	11

2-1 Front Panel Switches and Selectors

Switch/Selector Location Remove the display window using a standard screwdriver to access the switches and selectors shown below.



Switch/Selector Functions

Switch No.	Designation	Function
SW 2	Reset switch	The Unit can be reset and restarted by pressing the reset switch. Note Resetting the Unit completely clears I/O bit status and data memory. If the back panel DIP switch is set for PC-linked operation, the Unit will enter RUN or PROGRAM mode after resetting, depending on the status of the PC. If the back panel DIP switch is set for independent operation, the Unit will enter RUN, MONITOR (debug), or PROGRAM mode, depending on the setting of SW4. The same process occurs when the power is turned on.
SW 3	Display selector	Select indicator operation with this selector. Refer to the following pages for details.
SW 4	Mode selector	Changing this selector followed by pressing and releasing SW5 will alter the operating mode as shown below. This switch also determines the mode entered when power is turned on or the Unit is reset. SW 4 set to up position RUN SW 4 set to center MONITOR (debug) SW 4 set to down position PROGRAM
SW 5	Mode switch	When this switch is pressed and released, the Unit will enter the mode set on SW4. The operation of this switch is enabled by turning on pin 5 of the back panel DIP switch, and disabled by turning off pin 5. The Unit cannot be switched to RUN or MONITOR mode when the program is being transferred from a Programming Device or an error has occurred.

Display Selector

Switching the display selector (SW3) alters the indicator operation as follows:

SW3	Description	Indicator	Function
0	Indicate operating mode	0	RUN Lit during operation. Not lit in PROGRAM mode.
		1	MONITOR (debug) Lit in MONITOR (debug) mode. Not lit in RUN or PROGRAM mode.
		2	PROGRAM Lit in PROGRAM mode. Not lit during operation.
		3	PC stop Lit while the PC is not in operation (either in PROGRAM mode or in case of error).
		4	Error Lit to indicate an error during operation. Refer to 6-1 Error Messages and Troubleshooting for details.
		5	High-speed input 1 is set. Lit when external input bits 0200 through 0203 are set for high-speed inputs (Pin 3 of the DIP switch is turned on).
		6	High-speed input 2 is set. Lit when external input bits 0204 through 0207 are set for high-speed inputs (Pin 4 of the DIP switch is turned on).
		7	Communicating Lit when the Unit is communicating with the GPC, FIT, or LSS.
1	Indicate the status of output bits 0000 to 0007	0	0000 Lit while corresponding output is ON.
		1	0001
		2	0002
		3	0003
		4	0004
		5	0005
		6	0006
		7	0007
2	Indicate the status of output bits 0008 to 0015	0	0008 Lit while corresponding output is ON.
		1	0009
		2	0010
		3	0011
		4	0012
		5	0013
		6	0014
		7	0015
3	Indicate the status of input bits 0100 to 0107	0	0100 Lit while corresponding input is ON.
		1	0101
		2	0102
		3	0103
		4	0104
		5	0105
		6	0106
		7	0107

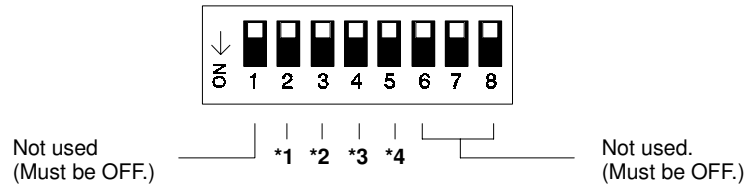
SW3	Description	Indicator	Function	
4	Indicate the status of input bits 0108 to 0115	0	0108	Lit while corresponding input is ON.
		1	0109	
		2	0110	
		3	0111	
		4	0112	
		5	0113	
		6	0114	
		7	0115	
5	Indicate the status of external input bits 0200 to 0207	0	0200	Lit while corresponding input is ON.
		1	0201	
		2	0202	
		3	0203	
		4	0204	
		5	0205	
		6	0206	
		7	0207	
6	Indicate the status of external input bits 0208 to 0215	0	0208	Lit while corresponding input is ON.
		1	0209	
		2	0210	
		3	0211	
		4	0212	
		5	0213	
		6	0214	
		7	0215	
7	Indicate the status of external output bits 0300 to 0307	0	0300	Lit while corresponding output is ON.
		1	0301	
		2	0302	
		3	0303	
		4	0304	
		5	0305	
		6	0306	
		7	0307	

SW3	Description	Indicator	Function	
8	Indicate the status of external output bits 0308 to 0315	0	0308	
		1	0309	
		2	0310	
		3	0311	
		4	0312	
		5	0313	
		6	0314	
		7	0315	
9	Indicate the year of the clock	0	8	$\times 10^1$
		1	4	
		2	2	
		3	1	
		4	8	$\times 10^0$
		5	4	
		6	2	
		7	1	
A	Indicate the month of the clock	0	---	
		1	---	
		2	---	
		3	1	$\times 10^1$
		4	8	
		5	4	$\times 10^0$
		6	2	
		7	1	
B	Indicate the date of the clock	0	---	
		1	---	
		2	2	$\times 10^1$
		3	1	
		4	8	$\times 10^0$
		5	4	
		6	2	
		7	1	

SW3	Description	Indicator	Function	
C	Indicate the hour of the clock	0	----	
		1	----	
		2	2	x 10 ¹
		3	1	
		4	8	x 10 ⁰
		5	4	
		6	2	
		7	1	
D	Indicate the minutes of the clock	0	----	
		1	4	x 10 ¹
		2	2	
		3	1	
		4	8	x 10 ⁰
		5	4	
		6	2	
		7	1	
E	Indicate the seconds of the clock	0	----	
		1	4	x 10 ¹
		2	2	
		3	1	
		4	8	x 10 ⁰
		5	4	
		6	2	
		7	1	
F	Indicate the day of the week	0	----	
		1	----	
		2	----	
		3	----	
		4	----	
		5	4	x 10 ⁰
		6	2	
		7	1	
		Data: 00 to 23 (24-hour clock) Indicators 0 and 1 are always OFF.		
		Data: 00 to 59 (minutes) Indicator 0 is always OFF.		
		Data: 00 to 59 (seconds) Indicator 0 is always OFF.		
		Data: 00 to 06 Indicators 0 through 4 are always OFF. 00: Sunday; 01: Monday; 02: Tuesday; 03: Wednesday; 04: Thursday; 05: Friday; 06: Saturday		

2-2 Back Panel DIP Switch

The DIP switch on the back panel sets the operating conditions of the Unit. All pins are OFF at the time of delivery.



*1. PC Data Transfer

2	Function
OFF	Data transfer between the PC and this Unit is the same as that for a standard 16-point I/O Unit.
ON	Data transfer between the PC and this Unit is carried out automatically via the I/O WRITE and I/O READ (WRIT(87)/READ(88)) instructions.

*2. High-speed Inputs 1

3	Function
OFF	Sets external input bits 0200 to 0203 for standard inputs.
ON	Sets external input bits 0200 to 0203 for high-speed inputs. A pulse width of 0.5 ms or longer can be received.

*3. High-speed Inputs 2

4	Function
OFF	Sets external input bits 0204 to 0207 for standard inputs.
ON	Sets external input bits 0204 to 0207 for high-speed inputs. A pulse width of 0.5 ms or longer can be received.

*4. Independent Operation/Linked Operation

5	Function
OFF	Operates in the same mode as the PC when the PC is in RUN or PROGRAM mode, but won't enter MONITOR mode. The Unit will be in RUN mode if the PC is in MONITOR mode. Front panel switches 4 and 5 are disabled.
ON	Operating mode switched independently of PC operating mode. Switches 4 and 5 (front panel) determine operating mode.

- Note**
1. Refer to *Section 3 Data Areas* for information about PC data transfer.
 2. Refer to *Section 5 Program Execution Timing* for information about high-speed inputs 1 and 2.
 3. Refer to *Section 4 Programming* and *Appendix C Programming Instructions* for information about linked operation with the PC.

Caution If power is applied to the PC when pin 5 is OFF and the PC is set for RUN or MONITOR mode, the Ladder Program I/O Unit will automatically switch to RUN mode. If the Unit is communicating with the GPC, FIT, or LSS it will switch to RUN mode when the operation is completed.

SECTION 3

Data Areas

This section describes the data areas available for use in programming. The use of the I/O READ and I/O WRITE instructions are also described.

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3-1-1	Normal I/O Operation	15
3-1-2	Operation via WRIT(87)/READ(88)	16
3-2	Work Bits	17
3-3	SR (Special Relay) Area	18
3-4	TR (Temporary Relay) Bits	18
3-5	TC (Timer/Counter) Area	18
3-6	DM (Data Memory) Area	18

3-1 IR (Internal Relay) Area

Data	Word/bit address		
16 bits (0000 to 0015) Output bits as seen from the PC	IR 00		Input bits as seen from the Unit. Cannot be used as work bits. The use of these bits depends on the setting of pin 2 of the back panel DIP switch. Refer to following subsections for details.
	00	08	
	01	09	
	02	10	
	03	11	
	04	12	
	05	13	
	06	14	
16 bits (0100 to 0115) Input bits as seen from the PC	IR 01		Output bits as seen from the Unit. Cannot be used as work bits. The use of these bits depends on the setting of pin 2 of the back panel DIP switch. Refer to following subsections for details.
	00	08	
	01	09	
	02	10	
	03	11	
	04	12	
	05	13	
	06	14	
16 external input bits (0200 to 0215)	IR 02		Bits 0200 to 0207 can be set for high-speed inputs. Cannot be used as work bits.
	00	08	
	01	09	
	02	10	
	03	11	
	04	12	
	05	13	
	06	14	
16 external output bits (0300 to 0315)	IR 03		Cannot be used as work bits.
	00	08	
	01	09	
	02	10	
	03	11	
	04	12	
	05	13	
	06	14	

3-1-1 Normal I/O Operation

When pin 2 of the back panel DIP switch is OFF, data is transferred through 2 words allocated for I/O. If pin 2 is OFF, data cannot be not transferred to and from the Ladder Program I/O Unit using the I/O WRITE and I/O READ (WRIT(87)/READ(88)) instructions from the PC.

The output bit data in PC word n (the first word allocated to the Unit by the PC) is input to word 00 in the Ladder Program I/O Unit. The bits of word 00 are treated as input bits when programming the Ladder Program I/O Unit.

The input bit data in PC word n+1 is output from word 01 in the Ladder Program I/O Unit. The bits of word 01 are treated as output bits when programming the Ladder Program I/O Unit.

PC Word Allocation			Unit Word Allocation		
Bit No.	IR n	IR n+1	Bit No.	Word 00	Word 01
	Output	Input		Input	Output
00	Output bit 00	Input bit 00	00	Input bit 00	Output bit 00
01	Output bit 01	Input bit 01	01	Input bit 01	Output bit 01
02	Output bit 02	Input bit 02	02	Input bit 02	Output bit 02
03	Output bit 03	Input bit 03	03	Input bit 03	Output bit 03
04	Output bit 04	Input bit 04	04	Input bit 04	Output bit 04
05	Output bit 05	Input bit 05	05	Input bit 05	Output bit 05
06	Output bit 06	Input bit 06	06	Input bit 06	Output bit 06
07	Output bit 07	Input bit 07	07	Input bit 07	Output bit 07
08	Output bit 08	Input bit 08	08	Input bit 08	Output bit 08
09	Output bit 09	Input bit 09	09	Input bit 09	Output bit 09
10	Output bit 10	Input bit 10	10	Input bit 10	Output bit 10
11	Output bit 11	Input bit 11	11	Input bit 11	Output bit 11
12	Output bit 12	Input bit 12	12	Input bit 12	Output bit 12
13	Output bit 13	Input bit 13	13	Input bit 13	Output bit 13
14	Output bit 14	Input bit 14	14	Input bit 14	Output bit 14
15	Output bit 15	Input bit 15	15	Input bit 15	Output bit 15

3-1-2 Operation via WRIT(87)/READ(88)

When pin 2 of the back panel DIP switch is ON, data can be transferred to and from the Ladder Program I/O Unit using the I/O WRITE and I/O READ (WRIT(87)/READ(88)) instructions from the PC. WRIT(87) and READ(88) are used automatically for this data transfer in the Ladder Program I/O Unit and are not available for user programming except in the PC. The Ladder Program I/O Unit must be mounted to the CPU Rack or Expansion I/O Rack of a PC that supports WRIT(87)/READ(88).

Data written by the WRIT(87) instruction in the PC program is stored in DM 064 through DM 095 in the Unit. A maximum of 32 words can be transferred. Data read by the READ(88) instruction in the PC is stored in DM 096 through DM 127. A maximum of 32 words of data can be read. The bits in parentheses are controlled automatically (as described below) when WRIT(87)/READ(88) are enabled. Treat these as read-only bits. The other input and output bits shown below can be used as normal I/O bits.

Do not output to word n with the MOV(21) instruction in the PC program. When outputting to word n, set the PC Busy, PC Write Completed, and PC Read Completed Flags to 0 (OFF). Also, do not output to word 01 with the MOV(21) instruction in the Ladder Program I/O Unit program. When outputting to word 01, set the I/O Busy, I/O Read End, I/O Write End, I/O Read OK, and I/O Write OK Flags to 0 (OFF).

Bit 0103 (the I/O Read OK Flag) is turned ON when data has been transferred correctly with the WRIT(87) instruction. It remains ON until the WRIT(87) instruction is executed again. Bit 0104 (the I/O Write OK Flag) is turned ON when data has been written from the Ladder Program I/O Unit. It is turned OFF when the READ(88) instruction is executed in the PC.

PC Word Allocation			Unit Word Allocation		
Bit No.	IR n	IR n+1	Bit No.	Word 00	Word 01
	Output	Input		Input	Output
00	(PC Busy)	(I/O Busy)	00	(PC Busy)	(I/O Busy)
01	(PC Write Complete)	(I/O Read End)	01	(PC Write Complete)	(I/O Read End)
02	(PC Read Complete)	(I/O Write End)	02	(PC Read Complete)	(I/O Write End)
03	Output bit 03	(I/O Read Ok)	03	Input bit 03	(I/O Read Ok)
04	Output bit 04	(I/O Write Ok)	04	Input bit 04	(I/O Write Ok)
05	Output bit 05	Input bit 05	05	Input bit 05	Output bit 05
06	Output bit 06	Input bit 06	06	Input bit 06	Output bit 06
07	Output bit 07	Input bit 07	07	Input bit 07	Output bit 07
08	Output bit 08	Input bit 08	08	Input bit 08	Output bit 08
09	Output bit 09	Input bit 09	09	Input bit 09	Output bit 09
10	Output bit 10	Input bit 10	10	Input bit 10	Output bit 10
11	Output bit 11	Input bit 11	11	Input bit 11	Output bit 11
12	Output bit 12	Input bit 12	12	Input bit 12	Output bit 12
13	Output bit 13	Input bit 13	13	Input bit 13	Output bit 13
14	Output bit 14	Input bit 14	14	Input bit 14	Output bit 14
15	Output bit 15	Input bit 15	15	Input bit 15	Output bit 15

3-2 Work Bits

Works bits are available for use in programming as required by the user. In the Ladder Program I/O Unit, work bits run from word 04 to word 12 and from bit 0400 to bit 1207, as shown below.

Word/bit address							
Word 04		Word 05		Word 06		Word 07	
00	08	00	08	00	08	00	08
01	09	01	09	01	09	01	09
02	10	02	10	02	10	02	10
03	11	03	11	03	11	03	11
04	12	04	12	04	12	04	12
05	13	05	13	05	13	05	13
06	14	06	14	06	14	06	14
07	15	07	15	07	15	07	15
Word 08		Word 09		Word 10		Word 11	
00	08	00	08	00	08	00	08
01	09	01	09	01	09	01	09
02	10	02	10	02	10	02	10
03	11	03	11	03	11	03	11
04	12	04	12	04	12	04	12
05	13	05	13	05	13	05	13
06	14	06	14	06	14	06	14
07	15	07	15	07	15	07	15
Word 12							
00	Not usable.						
01							
02							
03							
04							
05							
06							
07							

3-3 SR (Special Relay) Area

The following 16 bits are available for use in programming. Most of these are flags that can be read to determine program execution status or results. Bit 1304, the Carry Flag, is also manipulated by the user with STC(40) and CLC(41). Refer to descriptions of similar bits in the C500 Operation Manual for details.

Bit address	Description
1208	Always OFF
1209	Turns ON for scans over 100 ms
1210	Always OFF
1211	
1212	
1213	Always ON
1214	Always OFF
1215	Turns ON for one scan time at the beginning of operation.
1300	0.1 sec clock pulse
1301	0.2 sec clock pulse
1302	1.0 sec clock pulse
1303	Turns ON when the operational data is not BCD (ER flag).
1304	Turns ON if the operational result produces a carry (CY flag).
1305	Turns ON if the operational result is greater (GR flag).
1306	Turns ON if the operational result is equal to zero (EQ flag).
1307	Turns On if the operational result is less (LE flag).

3-4 TR (Temporary Relay) Bits

TR 0 through TR 7 can be used to store execution conditions at branches in ladder-diagram programs.

3-5 TC (Timer/Counter) Area

TC 00 through TC 15 can be used to define timers and counters in the program. Each TC number can be used only once to define a timer or counter.

3-6 DM (Data Memory) Area

The DM area contains 128 words between DM 000 and DM 127 and is used for storage of data by word. Although each word contains 16 bits, the DM area is accessible in word units only.

Clock data is assigned to DM 60 to 63; these words cannot be used for standard data. The clock can be set by writing data to these addresses in PROGRAM or MONITOR mode from a Programming Device or from the program. The clock is factory set to Sunday, January 1, year 00, 00:00:00. When power is applied, the clock starts at this time, and will continue timing for up to 10 days even if the power is cut off.

DM 064 through DM 127 are used for data transfer when pin 2 of the back panel DIP switch is turned ON (i.e., data transfer by the WRIT(87) and READ(88) instructions is enabled), and this region of the DM area cannot be used as normal DM words.

DM address							
000	016	032	048	064	080	096	112
001	017	033	049	065	081	097	113
002	018	034	050	066	082	098	114
003	019	035	051	067	083	099	115
004	020	036	052	068	084	100	116
005	021	037	053	069	085	101	117
006	022	038	054	070	086	102	118
007	023	039	055	071	087	103	119
008	024	040	056	072	088	104	120
009	025	041	057	073	089	105	121
010	026	042	058	074	090	106	122
011	027	043	059	075	091	107	123
012	028	044	060	076	092	108	124
013	029	045	061	077	093	109	125
014	030	046	062	078	094	110	126
015	031	047	063	079	095	111	127

DM 000	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
DM 001	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
...
DM 126	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
DM 127	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00

Data Configuration in DM 060 to DM 127

Word	Bits 8 to 15	Bits 0 to 7
DM 060	Minutes (0 to 59)	Seconds (0 to 59)
DM 061	Date (1 to 31)	Hour (0 to 23)
DM 062	Calendar year (last two digits: 00 to 99)	Month (1 to 12)
DM 063	---	Day of the week (Sunday [00] to Saturday [06])
DM 064 to DM 095	Back panel DIP switch pin 2 OFF: Used as normal DM words. Back panel DIP switch pin 2 ON: Used to store data transferred by the WRIT(87) instruction in the PC, and therefore cannot be used as normal DM words.	
DM 096 to DM 127	Back panel DIP switch pin 2 OFF: Used as normal DM words. Back panel DIP switch pin 2 ON: Used as normal DM words, but the data stored here will be read out by READ(88) in the PC.	

- Note**
1. If incorrect data is written to words DM 060 through DM 063, a clock data write error will occur, and indicator 3 will flash.
 2. DM 064 through DM 095, which contain the data written from the PC in the WRIT(87) instruction, should be read only and not written to from the program.

SECTION 4

Programming

This section describes the programming operations possible from the Programming Devices and the operating modes. Writing the program is basically the same as writing a program for the PC, except that the instruction set is a bit smaller and the data areas differ. Refer to the *C500 Operation Manual* for details on writing the program and to *Appendix C Programming Instructions* for the instruction set that can be used with the Unit.

4-1 Program Addresses and Memory Capacity

Instructions vary in length from 1 to 17 bytes. Since each instruction requires one address, the maximum number of addresses available in a program also varies. The instructions along with the corresponding number of bytes required for each are listed in *Appendix C Programming instructions*.

The memory capacity available for the program is 4K and hence the approximate maximum number of instructions which can be programmed is 524 (based on an average length of 8 bytes per instruction).

4-2 Operating Modes

Any one of three modes, RUN mode, MONITOR (debug) mode, or PROGRAM mode, can be selected in this Unit.

RUN Mode

Only executes the program. Programming Devices cannot be connected in this mode, and the Unit scans and processes the program at high-speed. Select this mode for normal operation.

MONITOR Mode

Executes the program. Execution of the program is possible while Programming Devices are connected. The processing time is longer than that in RUN mode, because of the time required to process transmissions to and from the Programming Device. MONITOR mode is mainly used to debug new programs. Refer to the following pages in this section for information about operations that can be performed online in MONITOR mode.

PROGRAM Mode

Does not execute the program. Normally used to transfer or compare the program. Refer to the following pages in this section for information about operations that can be performed online in PROGRAM mode.

4-3 Changing the Operating Mode

The program can be transferred to the Ladder Program I/O Unit only when it is in PROGRAM mode. The table below shows the mode which the Unit will enter when the Unit is turned on or reset. The operating mode is controlled by the settings of pin 5 of the back panel DIP switch, switch 4 on the front of the Unit, and the status of the PC.

SW4	PC in RUN or MONITOR mode		PC in PROGRAM mode	
	Pin 5 ON: Independent Operation	Pin 5 OFF: Linked Operation	Pin 5 ON: Independent Operation	Pin 5 OFF: Linked Operation
Up	RUN	RUN	RUN	PROGRAM
Center	MONITOR	MONITOR	MONITOR	PROGRAM
Down	PROGRAM	RUN	PROGRAM	PROGRAM

4-3-1 Linked Operation

The operating mode of the Unit is linked to the operating mode of the PC. After the operating mode shown above is entered when the Unit is turned on or reset,