DAE Instrument Corp.

CC500-STD a10-0x100 (A9)

Smart Lighting Control System
Modbus Gateway

Modbus Reference

燈控系統
通信協定

Revision 3.3e
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General Information

The CC500 is a Modbus gateway for the Smart Lighting Control System D-Bus protocol. It can interface with a PC host using either Ethernet or RS485 and communicates using the Modbus/RTU protocol.

The baud rate is fixed at 9600 bauds. The data format is 8 bits, no parity, 1 stop bit.

All numerical data is in integer form and must be scaled by multiplying/dividing with its associated unit to get the final data value.

Reading is executed through function code 3. Some may be read using function code 1 or 2 as well, this is provided as a convenience for some devices (such as a touch panel HMI) which does not support function code 3.

Writing is executed using function code 16. Function code 6 is provided as an alternative as a convenience for some devices (such as touch panel HMI) which does not support function code 16.

Most control is executed using function code 5.

Function code 3 can support reading a single register or multiple registers at a time. When reading multiple registers, a maximum of 125 registers (250 bytes) can be requested per command query. Requesting to read more than 125 registers at a time is considered an invalid command and will engender no response.

Function code 16 can write to a single register or multiple registers at a time. When writing to multiple registers, a maximum of 4 registers (8 data bytes) can be written to at a time. Requesting to write more than 4 registers at a time is considered an invalid command and will engender no response.

The CC500 will not respond to an invalid command, this is to force the host PC doing the reading to time out. The CC500 has a typical response latency of 100 milliseconds, but as a safety margin, a latency of 300 milliseconds should be allowed for, if this time is exceeded, the host PC should issue a time out.

An invalid command may be any one of the following:

1. The function code is not supported.
2. No register at the given register address for a given function code.
3. The data is malformed or out of range.
4. The CRC is incorrect.

The CC500 can operate in two modes. The first mode is normal Modbus. The second mode is a variation of the Modbus wherein any valid command will be executed but will not be responded to. The no response behavior for the second mode is not an error but rather a normal behavior as required for certain types of applications.

Each command is also given a code name for easier reference, the format is the function code followed by the starting register address (in hex) for that command. For example:

Read Latched DI (F2x400)

The function code is 2, and the starting address is 0x400.

The reason this is done is to make it easier to refer to the specific command by its code name, since many commands may be performed in more than one way.

Object Types and Commands

Object Types

Object Type	Read		Write	
	Command	Name	Command	Name
Group	Read Group Status	F1x001 F3x0A0	Set Group On/Off	F5x001
Pattern	Read Pattern Activation Status	F1x040 F3x0A4	Activate Pattern	F5x040
			Clear Pattern Activation Status	F16x0A4 F6x0A4
DO	Read DO Status	F1x100 F3x000	Set DO On/Off	F5x100
DI	Read DI Status	F2x000 F3x020	-----	-----
Latched DI	Read Latched DI	F3x060 F2x400	Clear Latched DI	F16x060 F6x060
Single DO Pulse	-----	-----	Single DO Pulse Out	F5x300
Dual DO Pulse	-----	-----	Dual DO Pulse Out	F5x500
LT Alive Status	Read LT Alive Status	F3x0A8	-----	-----
AI Value	Read AI Value	F3x100	-----	-----
AO Value	Read AO Value	F3x200	Set AO Value	F16x200 F6x200
AO Upper Limit	Read AO Upper Limit	F3xB00	Set AO Upper Limit	F16xB00 F6xB00
AO Lower Limit	Read AO Lower Limit	F3xC00	Set AO Lower Limit	F16xC00 F6xC00
Authorized DO	Read Authorized DO Status	F3xD00	Set Authorized DO	F16xD00 F6xD00
Authorized Group	Read Authorized Group Execution Flag	F3xD80	Set Authorized Group	F16xD90 F6xD90
			Clear Authorized Group Execution Flag	F16xD80 F6xD80

Commands

Command	Name	Description
Read Group Status [讀取群狀態表]	F1x001 F3x0A0	• Reads the bit map representing the on/off status of each group.
Set Group On/Off [控制群控]	F5x001	• Commands all the DO belonging to a given group to turn On or Off at the same time.
Read Pattern Activation Status [讀取被觸發場景表]	F1x040 F3x0A4	• Reads the bit map representing the activation status of each pattern. • The bit representing a pattern is sticky, once activated (set to 1), the bit will always remain in that state since a pattern cannot be turned off. To clear the bit, the map must be cleared manually using the **Clear Pattern Activation Map** command.

Command	Name	Description
Activate Pattern [觸發情境]	F5x040	• Commands all the DO belonging to a given pattern to arrange themselves into a formation consisting of On and Off elements. • Note that a pattern can only be activated, a pattern cannot be turned Off.
Clear Pattern Activation Status [清除場景]	F16x0A4 F6x0A4	• Clears the bit map representing the activation status of each pattern. • The bit representing a pattern is sticky, once activated (set to 1), the bit will always remain in that state since a pattern cannot be turned off. This command is needed in order to clear this sticky bit. • See also the command **Read Pattern Activation Map**.
Read DO Status	F1x100 F3x000	• Reads the status of a discrete output
Set DO On/Off [控制單點]	F5x100	• Commands a single DO to turn either On or Off.
Read DI Status	F2x000 F3x020	• Reads the real time status of a discrete input
Read Latched DI [寫入保全 DI]	F3x060 F2x400	• Reads the status of the latched discrete input. The latched DI is a flag that is set when the DI channel to which it refers to goes from LOW to HIGH. The event is remembered (latched), the flag is not cleared when the DI channel goes back to LOW. It can only be cleared by explicitly issuing the Clear Latched DI command.
Clear Latched DI [清除保全 DI]	F16x060 F6x060	• Clears the latched DI flag. • The latched DI flag is sticky, it is set when the DI goes high, the flag will remain set even when the DI goes back low.
Single DO Pulse Out [控制單 DO Pulse]	F5x300	• Commands a single DO to output a pulse. The pulse is low->high->low.
Dual DO Pulse Out [控制雙 DO Pulse]	F5x500	• Commands a pair of DO to each output a pulse simultaneously. The pulse is low->high->low.
Read LT Alive Status [LT 是否存在表]	F3x0A8	• Reads the bit map representing the alive status of each LT. • An LT is alive when it can be communicated to, an LT is not alive when it does not exist on the bus or when it is not responding to commands from the CC500.
Read AI Value [讀取 AI 數值]	F3x100	• Reads the value of the analog input. • The value is a percentage from 0 to 100, with no decimal place.
Read AO Value [讀取 AO 數值]	F3x200	• Reads the value of the analog output. • The value is a percentage from 0 to 100, with no decimal place.
Set AO Value [寫入AO數值]	F16x200 F6x200	• Writes a value to the analog output. • The value can be any percent from 0 to 100. There is no decimal place.
Read AO Upper Limit [讀取 AO 高階設定]	F3xB00	• Reads the value of the upper limit for an AO channel. • See also the **Set AO Upper Limit** command to set this value.
Set AO Upper Limit [寫入 AO 高階設定]	F16xB00 F6xB00	• Sets the value of the upper limit for an AO channel. • See also the **Read AO Upper Limit** command to read the value that is set from this command.
Read AO Lower Limit [讀取 AO 低階設定]	F3xC00	• Reads the value of the lower limit for an AO channel. • See also the **Set AO Upper Limit** command to set this value.
Set AO Lower Limit [寫入 AO 低階設定]	F16xC00 F6xC00	• Sets the value of the lower limit for an AO channel. • See also the **Read AO Lower Limit** command to read the value that is set from this command.
Read Authorized DO Status	F3xD00	• Reads the current authorization status of the DO

Command	Name	Description
Set Authorized DO	F16xD00 F6xD00	• Authorize a DO or multiple DO's of a given LT • Note that the DO can only be authorized using this command, it cannot be de-authorized using this same command. Writing a zero to the DO bit will have no effect. • To de-authorize the DO, simply issue a set DO on/off command (F5x100); when the Read Authorized DO Status command (F3xD00) is issued, the associated DO bit will then be cleared automatically after issuing the F5x100 command.
Read Authorized Group Execution Flag	F3xD80	• Reads the status of the group execution flag • Used to verify that the authorize group command has been executed; if the flag is not set, then the authorize group command should be resent
Set Authorized Group	F16xD90 F6xD90	• Authorize the specified group • Sending this command does not guarantee that it is executed, follow up by checking the flag using the command F3xD80 • Note that the group cannot be de-authorized using this command, the group is automatically de-authorized when the Set Group on/off command (F5x001) is issued.
Clear Authorized Group Execution Flag	F16xD80 F6xD80	• Clears the group execution flag • Once the authorize group has been verified to have been executed properly using the F3xD80 command, issue this command the clear the same flag

LT Commands

Command	TU104	LT2504	LT2508	LT2544	LT3050	LT3504	LT3506	LT3000	LT3100	LT3384
Read Group Status [讀取群組狀態]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read Pattern Status [讀取情境狀態]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read DO Status [讀取單點 DO 狀態]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read DI Status [讀取 DI 狀態]	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔
Read Latched DI [讀取保全 DI]	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔
Read LT Alive Status [讀取LT是否存在]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read AI Value [讀取 AI 數值]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Read AO Value [讀取 AO 數值]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Read AO Upper Limit [讀取 AO 高階設定]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Read AO Lower Limit [讀取 AO 低階設定]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Read Authorized DO Status [讀取DO授權模式]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
Read Authorized Group Execution Flag [讀取群組授權是否已執行]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
Command	**TU104**	**LT2504**	**LT2508**	**LT2544**	**LT3050**	**LT3504**	**LT3506**	**LT3000**	**LT3100**	**LT3384**
Set Group On/Off [控制群組]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Activate Pattern [觸發情境]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Clear Pattern Activation Status [清除發送場景命令]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Set DO On/Off [控制單點DO]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Clear Latched DI [清除保全 DI]	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔
Single DO Pulse Out [控制單 DO Pulse]	✘	✘	✘	✘	✘	✘	✔	✘	✘	✘
Dual DO Pulse Out [控制雙 DO Pulse]	✘	✘	✘	✘	✘	✘	✔	✘	✘	✘
Set AO Value [寫入AO數值]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Set AO Upper Limit [寫入 AO 高階設定]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Set AO Lower Limit [寫入 AO 低階設定]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘

Command	TU104	LT2504	LT2508	LT2544	LT3050	LT3504	LT3506	LT3000	LT3100	LT3384
Set Authorized DO [單控DO授權]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
Set Authorized Group [群組授權]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
Clear Authorized Group Execution Flag [清楚群組授權是否已執行]	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔

Command	LT3036	LT3070	LT4500	LT4500-2	LT4514	LT4602	KT454	KT462	iRCU	iHCU
Read Group Status [讀取群組狀態]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read Pattern Status [讀取情境狀態]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read DO Status [讀取 DO 狀態]	✔	✔	✔	✔	✔	✘	✔	✔	✔	✔
Read DI Status [讀取 DI 狀態]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Read Latched DI [讀取保全 DI]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Read LT Alive Status [讀取LT是否存在]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Read AI Value [讀取 AI 數值]	✘	✘	✔	✔	✘	✔	✘	✘	✘	✔
Read AO Value [讀取 AO 數值]	✘	✘	✔	✔	✔	✔	✔	✔	✘	✔
Read AO Upper Limit [讀取 AO 高階設定]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Read AO Lower Limit [讀取 AO 低階設定]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Read Authorized DO Status [讀取DO授權模式]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Read Authorized Group Execution Flag [讀取群組授權是否已執行]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Command	**LT3036**	**LT3070**	**LT4500**	**LT4500-2**	**LT4514**	**LT4602**	**KT454**	**KT462**	**iRCU**	**iHCU**
Set Group On/Off [控制群控]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Activate Pattern [觸發情境]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Clear Pattern Activation Status [清除發送場景命令]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Set DO On/Off [控制單點]	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Clear Latched DI [清除保全 DI]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Single DO Pulse Out [控制單 DO Pulse]	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘

Command	LT3036	LT3070	LT4500	LT4500-2	LT4514	LT4602	KT454	KT462	iRCU	iHCU
Dual DO Pulse Out [控制雙 DO Pulse]	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘
Set AO Value [寫入AO數值]	✘	✘	✔	✔	✔	✔	✔	✔	✘	✔
Set AO Upper Limit [寫入 AO 高階設定]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Set AO Lower Limit [寫入 AO 低階設定]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Set Authorized DO [單控DO授權]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Set Authorized Group [群組授權]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘
Clear Authorized Group Execution Flag [清楚群組授權是否已執行]	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘

Register Address Summary (First & Last Only)

Function Code 1

Address	Size	Command	LT	Channel	Range
0001H	1 bit	Read Group Status (first)	ALL	Group 1	0=off, 1=on
003FH	1 bit	Read Group Status (last)	ALL	Group 63	0=off, 1=on
0040H	1 bit	Read Pattern Status (first)	ALL	Pattern 1	0=not activated, 1=activated
007FH	1 bit	Read Pattern Status (last)	ALL	Pattern 64	0=not activated, 1=activated
0100H	1 bit	Read DO Status (first)	1	DO 1	0=off, 1=on
0101H	1 bit			DO 2	0=off, 1=on
0102H	1 bit			DO 3	0=off, 1=on
0103H	1 bit			DO 4	0=off, 1=on
0104H	1 bit			DO 5	0=off, 1=on
0105H	1 bit			DO 6	0=off, 1=on
0106H	1 bit			DO 7	0=off, 1=on
0107H	1 bit			DO 8	0=off, 1=on
0178H	1 bit	Read DO Status (last)	16	DO 1	0=off, 1=on
0179H	1 bit			DO 2	0=off, 1=on
017AH	1 bit			DO 3	0=off, 1=on
017BH	1 bit			DO 4	0=off, 1=on
017CH	1 bit			DO 5	0=off, 1=on
017DH	1 bit			DO 6	0=off, 1=on
017EH	1 bit			DO 7	0=off, 1=on
017FH	1 bit			DO 8	0=off, 1=on

Function Code 2

Address	Size	Command	LT	Channel	Range
0000H	1 bit	Read DI Status (first)	1	DI 1	0=off, 1=on
0001H	1 bit			DI 2	0=off, 1=on
0002H	1 bit			DI 3	0=off, 1=on
0003H	1 bit			DI 4	0=off, 1=on
0004H	1 bit			DI 5	0=off, 1=on
0005H	1 bit			DI 6	0=off, 1=on
0006H	1 bit			DI 7	0=off, 1=on
0007H	1 bit			DI 8	0=off, 1=on
0008H	1 bit			DI 9	0=off, 1=on
0009H	1 bit			DI 10	0=off, 1=on
000AH	1 bit			DI 11	0=off, 1=on
000BH	1 bit			DI 12	0=off, 1=on
000CH	1 bit			DI 13	0=off, 1=on
000DH	1 bit			DI 14	0=off, 1=on

Address	Size	Command	LT	Channel	Range
000EH	1 bit			DI 15	0=off, 1=on
000FH	1 bit			DI 16	0=off, 1=on
00F0H	1 bit	Read DI Status (last)	16	DI 1	0=off, 1=on
00F1H	1 bit			DI 2	0=off, 1=on
00F2H	1 bit			DI 3	0=off, 1=on
00F3H	1 bit			DI 4	0=off, 1=on
00F4H	1 bit			DI 5	0=off, 1=on
00F5H	1 bit			DI 6	0=off, 1=on
00F6H	1 bit			DI 7	0=off, 1=on
00F7H	1 bit			DI 8	0=off, 1=on
00F8H	1 bit			DI 9	0=off, 1=on
00F9H	1 bit			DI 10	0=off, 1=on
00FAH	1 bit			DI 11	0=off, 1=on
00FBH	1 bit			DI 12	0=off, 1=on
00FCH	1 bit			DI 13	0=off, 1=on
00FDH	1 bit			DI 14	0=off, 1=on
00FEH	1 bit			DI 15	0=off, 1=on
00FFH	1 bit			DI 16	0=off, 1=on
0400H	1 bit	Read Latched DI Status (first)	1	DI 1	0=off, 1=on
0401H	1 bit			DI 2	0=off, 1=on
0402H	1 bit			DI 3	0=off, 1=on
0403H	1 bit			DI 4	0=off, 1=on
0404H	1 bit			DI 5	0=off, 1=on
0405H	1 bit			DI 6	0=off, 1=on
0406H	1 bit			DI 7	0=off, 1=on
0407H	1 bit			DI 8	0=off, 1=on
0408H	1 bit			DI 9	0=off, 1=on
0409H	1 bit			DI 10	0=off, 1=on
040AH	1 bit			DI 11	0=off, 1=on
040BH	1 bit			DI 12	0=off, 1=on
040CH	1 bit			DI 13	0=off, 1=on
040DH	1 bit			DI 14	0=off, 1=on
040EH	1 bit			DI 15	0=off, 1=on
040FH	1 bit			DI 16	0=off, 1=on
04F0H	1 bit	Read Latched DI Status (last)	16	DI 1	0=off, 1=on
04F1H	1 bit			DI 2	0=off, 1=on
04F2H	1 bit			DI 3	0=off, 1=on
04F3H	1 bit			DI 4	0=off, 1=on
04F4H	1 bit			DI 5	0=off, 1=on
04F5H	1 bit			DI 6	0=off, 1=on
04F6H	1 bit			DI 7	0=off, 1=on
04F7H	1 bit			DI 8	0=off, 1=on
04F8H	1 bit			DI 9	0=off, 1=on
04F9H	1 bit			DI 10	0=off, 1=on
04FAH	1 bit			DI 11	0=off, 1=on
04FBH	1 bit			DI 12	0=off, 1=on
04FCH	1 bit			DI 13	0=off, 1=on
04FDH	1 bit			DI 14	0=off, 1=on

Address	Size	Command	LT	Channel	Range
04FEH	1 bit			DI 15	0=off, 1=on
04FFH	1 bit			DI 16	0=off, 1=on

Function Code 3

Address	Modscan	Size	Command	LT	Channel	Range
0000H	40001	2 bytes	Read DO Status (first)	1, 2	DO 1 to 8	bit 15~8: LT even DO 8~1 bit 7~0: LT odd DO 8~1 0=off, 1=on
0007H	40008	2 bytes	Read DO Status (last)	15, 16	DO 1 to 8	bit 15~8: LT even DO 8~1 bit 7~0: LT odd DO 8~1 0=off, 1=on
0020H	40033	2 bytes	Read DI Status (first)	1	DI 1 to 16	bit 15~0: DI 16~1 0=off, 1=on
002FH	40048	2 bytes	Read DI Status (last)	16	DI 1 to 16	bit 15~0: DI 16~1 0=off, 1=on
0060H	40097	2 bytes	Read Latched DI Status (first)	1	DI 1 to 16	bit 15~0: DI 16~1 0=off, 1=on
006FH	40112	2 bytes	Read Latched DI Status (last)	16	DI 1 to 16	bit 15~0: DI 16~1 0=off, 1=on
00A0H	40161	2 bytes	Read Group Status	All	Groups 1 to 16	bit 15~0: group 16~1 0=off, 1=on
00A1H	40162	2 bytes		All	Groups 17 to 32	bit 15~0: group 32~17 0=off, 1=on
00A2H	40163	2 bytes		All	Groups 33 to 48	bit 15~0: group 48~33 0=off, 1=on
00A3H	40164	2 bytes		All	Groups 49 to 63	bit 14~0: group 63~49 0=off, 1=on
00A4H	40165	2 bytes	Read Pattern Activation Status	All	Patterns 1 to 16	bit 15~0: patterns 16~1 0=off, 1=activated
00A5H	40166	2 bytes		All	Patterns 17 to 32	bit 15~0: pattern 32~17 0=off, 1=activated
00A6H	40167	2 bytes		All	Patterns 33 to 48	bit 15~0: pattern 48~33 0=off, 1=activated
00A7H	40168	2 bytes		All	Patterns 49 to 64	bit 15~0: pattern 64~49 0=off, 1=activated
00A8H	40169	2 bytes	Read LT Alive Status	1 to 16	---	bit 15~0: LT 16~1 0=not found, 1=alive
0100H	40257	2 bytes	Read AI Value	1	AI 1	hi byte=0, lo byte=0~100%
0101H	40258	2 bytes			AI 2	hi byte=0, lo byte=0~100%

Address	Modscan	Size	Command	LT	Channel	Range
0102H	40259	2 bytes	(first)	1	AI 3	hi byte=0, lo byte=0~100%
0103H	40260	2 bytes			AI 4	hi byte=0, lo byte=0~100%
013CH	40317	2 bytes	Read AI Value (last)	16	AI 1	hi byte=0, lo byte=0~100%
013DH	40318	2 bytes			AI 2	hi byte=0, lo byte=0~100%
013EH	40319	2 bytes			AI 3	hi byte=0, lo byte=0~100%
013FH	40320	2 bytes			AI 4	hi byte=0, lo byte=0~100%
0200H	40513	2 bytes	Read AO Value (first)	1	AO 1	hi byte=0, lo byte=0~100%
0201H	40514	2 bytes			AO 2	hi byte=0, lo byte=0~100%
0202H	40515	2 bytes			AO 3	hi byte=0, lo byte=0~100%
0203H	40516	2 bytes			AO 4	hi byte=0, lo byte=0~100%
023CH	40573	2 bytes	Read AO Value (last)	16	AO 1	hi byte=0, lo byte=0~100%
023DH	40574	2 bytes			AO 2	hi byte=0, lo byte=0~100%
023EH	40575	2 bytes			AO 3	hi byte=0, lo byte=0~100%
023FH	40576	2 bytes			AO 4	hi byte=0, lo byte=0~100%
0B00H	42817	2 bytes	Read AO Upper Limit (first)	1	AO 1	hi byte=0, lo byte=7~100%
0B01H	42818	2 bytes			AO 2	hi byte=0, lo byte=7~100%
0B02H	42819	2 bytes			AO 3	hi byte=0, lo byte=7~100%
0B03H	42820	2 bytes			AO 4	hi byte=0, lo byte=7~100%
0B3CH	42877	2 bytes	Read AO Upper Limit (last)	16	AO 1	hi byte=0, lo byte=7~100%
0B3DH	42878	2 bytes			AO 2	hi byte=0, lo byte=7~100%
0B3EH	42879	2 bytes			AO 3	hi byte=0, lo byte=7~100%
0B3FH	42880	2 bytes			AO 4	hi byte=0, lo byte=7~100%

Address	Modscan	Size	Command	LT	Channel	Range
0C00H	43073	2 bytes	Read AO Lower Limit (first)	1	AO 1	hi byte=0, lo byte=6~99%
0C01H	43074	2 bytes			AO 2	hi byte=0, lo byte=6~99%
0C02H	43075	2 bytes			AO 3	hi byte=0, lo byte=6~99%
0C03H	43076	2 bytes			AO 4	hi byte=0, lo byte=6~99%
0C3CH	43133	2 bytes	Read AO Lower Limit (last)	16	AO 1	hi byte=0, lo byte=6~99%
0C3DH	43134	2 bytes			AO 2	hi byte=0, lo byte=6~99%
0C3EH	43135	2 bytes			AO 3	hi byte=0, lo byte=6~99%
0C3FH	43136	2 bytes			AO 4	hi byte=0, lo byte=6~99%
0D00H	43329	2 bytes	Read Authorized DO Status (first)	1	DO 1 to 8	bit 7~0: DO 8~1 0=normal, 1=authorized
0D0FH	43344	2 bytes	Read Authorized DO Status (last)	16	DO 1 to 8	bit 7~0: DO 8~1 0=normal, 1=authorized
0D80H	43457	2 bytes	Read Authorized Group Execution Flag	All	Group 1 to 16	bit 15~0: Group 16~1 0=not yet executed, 1=already executed
0D81H	43458	2 bytes		All	Group 17 to 32	bit 15~0: Group 32~17 0=not yet executed, 1=already executed
0D82H	43459	2 bytes		All	Group 33 to 48	bit 15~0: Group 48~33 0=not yet executed, 1=already executed
0D83H	43460	2 bytes		All	Group 49 to 63	bit 14~0: Group 63~49 0=not yet executed, 1=already executed

Function Code 5

Address	Command	LT	Channel	Range
0001H	Set Group On/Off (first)	ALL	Group 1	hi byte: 0=off, 255=on; lo byte=0
003FH	Set Group On/Off (last)	ALL	Group 63	hi byte: 0=off, 255=on; lo byte=0
0040H	Activate Pattern (first)	ALL	Pattern 1	hi byte: 255=activate; lo byte=0
007FH	Activate Pattern (last)	ALL	Pattern 64	hi byte: 255=activate; lo byte=0
0100H	Set DO On/Off (first)	1	DO 1	hi byte: 0=off, 255=on; lo byte=0
0101H			DO 2	hi byte: 0=off, 255=on; lo byte=0
0102H			DO 3	hi byte: 0=off, 255=on; lo byte=0
0103H			DO 4	hi byte: 0=off, 255=on; lo byte=0
0104H			DO 5	hi byte: 0=off, 255=on; lo byte=0
0105H			DO 6	hi byte: 0=off, 255=on; lo byte=0
0106H			DO 7	hi byte: 0=off, 255=on; lo byte=0
0107H			DO 8	hi byte: 0=off, 255=on; lo byte=0
0178H	Set DO On/Off (last)	16	DO 1	hi byte: 0=off, 255=on; lo byte=0
0179H			DO 2	hi byte: 0=off, 255=on; lo byte=0
017AH			DO 3	hi byte: 0=off, 255=on; lo byte=0
017BH			DO 4	hi byte: 0=off, 255=on; lo byte=0
017CH			DO 5	hi byte: 0=off, 255=on; lo byte=0
017DH			DO 6	hi byte: 0=off, 255=on; lo byte=0
017EH			DO 7	hi byte: 0=off, 255=on; lo byte=0
017FH			DO 8	hi byte: 0=off, 255=on; lo byte=0
0300H	Single DO Pulse Out (first)	1	DO 1	hi byte: 255=pulse out; lo byte=0
0301H			DO 2	hi byte: 255=pulse out; lo byte=0
0302H			DO 3	hi byte: 255=pulse out; lo byte=0
0303H			DO 4	hi byte: 255=pulse out; lo byte=0
0304H			DO 5	hi byte: 255=pulse out; lo byte=0
0305H			DO 6	hi byte: 255=pulse out; lo byte=0
0306H			DO 7	hi byte: 255=pulse out; lo byte=0
0307H			DO 8	hi byte: 255=pulse out; lo byte=0
0378H	Single DO Pulse Out (last)	16	DO 1	hi byte: 255=pulse out; lo byte=0
0379H			DO 2	hi byte: 255=pulse out; lo byte=0
037AH			DO 3	hi byte: 255=pulse out; lo byte=0
037BH			DO 4	hi byte: 255=pulse out; lo byte=0
037CH			DO 5	hi byte: 255=pulse out; lo byte=0
037DH			DO 6	hi byte: 255=pulse out; lo byte=0
037EH			DO 7	hi byte: 255=pulse out; lo byte=0
037FH			DO 8	hi byte: 255=pulse out; lo byte=0
0500H	Dual DO Pulse Out (first)	1	DO 1 & 2	hi byte: 255=pulse out; lo byte=0
0501H			DO 3 & 4	hi byte: 255=pulse out; lo byte=0
0502H			DO 5 & 6	hi byte: 255=pulse out; lo byte=0
0503H			DO 7 & 8	hi byte: 255=pulse out; lo byte=0
053CH	Dual DO Pulse Out (last)	16	DO 1 & 2	hi byte: 255=pulse out; lo byte=0
053DH			DO 3 & 4	hi byte: 255=pulse out; lo byte=0
053EH			DO 5 & 6	hi byte: 255=pulse out; lo byte=0
053FH			DO 7 & 8	hi byte: 255=pulse out; lo byte=0

Function Code 6

Address	Size	Command	LT	Channel	Range
0060H	2 bytes	Clear Latched DI (first)	1	DI 1 to 16	0=off, 1=on
006FH	2 bytes	Clear Latched DI (last)	16	DI 1 to 16	0=off, 1=on
00A4H	2 bytes	Clear Pattern Activation Status	1 to 16	Pattern 1 to 16	bit 15~0: Pattern 16 to 1 0=clear, 1=don't clear
00A5H	2 bytes		1 to 16	Patterns 17 to 32	bit 15~0: Pattern 32 to 17 0=clear, 1=don't clear
00A6H	2 bytes		1 to 16	Patterns 33 to 48	bit 15~0: Pattern 48 to 33 0=clear, 1=don't clear
00A7H	2 bytes		1 to 16	Patterns 49 to 64	bit 15~0: Pattern 64 to 49 0=clear, 1=don't clear
0200H	2 bytes	Set AO Value (first)	1	AO 1	hi byte=0, lo byte=0~100%
0201H	2 bytes			AO 2	hi byte=0, lo byte=0~100%
0202H	2 bytes			AO 3	hi byte=0, lo byte=0~100%
0203H	2 bytes			AO 4	hi byte=0, lo byte=0~100%
023CH	2 bytes	Set AO Value (last)	16	AO 1	hi byte=0, lo byte=0~100%
023DH	2 bytes			AO 2	hi byte=0, lo byte=0~100%
023EH	2 bytes			AO 3	hi byte=0, lo byte=0~100%
023FH	2 bytes			AO 4	hi byte=0, lo byte=0~100%
0B00H	2 bytes	Set AO Upper Limit (first)	1	AO 1	hi byte=0, lo byte=7~100%
0B01H	2 bytes			AO 2	hi byte=0, lo byte=7~100%
0B02H	2 bytes			AO 3	hi byte=0, lo byte=7~100%
0B03H	2 bytes			AO 4	hi byte=0, lo byte=7~100%
0B3CH	2 bytes	Set AO Upper Limit (last)	16	AO 1	hi byte=0, lo byte=7~100%
0B3DH	2 bytes			AO 2	hi byte=0, lo byte=7~100%
0B3EH	2 bytes			AO 3	hi byte=0, lo byte=7~100%
0B3FH	2 bytes			AO 4	hi byte=0, lo byte=7~100%
0C00H	2 bytes	Set AO Lower Limit (first)	1	AO 1	hi byte=0, lo byte=6~99%
0C01H	2 bytes			AO 2	hi byte=0, lo byte=6~99%
0C02H	2 bytes			AO 3	hi byte=0, lo byte=6~99%
0C03H	2 bytes			AO 4	hi byte=0, lo byte=6~99%
0C3CH	2 bytes	Set AO Lower Limit (last)	16	AO 1	hi byte=0, lo byte=6~99%
0C3DH	2 bytes			AO 2	hi byte=0, lo byte=6~99%
0C3EH	2 bytes			AO 3	hi byte=0, lo byte=6~99%
0C3FH	2 bytes			AO 4	hi byte=0, lo byte=6~99%
0D00H	2 bytes	Set Authorized DO (first)	1	DO 1 to 8	bit 7~0: DO 8~1, 0=normal, 1=authorized
0D0FH	2 bytes	Set Authorized DO(last)	16	DO 1 to 8	bit 7~0: DO 8~1, 0=normal, 1=authorized
0D80H	2 bytes	Clear Authorized Group Execution Flag	All	Group 1 to 16	bit 15~0: group 16~1 0=clear, 1=don't clear
0D81H	2 bytes		All	Group 17 to 32	bit 15~0: group 32~17 0=clear, 1=don't clear
0D82H	2 bytes		All	Group 33 to 48	bit 15~0: group 48~33 0=clear, 1=don't clear
0D83H	2 bytes		All	Group 49 to 63	bit 15~0: group 63~49 0=clear, 1=don't clear

Address	Size	Command	LT	Channel	Range
0D90H	2 bytes	Set Authorized Group	All	Group 1 to 63	hi byte=0, lo byte: group=1 to 63

Function Code 16

Address	Size	Command	LT	Channel	Range
0060H	2 bytes	Clear Latched DI (first)	1	DI 1 to 16	bit 15~0: Latched DI 16~1 0=clear, 1=don't clear
006FH	2 bytes	Clear Latched DI (last)	16	DI 1 to 16	bit 15~0: Latched DI 16~1 0=clear, 1=don't clear
00A4H	2 bytes	Clear Pattern Activation Status	1 to 64	Patterns 1 to 16	bit 15~0: Pattern 16 to 1 0=clear, 1=don't clear
00A5H	2 bytes		1 to 64	Patterns 17 to 32	bit 15~0: Pattern 32 to 17 0=clear, 1=don't clear
00A6H	2 bytes		1 to 64	Patterns 33 to 48	bit 15~0: Pattern 48 to 33 0=clear, 1=don't clear
00A7H	2 bytes		1 to 64	Patterns 49 to 64	bit 15~0: Pattern 64 to 49 0=clear, 1=don't clear
0200H	2 bytes	Set AO Value (first)	1	AO 1	hi byte=0, lo byte=0~100%
0201H	2 bytes			AO 2	hi byte=0, lo byte=0~100%
0202H	2 bytes			AO 3	hi byte=0, lo byte=0~100%
0203H	2 bytes			AO 4	hi byte=0, lo byte=0~100%
023CH	2 bytes	Set AO Value (last)	16	AO 1	hi byte=0, lo byte=0~100%
023DH	2 bytes			AO 2	hi byte=0, lo byte=0~100%
023EH	2 bytes			AO 3	hi byte=0, lo byte=0~100%
023FH	2 bytes			AO 4	hi byte=0, lo byte=0~100%
0B00H	2 bytes	Set AO Upper Limit (first)	1	AO 1	hi byte=0, lo byte=7~100%
0B01H	2 bytes			AO 2	hi byte=0, lo byte=7~100%
0B02H	2 bytes			AO 3	hi byte=0, lo byte=7~100%
0B03H	2 bytes			AO 4	hi byte=0, lo byte=7~100%
0B3CH	2 bytes	Set AO Upper Limit (last)	16	AO 1	hi byte=0, lo byte=7~100%
0B3DH	2 bytes			AO 2	hi byte=0, lo byte=7~100%
0B3EH	2 bytes			AO 3	hi byte=0, lo byte=7~100%
0B3FH	2 bytes			AO 4	hi byte=0, lo byte=7~100%
0C00H	2 bytes	Set AO Lower Limit (first)	1	AO 1	hi byte=0, lo byte=6~99%
0C01H	2 bytes			AO 2	hi byte=0, lo byte=6~99%
0C02H	2 bytes			AO 3	hi byte=0, lo byte=6~99%
0C03H	2 bytes			AO 4	hi byte=0, lo byte=6~99%
0C3CH	2 bytes	Set AO Lower Limit (last)	16	AO 1	hi byte=0, lo byte=6~99%
0C3DH	2 bytes			AO 2	hi byte=0, lo byte=6~99%
0C3EH	2 bytes			AO 3	hi byte=0, lo byte=6~99%
0C3FH	2 bytes			AO 4	hi byte=0, lo byte=6~99%
0D00H	2 bytes	Set Authorized DO (first)	1	DO 1 to 8	bit 7~0: DO 8~1, 0=normal, 1=authorized
0D0FH	2 bytes	Set Authorized DO (last)	16	DO 1 to 8	bit 7~0: DO 8~1, 0=normal, 1=authorized
0D80H	2 bytes		All	Group 1 to 16	bit 15~0: Group 16~1 0=clear, 1=don't clear

Address	Size	Command	LT	Channel	Range
0D81H	2 bytes	Clear Authorized Group Execution Flag	All	Group 17 to 32	bit 15~0: Group 32~17 0=clear, 1=don't clear
0D82H	2 bytes		All	Group 33 to 48	bit 15~0: Group 48~33 0=clear, 1=don't clear
0D83H	2 bytes		All	Group 49 to 63	bit 14~0: Group 63~49 0=clear, 1=don't clear
0D90H	2 bytes	Set Authorized Group	All	Group 1 to 63	hi byte=0, lo byte=1~63

Command & Data Formats

Read Group Status (F1x001)

Command Format

Query

CC500 Address	1	Reg-H	Reg-L	0	Number of Groups	CRC-L	CRC-H

- Number of Groups = 1 to 63

Reply

CC500 Address	1	Byte Count	First Byte	. . .	Last Byte	CRC-L	CRC-H

Data Format

Byte	First Byte								...	Last Byte							
Bit #	7	6	5	4	3	2	1	0	...	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On																
Group	g+7	g+6	g+5	g+4	g+3	g+2	g+1	g	...	g+15	g+14	g+13	g+12	g+11	g+10	g+9	g+8

Group to Register Address Conversion

- Reg = (Group - 1) + 1

Example

- CC500 Address 1
- Group 1
  - Register Address = (1 - 1) + 1 = 1
    - RH = 1 div 256 = 0
    - RL = 1 mod 256 = 1

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	1	0	1	0	32	108	18

Reply

CC500 Address	Function Code	Byte Count	Read Data				CRC	
			Byte 1	Byte 2	Byte 3	Byte 4	low	high
1	1	4	0x37	0xA3	0x00	0x56	133	185

Byte	Byte 1								Byte 2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x37								0xA3							
	0	0	1	1	0	1	1	1	1	0	1	0	0	0	1	1
Status	Off	Off	On	On	Off	On	On	On	On	Off	On	Off	Off	Off	On	On
Group	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

Byte	Byte 3								Byte 4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x00								0x56							
	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0
Status	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	On	Off	On	On	Off
Group	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25

Read Pattern Status (F1x040)

Command Format

Query

CC500 Address	1	Reg-H	Reg-L	0	Number of Patterns	CRC-L	CRC-H

✦ Number of Patterns = 1 to 64

Reply

CC500 Address	1	Byte Count	First Byte	. . .	First Byte	CRC-L	CRC-H

Data Format

Byte	First Byte								...	Last Byte							
Bit #	7	6	5	4	3	2	1	0	...	7	6	5	4	3	2	1	0
Bit State	0 = not activated, 1 = activated																
Group	p+7	p+6	p+5	p+4	p+3	p+2	p+1	p	...	p+15	p+14	p+13	p+12	p+11	p+10	p+9	p+8

Pattern to Register Address Conversion

❖ Reg = (Pattern - 1) + 64

Example

✦ CC500 Address 1

✦ Pattern 1

➡ Register Address = (1 - 1) + 64 = 64

➡ RH = 1 div 256 = 0

➡ RL = 64 mod 256 = 64

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	1	0	64	0	32	60	6

Reply

CC500 Address	Function Code	Byte Count	Read Data				CRC	
			Byte 1	Byte 2	Byte 3	Byte 4	low	high
1	1	4	0x37	0xA3	0x00	0x56	133	185

Byte	Byte 1								Byte 2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x37								0xA3							
	0	0	1	1	0	1	1	1	1	0	1	0	0	0	1	1
Status	Off	Off	On	On	Off	On	On	On	On	Off	On	Off	Off	Off	On	On
Pattern	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

Byte	Byte 3								Byte 4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x00								0x56							
	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0
Status	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	On	Off	On	On	Off
Pattern	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25

✦ Off = Pattern Not Activated, On = Pattern Activated

Read DO Status (F1x100)

Command Format

Query

CC500 Address	1	Reg-H	Reg-L	0	Number of DO	CRC-L	CRC-H

✦ Number of DO = 1 to 2000

Reply

CC500 Address	1	Byte Count	First Byte	. . .	Last Byte	CRC-L	CRC-H

Data Format

Byte	First Byte								...	Last Byte							
Bit #	7	6	5	4	3	2	1	0	...	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On																
DO	8	7	6	5	4	3	2	1	...	8	7	6	5	4	3	2	1
LT	LT (starting)								...	LT (ending)							

LT to Register Address Conversion

❖ Reg = (LT - 1) * 8 + (DO - 1) + 256

Example

✦ CC500 Address 1

✦ LT address 1, DO 1

➡ Register Address = (1 - 1) * 8 + (1 - 1) + 256 = 256

➡ RH = 256 div 256 = 1

➡ RL = 256 mod 256 = 0

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	1	1	0	0	32	60	46

Reply

CC500 Address	Function Code	Byte Count	Read Data				CRC	
			Byte 1	Byte 2	Byte 3	Byte 4	low	high
1	1	4	0x37	0xA3	0x00	0x56	133	185

Byte	Byte 1								Byte 2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x37								0xA3							
	0	0	1	1	0	1	1	1	1	0	1	0	0	0	1	1
Status	Off	Off	On	On	Off	On	On	On	On	Off	On	Off	Off	Off	On	On
DO	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 1								LT 2							

Byte	Byte 3								Byte 4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x00								0x56							
	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0
Status	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	On	Off	On	On	Off
DO	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 3								LT 4							

Read DI Status (F2x000)

Command Format

Query

CC500 Address	2	Reg-H	Reg-L	0	Number of DI	CRC-L	CRC-H

✦ Number of DI = 1 to 2000

Reply

CC500 Address	2	Byte Count	First Byte	. . .	Last Byte	CRC-L	CRC-H

Data Format

Byte	First Byte								...	Last Byte							
Bit #	7	6	5	4	3	2	1	0	...	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On																
DI	8	7	6	5	4	3	2	1	...	8	7	6	5	4	3	2	1
LT	LT (starting)									LT (ending)							

LT to Register Address Conversion

❖ Reg = (LT - 1) * 16 + (DI - 1)

Example

✦ Cc500 Address 1

✦ LT address 1, DI 1

➡ Register Address = (1 - 1) * 16 + (1 - 1) = 0

➡ RH = 0 div 256 = 0

➡ RL = 0 mod 256 = 0

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	2	0	0	0	32	121	210

Reply

CC500 Address	Function Code	Byte Count	Read Data				CRC	
			Byte 1	Byte 2	Byte 3	Byte 4	low	high
1	2	4	0x37	0xA3	0x00	0x56	133	138

Byte	Byte 1								Byte 2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x37								0xA3							
	0	0	1	1	0	1	1	1	1	0	1	0	0	0	1	1
Status	Off	Off	On	On	Off	On	On	On	On	Off	On	Off	Off	Off	On	On
DI	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 1								LT 2							

Byte	Byte 3								Byte 4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x00								0x56							
	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0
Status	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	On	Off	On	On	Off
DI	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 3								LT 4							

Read Latched DI Status (F2x400)

Command Format

Query

CC500 Address	2	Reg-H	Reg-L	0	Number of Latched DI	CRC-L	CRC-H

✦ Number of DI = 1 to 2000

Reply

CC500 Address	2	Byte Count	First Byte	. . .	Last Byte	CRC-L	CRC-H

Data Format

Byte	First Byte								...	Last Byte							
Bit #	7	6	5	4	3	2	1	0	...	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On																
Latched DI	8	7	6	5	4	3	2	1	...	8	7	6	5	4	3	2	1
LT	LT (starting)									LT (ending)							

LT to Register Address Conversion

❖ Reg = (LT - 1) * 16 + (DI - 1) + 1024

Example

✦ Cc500 Address 1

✦ LT address 1, DI 1

➡ Register Address = (1 - 1) * 16 + (1 - 1) + 1024 = 1024

➡ RH = 1024 div 256 = 4

➡ RL = 1024 mod 256 = 0

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	2	4	0	0	32	120	226

Reply

CC500 Address	Function Code	Byte Count	Read Data				CRC	
			Byte 1	Byte 2	Byte 3	Byte 4	low	high
1	2	4	0x37	0xA3	0x00	0x56	133	138

Byte	Byte 1								Byte 2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x37								0xA3							
	0	0	1	1	0	1	1	1	1	0	1	0	0	0	1	1
Status	Off	Off	On	On	Off	On	On	On	On	Off	On	Off	Off	Off	On	On
Latched DI	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 1								LT 2							

Byte	Byte 3								Byte 4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x00								0x56							
	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0
Status	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	On	Off	On	On	Off
Latched DI	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 3								LT 4							

✦ Off = Not Latched, On = Latched On

Read DO Status (F3x000)

Command Format

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

✦ N = 1 to 32

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On															
DO	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT n+1 (even)								LT n (odd)							

LT to Register Address Conversion

❖ Reg = (LT - 1) div 2

Example

✦ CC500 Address 1

✦ LT address 15 and 16

➡ Register Address = (15 - 1) div 2 = 7

➡ RH = 7 div 256 = 0

➡ RL = 7 mod 256 = 7

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	0	7	0	1	53	203

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0xAB	0xCD	6	225

Byte	High Byte (DH)								Low Byte (DL)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0xAB								0xCD							
	1	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1
Status	On	Off	On	Off	On	Off	On	On	On	On	Off	Off	On	On	Off	On
DO	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
LT	LT 16								LT 15							

Read DI Status (F3x020)

Command Format

- N = 1 to 64

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	High Byte								Low Byte							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On															
DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

LT to Register Address Conversion

- Reg = (LT - 1) + 32

Example

- CC500 Address 1
- LT address 1
  - Register Address = (1 - 1) + 32 = 32
    - RH = 32 div 256 = 0
    - RL = 32 mod 256 = 32

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	0	32	0	1	133	192

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0xCD	0xEF	173	88

Byte	High Byte (DH)								Low Byte (DL)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0xC				0xD				0xE				0xF			
	1	1	0	0	1	1	0	1	1	1	1	0	1	1	1	1
Status	On	On	Off	Off	On	On	Off	On	On	On	On	Off	On	On	On	On
DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Read Latched DI Status (F3x060)

Command Format

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

✦ N = 1 to 64

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	High Byte								Low Byte							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On															
DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

LT to Register Address Conversion

❖ Reg = (LT - 1) + 96

Example

✦ CC500 Address 1

✦ LT address 1

➡ Register Address = (1 - 1) + 96 = 96

➡ RH = 96 div 256 = 0

➡ RL = 96 mod 256 = 96

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	0	96	0	1	132	20

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0x78	0x9A	26	47

Byte	high byte (DH)								low byte (DL)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x7				0x8				0x9				0xA			
	0	1	1	1	1	0	0	0	1	0	0	1	1	0	1	0
Status	Off	On	On	On	On	Off	Off	Off	On	Off	Off	On	On	Off	On	Off
DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

✦ Off = Not Latched, On = Latched On

Read Group Status (F3x0A0)

Command Format

- N = 1 to 4

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = Off, 1 = On															
Groups 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Groups 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Groups 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Groups 49 to 63	---	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Group to Register Address Conversion

Groups	Register Address	Note
1 to 16	160	Each register has the status of 16 groups
17 to 32	161	
33 to 48	162	
49 to 63	163	This last register has the status of 15 groups only

Example

- CC500 Address 1
- Read Groups 1 to 63
  - Starting Register Address = 160
    - RH = 160 div 256 = 0
    - RL = 160 mod 256 = 160

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	0	160	0	4	68	43

Reply

CC500 Address	Function Code	Byte Count	Read Data				
			D1	D2	D3	D4	. . .
1	3	2	0x12	0x34	0x56	0x78	

	Read Data				CRC	
	D5	D6	D7	D8	low	high
. . .	0x9A	0xBC	0xDE	0xF0	4	133

Byte	D1								D2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x1				0x2				0x3				0x4			
	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0
Status	Off	Off	Off	On	Off	Off	On	Off	Off	Off	On	On	Off	On	Off	Off
Group	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Byte	D3								D4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x5				0x6				0x7				0x8			
	0	1	0	1	0	1	1	0	0	1	1	1	1	0	0	0
Status	Off	On	Off	On	Off	On	On	Off	Off	On	On	On	On	Off	Off	Off
Group	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Byte	D5								D6							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x9				0xA				0xB				0xC			
	1	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0
Status	On	Off	Off	On	On	Off	On	Off	On	Off	On	On	On	On	Off	Off
Group	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33

Byte	D7								D8							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0xD				0xE				0xF				0x0			
	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0
Status	On	On	Off	On	On	On	On	Off	On	On	On	On	Off	Off	Off	Off
Group	---	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Read Pattern Activation Status (F3x0A4)

Command Format

- N = 1 to 4

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = Not activated, 1 = Activated															
Patterns 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Patterns 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Patterns 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Patterns 49 to 64	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Patterns to Register Address Conversion

Patterns	Register Address
1 to 16	164
17 to 32	165
33 to 48	166
49 to 64	167

✳ Note that there are 64 patterns but only 63 groups.

Example

- CC500 Address 1
- Read Patterns 1 to 64
  - Starting Register Address = 164
    - RH = 164 div 256 = 0
    - RL = 164 mod 256 = 164

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	0	164	0	4	5	234

Reply

CC500 Address	Function Code	Byte Count	Read Data				
			D1	D2	D3	D4	
1	3	2	0x12	0x34	0x56	0x78	. . .

	Read Data				CRC	
	D5	D6	D7	D8	low	high
...	0x9A	0xBC	0xDE	0xF0	4	133

Byte	D1								D2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x12								0x34							
	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0
Status	---	---	---	Act	---	---	Act	---	---	---	Act	Act	---	Act	---	---
Pattern	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Byte	D3								D4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x56								0x78							
	0	1	0	1	0	1	1	0	0	1	1	1	1	0	0	0
Status	---	Act	---	Act	---	Act	Act	---	---	Act	Act	Act	Act	---	---	---
Pattern	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Byte	D5								D6							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x9A								0xBC							
	1	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0
Status	Act	---	---	Act	Act	---	Act	---	Act	---	Act	Act	Act	Act	---	---
Pattern	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33

Byte	D7								D8							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0xDE								0xF0							
	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0
Status	Act	Act	---	Act	Act	Act	Act	---	Act	Act	Act	Act	---	---	---	---
Pattern	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Read LT Alive Status (F3x0A8)

Command Format

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

- N = 1 to 4

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = Not Found, 1 = Alive															
LT 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
LT 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
LT 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
LT 49 to 64	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

LT to Register Address Conversion

LT	Register Address
1 to 16	168
17 to 32	169
33 to 48	170
49 to 64	171

Example

- CC500 Address 1
- Read Alive Status for LT 1 to 64
  - Starting Register Address = 168
    - RH = 168 div 256 = 0
    - RL = 168 mod 256 = 168

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	0	168	0	4	197	233

Reply

CC500 Address	Function Code	Byte Count	Read Data				
			D1	D2	D3	D4	. . .
1	3	2	0x12	0x34	0x56	0x78	

	Read Data				CRC	
	D5	D6	D7	D8	low	high
. . .	0x9A	0xBC	0xDE	0xF0	4	133

Byte	D1								D2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x1				0x2				0x3				0x4			
	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0
Status	---	---	---	Alive	---	---	Alive	---	---	---	Alive	Alive	---	Alive	---	---
LT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Byte	D3								D4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x5				0x6				0x7				0x8			
	0	1	0	1	0	1	1	0	0	1	1	1	1	0	0	0
Status	---	Alive	---	Alive	---	Alive	Alive	---	---	Alive	Alive	Alive	Alive	---	---	---
LT	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Byte	D5								D6							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x9				0xA				0xB				0xC			
	1	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0
Status	Alive	---	---	Alive	Alive	---	Alive	---	Alive	---	Alive	Alive	Alive	Alive	---	---
LT	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33

Byte	D7								D8							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0xD				0xE				0xF				0x0			
	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0
Status	Alive	Alive	---	Alive	Alive	Alive	Alive	---	Alive	Alive	Alive	Alive	---	---	---	---
LT	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Read AI Value (F3x100)

Command Format

- N = 1 to 125

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Data Format

- AI Value = Data-L x 1%

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AI - 1) + 256

Example

- CC500 Address 1
- LT address 1, AI 3
  - Register Address = (1 - 1) * 4 + (3 - 1) + 256 = 258
    - RH = 258 div 256 = 1
    - RL = 258 mod 256 = 2

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	1	2	0	1	36	54

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0	76	185	177

- DL = 76
  - AI Value = 76 x 1% = 76%

Read AO Value (F3x200)

Command Format

- N = 1 to 125

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Data Format

- AO Value = Data-L x 1%

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 512

Example

- CC500 Address 1
- LT address 1, AO 4
  - Register Address = (1 - 1) * 4 + (4 - 1) + 512 = 515
    - RH = 515 div 256 = 2
    - RL = 515 mod 256 = 3

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	2	3	0	1	117	178

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0	46	56	88

- DL = 46
  - AO Value = 46 * 1% = 46%

Read AO Upper Limit (F3xB00)

Command Format

- N = 1 to 125

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Data Format

- AO Upper Limit = Data-L x 1%
- Return Value Range: 7 to 100%

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 2816

Example

- CC500 Address 1
- LT address 1, AO 3
  - Register Address = (1 - 1) * 4 + (3 - 1) + 2816 = 2818
    - RH = 2818 div 256 = 11
    - RL = 2818 mod 256 = 2

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	11	2	0	1	39	238

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0	80	184	120

- DL = 80
  - AO Upper Limit = 80 x 1% = 80%

Read AO Lower Limit (F3xC00)

Command Format

- N = 1 to 125

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Data Format

- AO Lower Limit = Data-L x 1%
- Return Value Range: 6 to 99%

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 3072

Example

- CC500 Address 1
- LT address 1, AO 1
  - Register Address = (1 - 1) * 4 + (1 - 1) + 3072 = 3072
    - RH = 3072 div 256 = 12
    - RL = 3072 mod 256 = 0

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	12	0	0	1	135	90

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high (DH)	low (DL)	low	high
1	3	2	0	25	121	142

- DL = 25
  - AO Lower Limit = 25 x 1% = 25%

Read Authorized DO Status (F3xD00)

Command Format

- N = 1 to 125

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = normal, 1 = authorized															
DO	---	---	---	---	---	---	---	---	8	7	6	5	4	3	2	1

LT to Register Address Conversion

- Reg = (LT - 1) + 3328

Example - Read Authorization Mode for LT 2

- CC500 Address 1
- LT address 2
  - Register Address = (2 - 1) + 3328 = 3329
    - RH = 3329 div 256 = 13
    - RL = 3329 mod 256 = 1

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	13	1	0	1	215	102

Reply

CC500 Address	Function Code	Byte Count	Read Data		CRC	
			high	low (DL)	low	high
1	3	2	0	0xA3	248	61

- DL = 0xA3

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Return Data	0x00								0xA3							
Bit State	---	---	---	---	---	---	---	---	1	0	1	0	0	0	1	1
Authorized	---	---	---	---	---	---	---	---	auth	no	auth	no	no	no	auth	auth
DO	---	---	---	---	---	---	---	---	8	7	6	5	4	3	2	1

Read Authorized Group Execution Flag (F3xD80)

Command Format

- N = 1 to 4

Query

CC500 Address	3	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Reply

CC500 Address	3	Nx2	Data1-H	Data1-L	. . .	DataN-H	DataN-L	CRC-L	CRC-H

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = not executed, 1 = executed															
Groups 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Groups 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Groups 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Groups 49 to 63	---	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Group to Register Address Conversion

Groups	Register Address	Note
1 to 16	3456	Each register has the status of 16 groups
17 to 32	3457	
33 to 48	3458	
49 to 63	3459	This last register has the status of 15 groups only

Example

- CC500 Address 1
- Read Groups 1 to 63
  - Starting Register Address = 3456
    - RH = 3456 div 256 = 13
    - RL = 3456 mod 256 = 128

Query

CC500 Address	Function Code	Register Address		Number of Points		CRC	
		high (RH)	low (RL)	high	low	low	high
1	3	13	128	0	4	71	77

Reply

CC500 Address	Function Code	Byte Count	Read Data				
			D1	D2	D3	D4	. . .
1	3	8	0x12	0x34	0x56	0x78	

	Read Data				CRC	
	D5	D6	D7	D8	low	high
. . .	0x9A	0xBC	0xDE	0xF0	122	37

Byte	D1								D2							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x1				0x2				0x3				0x4			
	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0
Status	no	no	no	exe	no	no	exe	no	no	no	exe	exe	no	exe	no	no
Group	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Byte	D3								D4							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x5				0x6				0x7				0x8			
	0	1	0	1	0	1	1	0	0	1	1	1	1	0	0	0
Status	no	exe	no	exe	no	exe	exe	no	no	exe	exe	exe	exe	no	no	no
Group	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Byte	D5								D6							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0x9				0xA				0xB				0xC			
	1	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0
Status	exe	no	no	exe	exe	no	exe	no	exe	no	exe	exe	exe	exe	no	no
Group	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33

Byte	D7								D8							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data	0xD				0xE				0xF				0x0			
	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0
Status	exe	exe	no	exe	exe	exe	exe	no	exe	exe	exe	exe	no	no	no	no
Group	---	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Set Group On/Off (F5x001)

Data Format

Set Group To	Value
On	255
Off	0

Command Format

Query and Reply

CC500 Address	5	Reg-H	Reg-L	Group On/Off	0	CRC-L	CRC-H

Group to Register Address Conversion

- Reg = Group

Example 1 - Set Group to On

- CC500 Address 1
- Set Group 27 To On
  - Register Address = 27
    - RH = 27 div 256 = 0
    - RL = 27 mod 256 = 27
  - Group On
    - DH = 255

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DH)	low	low	high
1	5	0	27	255	0	252	61

Example 2 - Set Group to Off

- CC500 Address 1
- Set Group 63 To Off
  - Register Address = 63
    - RH = 63 div 256 = 0
    - RL = 63 mod 256 = 63
  - Group Off
    - DH = 0

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DH)	low	low	high
1	5	0	63	0	0	253	198

Activate Pattern (F5x040)

Patterns can only be activated, which is the equivalent of being turned on.

Data Format

- Patterns can only be activated, the activation code is 255, there is no off for a pattern.

Command Format

Query and Reply

CC500 Address	5	Reg-H	Reg-L	255	0	CRC-L	CRC-H

Pattern to Register Address Conversion

- `Reg = (Pattern - 1) + 64`

Example

- CC500 Address 1
- Activate Pattern 7
  - Register Address = (7 - 1) + 64 = 70
    - RH = 70 div 256 = 0
    - RL = 70 mod 256 = 70
  - Activate Pattern
    - DH = 255

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DH)	low	low	high
1	5	0	70	255	0	109	239

Set DO On/Off (F5x100)

Data Format

Set DO To	Value
On	255
Off	0

Command Format

Query and Reply

CC500 Address	5	Reg-H	Reg-L	DO On/Off	0	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT + 31) x 8 + (DO - 1) + 256

Example 1 - Set DO to On

- CC500 Address 1
- LT address 1, DO 6 to ON
  - Register Address = (1 + 31) x 8 + (6 - 1) + 256 = 261
    - RH = 261 div 256 = 1
    - RL = 261 mod 256 = 5
  - DO On = 255

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DO)	low	low	high
1	5	1	5	255	0	157	199

Example 2 - Set DO to Off

- CC500 Address 1
- LT address 1, DO 3 to OFF
  - Register Address = (1 + 31) x 8 + (3 - 1) + 256 = 258
    - RH = 258 div 256 = 1
    - RL = 258 mod 256 = 2
  - DO Off = 0

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DO)	low	low	high
1	5	1	2	0	0	109	246

Single DO Pulse Out (F5x300)

Command Format

Query and Reply

CC500 Address	5	Reg-H	Reg-L	255	0	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 8 + (DO - 1) + 768

Example

- CC500 Address 1
- Send out pulse from LT 15, DO 6
  - Register Address = (15 - 1) * 8 + (6 - 1) + 768 = 885
    - RH = 885 div 256 = 3
    - RL = 885 mod 256 = 117
  - Pulse Out
    - DH = 255

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DH)	low	low	high
1	5	3	117	255	0	157	164

Dual DO Pulse Out (F5x500)

Command Format

Query and Reply

CC500 Address	5	Reg-H	Reg-L	255	0	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (DO - 1) div 2 + 1280

Example

- CC500 Address 1
- Send out a pulse from both DO 7 and 8 simultaneously on LT 1
  - Register Address = (1 - 1) * 4 + (7 - 1) div 2 + 1280 = 1283
    - RH = 1283 div 256 = 5
    - RL = 1283 mod 256 = 3
  - Pulse Out
    - DH = 255

Query and Reply

CC500 Address	Function Code	Starting Register		Force Data		CRC	
		high (RH)	low (RL)	high (DH)	low	low	high
1	5	5	3	255	0	124	246

Clear Latched DI (F6x060)

Data Format

- The data written is a mask and each DI can be cleared independently.

DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Bit State	0 = Clear, 1 = Don't Clear															
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	Data-H (high byte)								Data-L (low byte)							

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	Data-H	Data-L	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) + 96

Example - Clear Some Latched DIs For One LT

- CC500 Address 1
- LT address 1
  - Register Address = (1 - 1) + 96 = 96
    - RH = 96 div 256 = 0
    - RL = 96 mod 256 = 96
- Data mask for the Latched DIs to be cleared:

DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
State	---	Clr	---	Clr	---	Clr	---	---	---	---	Clr	Clr	---	---	Clr	---
Data	1	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1
	0xA				0xB				0xC				0xD			
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	high byte (DH)								low byte (DL)							

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	0	96	0xAB	0xCD	55	113

Clear Pattern Activation Status (F6x0A4)

Data Format

- There are 64 patterns, which are grouped into 4 registers of 16 patterns each.
- Each pattern is represented by a bit. Each pattern can be cleared independently.

Patterns 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Patterns 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Patterns 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Patterns 49 to 64	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Bit State	0 = clear, 1 = don't clear															
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	Data-H (high byte)								Data-L (low byte)							

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	Data-H	Data-L	CRC-L	CRC-H

Patterns to Register Address Conversion

Patterns	Register Address
1 to 16	164
17 to 32	165
33 to 48	166
49 to 64	167

Example

- CC500 Address 1
- Patterns 1 to 64
  - Register Address = 164
    - RH = 164 div 256 = 0
    - RL = 164 mod 256 = 164
- Clear Activation Status for all Patterns
  - D1, D2, D3, D4, D5, D6, D7, D8 = 0

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	0	164	0	0	200	41

Set AO Value (F6x200)

Data Format

- AO = 1 to 4
- Allowed AO Values: 0 to 100%
- Data-L = AO Value / 1%

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	0	AO Value	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 512

Example

- CC500 Address 1
- LT address 1, AO 1
  - Register Address = (1 - 1) * 4 + (1 - 1) + 512 = 512
    - RH = 512 div 256 = 2
    - RL = 512 mod 256 = 0
- AO Value = 50%
  - DL = 50% / 1% = 50
- Note that the allowed values for AO is from 0 to 100%.

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	2	0	0	50	9	167

Set AO Upper Limit (F6xB00)

Data Format

- AO = 1 to 4
- Allowed AO Upper Limit Values: 7 to 100%
- Data-L = AO Upper Limit / 1%

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	0	AO Upper Limit	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 2816

Example

- CC500 Address 1
- LT address 1, AO 1
  - Register Address = (1 - 1) * 4 + (1 - 1) + 2816 = 2816
    - RH = 2816 div 256 = 11
    - RL = 2816 mod 256 = 0
- Set AO Upper Limit to 85%
  - DL = 85% / 1% = 85

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	11	0	0	85	75	209

Set AO Lower Limit (F6xC00)

Data Format

- AO = 1 to 4
- Allowed AO Lower Limit Values: 6 to 99%
- Data-L = AO Lower Limit / 1%

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	0	AO Lower Limit	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 3072

Example

- CC500 Address 1
- LT address 1, AO 4
  - Register Address = (1 + 1) * 4 + (4 - 1) + 3072 = 3075
    - RH = 3075 div 256 = 12
    - RL = 3075 mod 256 = 3
- Set AO Upper Limit to 10%
  - DL = 10% / 1% = 10

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	12	3	0	10	250	157

Set Authorized DO (F6xD00)

The DO can only be authorized using this command; it cannot be de-authorized using this command. To de-authorize the DO, issue the Set DO on/off command (F5x100). Issuing the F5x100 command will force the DO to the specified state and automatically de-authorize the DO.

Data Format

Bit Value	State
0	no effect
1	authorized

Bit	7	6	5	4	3	2	1	0
DO	8	7	6	5	4	3	2	1

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	0	Authorized DO 1~8	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) + 3328

Example

- CC500 Address 1
- LT address 1
  - Register Address = (1 - 1) + 3328 = 3328
    - RH = 3328 div 256 = 13
    - RL = 3328 mod 256 = 0
- Set DO 6, 3 and 0 to authorized
  - DL = 0x49

Bit	7	6	5	4	3	2	1	0
DO	8	7	6	5	4	3	2	1
State	0	auth	0	0	auth	0	0	auth

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	13	0	0	0x49	74	144

Clear Authorized Group Execution Flag (F6xD80)

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0=clear, 1=don't clear															
Groups 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Groups 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Groups 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Groups 49 to 63	---	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Command Format

Query / Reply

CC500 Address	6	Reg-H	Reg-L	Groups to Clear	Groups to Clear	CRC-L	CRC-H

Groups to Register Address Conversion

Groups	Register Address
1 to 16	3456
17 to 32	3457
33 to 48	3458
49 to 63	3459

Example

- CC500 Address 1
- Groups 1 to 16 = Register 3456
  - RH = 3456 div 256 = 13
  - RL = 3456 mod 256 = 128
- Clear Groups 1 to 16
  - DL = 0x00

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	13	128	0	0	138	142

Set Authorized Group (F6xD90)

This command authorizes the specified group to operate locally. This command can only authorize the group, it cannot de-authorize it; to de-authorize the group, issue the Set Group on/off (F5x001); doing so will de-authorize the group.

Issuing this command does not guarantee that the command has been executed; read the Authorized Group Execution Flag using F6xD00 or F16xD00 to verify that the execution was performed; if not, reissue this command again.

Command Format

Query / Reply

CC500 Address	6	13	144	0	Group to Authorize	CRC-H	CRC-L

Example

- CC500 Address 1
- Authorize group 18

Query / Reply

CC500 Address	Function Code	Register Address		Write Data		CRC	
		high (RH)	low (RL)	high (DH)	low (DL)	low	high
1	6	13	144	0	18	11	70

Clear Latched DI (F16x060)

Data Format

- N = 1 to 4
- The data written is a mask and each DI can be cleared independently.

DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Bit State	0 = Clear, 1 = Don't Clear															
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	Data-H (high byte)								Data-L (low byte)							

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	Data1-H DI 9~16 Mask	Data1-L DI 1~8 Mask	...	DataN-H DI 9~16 Mask	DataN-L DI 1~8 Mask	CRC-L	CRC-H

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

LT to Register Address Conversion

- Reg =(LT - 1) + 96

Example - Clear Some Latched DIs For One LT

- CC500 Address 1
- LT address 1
  - Register Address = (1 - 1) + 96 = 96
    - RH = 96 div 256 = 0
    - RL = 96 mod 256 = 96
- Data mask for the Latched DIs to be cleared:

DI	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
State	---	Clr	---	Clr	---	Clr	---	---	---	---	Clr	Clr	---	---	Clr	---
Data	1	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1
	0xAB								0xCD							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	high byte (DH)								low byte (DL)							

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	0	96	0	1	2	0xAB	0xCD	17	85

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	0	96	0	1	1	215

Clear Pattern Activation Status (F16x0A4)

Data Format

- There are 64 patterns, which are grouped into 4 registers of 16 patterns each.
- Each pattern is represented by a bit. Each pattern can be cleared independently.

Patterns 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Patterns 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Patterns 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Patterns 49 to 64	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Bit State	0 = clear, 1 = don't clear															
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	Data-H								Data-L (low byte)							

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	Data1-H Mask	Data1-L Mask	. . .	DataN-H Mask	DataN-L Mask	CRC-L	CRC-H

- N = 1 to 4

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Patterns to Register Address Conversion

Patterns	Register Address
1 to 16	164
17 to 32	165
33 to 48	166
49 to 64	167

Example

- CC500 Address 1
- Patterns 1 to 64
  - Register Address = 164
    - RH = 164 div 256 = 0
    - RL = 164 mod 256 = 164
- Clear Activation Status for all Patterns
  - D1, D2, D3, D4, D5, D6, D7, D8 = 0

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		
		high (RH)	low (RL)	high	low		D1	D2	
1	16	0	164	0	4	8	0	0	. . .

	Write Data						CRC	
	D3	D4	D5	D6	D7	D8	low	high
. . .	0	0	0	0	0	0	196	116

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	0	164	0	4	128	41

Set AO Value (F16x200)

Data Format

- N = 1 to 4
- Allowed AO Values: 0 to 100%
- Data-L = AO Value / 1%

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 512

Example

- CC500 Address 1
- LT address 1, AO 1
  - Register Address = (1 - 1) * 4 + (1 - 1) + 512 = 512
    - RH = 512 div 256 = 2
    - RL = 512 mod 256 = 0
- AO Value = 50%
  - DL = 50% / 1% = 50
- Note that the allowed values for AO is from 0 to 100%.

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	2	0	0	1	2	0	50	4	69

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	2	0	0	1	0	113

Set AO Upper Limit (F16xB00)

Data Format

- N = 1 to 4
- Allowed AO Values: 7 to 100%
- Data-L = AO Value / 1%

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 2816

Example

- CC500 Address 1
- LT address 1, AO 1
  - Register Address = (1 - 1) * 4 + (1 - 1) + 2816 = 2816
    - RH = 2816 div 256 = 11
    - RL = 2816 mod 256 = 0
- AO Value = 50%
  - DL = 50% / 1% = 50
- Note that the allowed values for AO is from 7 to 100%.

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	11	0	0	1	2	0	50	157	69

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	11	0	0	1	3	237

Set AO Lower Limit (F16xC00)

Data Format

- N = 1 to 4
- Allowed AO Values: 6 to 99%
- Data-L = AO Value / 1%

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	0	Data1-L	. . .	0	DataN-L	CRC-L	CRC-H

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) * 4 + (AO - 1) + 3072

Example

- CC500 Address 1
- LT address 1, AO 1
  - Register Address = (1 - 1) * 4 + (1 - 1) + 3072 = 3072
    - RH = 3072 div 256 = 12
    - RL = 3072 mod 256 = 0
- AO Value = 50%
  - DL = 50% / 1% = 50
- Note that the allowed values for AO is from 0 to 100%.

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	12	0	0	1	2	0	50	235	133

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	12	0	0	1	2	153

Set Authorized DO (F16xD00)

The DO can only be authorized using this command; it cannot be de-authorized using this command. To de-authorize the DO, issue the Set DO on/off command (F5x100). Issuing the F5x100 command will force the DO to the specified state and automatically de-authorize the DO.

Data Format

- N = 1 to 4

Bit Value	State
0	no effect
1	authorized

Bit	7	6	5	4	3	2	1	0
DO	8	7	6	5	4	3	2	1

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	0	Authorized DO 1~8	. . .	0	Authorized DO 1~8	CRC-L	CRC-H

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

LT to Register Address Conversion

- Reg = (LT - 1) + 3328

Example

- CC500 Address 1
- LT address 1
  - Register Address = (1 - 1) + 3328 = 3328
    - RH = 3328 div 256 = 13
    - RL = 3328 mod 256 = 0
- Set DO 6, 3 and 0 to authorized
  - DL = 0x49

Bit	7	6	5	4	3	2	1	0
DO	8	7	6	5	4	3	2	1
State	0	auth	0	0	auth	0	0	auth

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	13	0	0	1	2	0	0x49	187	102

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	13	0	0	1	3	101

Clear Authorized Group Execution Flag (F16xD80)

Data Format

Byte	Data-H (high byte)								Data-L (low byte)							
Bit #	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit State	0 = clear, 1 = don't clear															
Groups 1 to 16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Groups 17 to 32	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Groups 33 to 48	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Groups 49 to 63	---	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Command Format

Query

CC500 Address	16	Reg-H	Reg-L	0	N	Nx2	Groups to Clear	Groups to Clear	. . .	Groups to Clear	Groups to Clear	CRC-L	CRC-H

Reply

CC500 Address	16	Reg-H	Reg-L	0	N	CRC-L	CRC-H

Groups to Register Address Conversion

Groups	Register Address
1 to 16	3456
17 to 32	3457
33 to 48	3458
49 to 63	3459

Example

- CC500 Address 1
- Groups 1 to 16
  - Register Address = 3456
    - RH = 3456 div 256 = 13
    - RL = 3456 mod 256 = 128
- Clear groups 1 to 16
  - DL = 0x00

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	13	128	0	1	2	0	0x00	101	80

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	13	128	0	1	2	141

Set Authorized Group (F16xD90)

This command authorizes the specified group to operate locally. This command can only authorize the group, it cannot de-authorize it; to de-authorize the group, issue the Set Group on/off (F5x001); doing so will de-authorize the group.

Issuing this command does not guarantee that the command has been executed; read the Authorized Group Execution Flag using F6xD00 or F16xD00 to verify that the execution was performed; if not, reissue this command again.

Command Format

Query

CC500 Address	16	13	144	0	1	2	0	Group to Authorize	CRC-L	CRC-H

Reply

CC500 Address	16	13	144	0	1	CRC-L	CRC-H

Example

- CC500 Address 1
- Authorize group 18

Query

CC500 Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high (RH)	low (RL)	high	low		high (DH)	low (DL)	low	high
1	16	13	144	0	1	2	0	18	231	205

Reply

CC500 Address	Function Code	Register Address		Number of Registers		CRC	
		high (RH)	low (RL)	high	low	low	high
1	16	13	144	0	1	3	72

CRC Computation

The CC500 conforms to the Modbus/RTU protocol and thus uses CRC16 for its error checking. The computed CRC is appended to the end of the message with the LSB first and then the MSB. Below is the pseudo code for computing the CRC as used by the standard Modbus/RTU. The pseudo code is written in the Ruby language and can be directly used as such.

Definition

```
def get_crc (*byte_array)
    sum = 0xFFFF
    byte_array.each do |byte|
      sum ^= byte
      8.times do
        carry = (1 == sum & 1)
        sum = 0x7FFF & (sum >> 1)
        sum ^= 0xA001 if carry
    end
  end
  return [sum & 0xFF, sum >> 8]
end
```

Usage

```
>> crc = get_crc(1,3,0,141,0,5)
=> [21, 226]        <---- [CRC low byte, CRC high byte]
```

Terms and Abbreviations

div

Operator that gives the quotient after an integer division. Example: 773 div 256 = 3

mod

Operator that gives the remainder after an integer division. Example: 773 mod 256 = 5

Reg-H

Short for Register Address High byte.

Reg-L

Short for Register Address Low byte.

CRC

Short for Cyclic Redundancy Code.

CRC-H

Short for CRC High byte.

CRC-L

Short for CRC Low byte.

-H

Suffix to indicate the high byte of a word-sized data.

-L

Suffix to indicate the lower byte of a word-sized data.

DO

Short for Discrete Output (also known as Digital Output).

DI

Short for Discrete Input (also known as Digital Input).

AO

Short for Analog Output.

AI

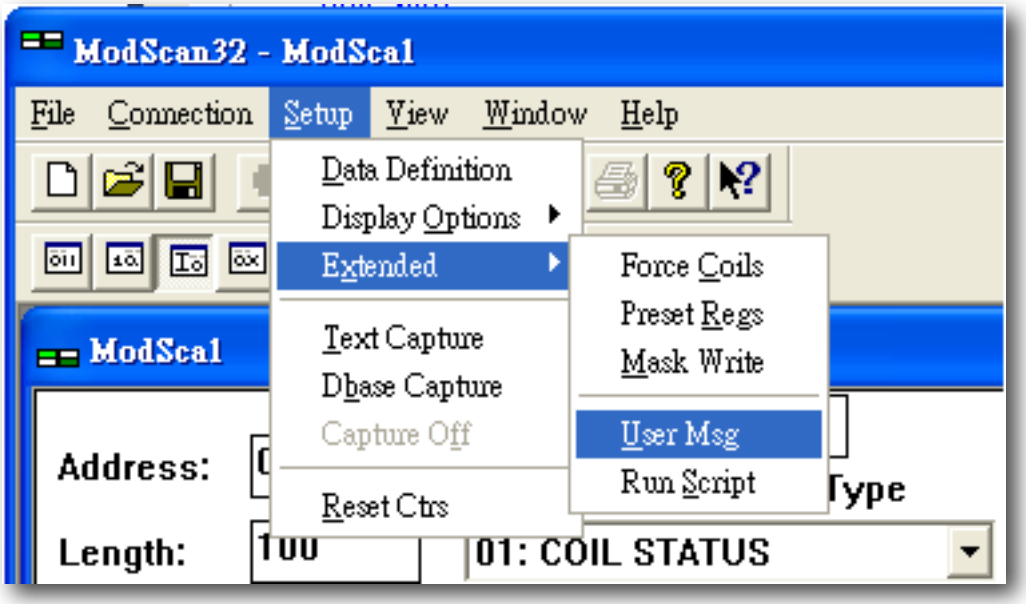
Short for Analog Input.

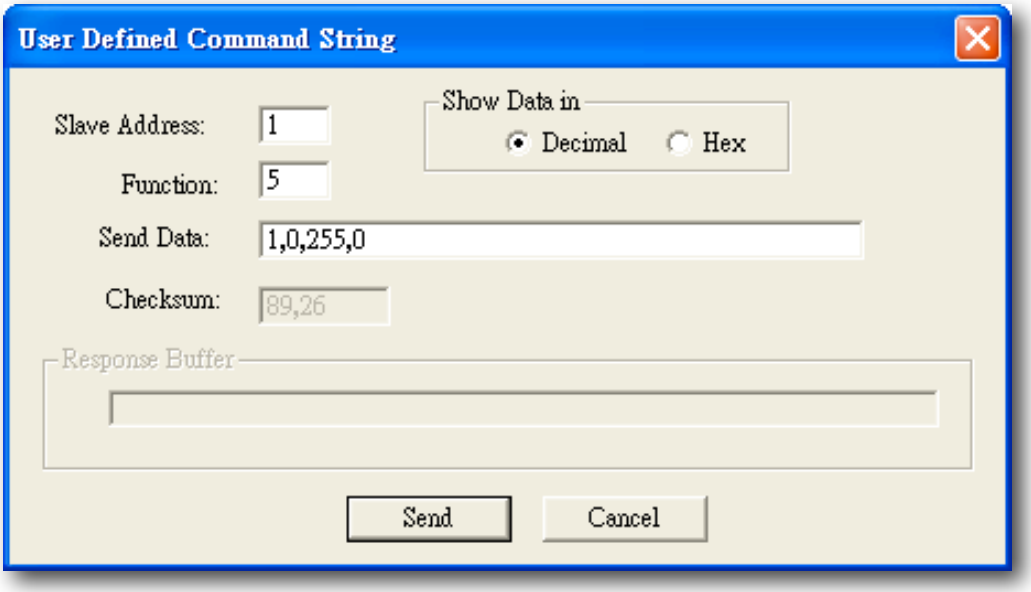
Notes on Using Modscan

This is not a manual of Modscan, but only a short note describing its manual commands capability.

Most users are familiar with Modscan's ability to read and continuously poll a designated device using Modbus commands 1 to 4. But in addition, Modscan also has the ability to issue other commands as well.

For the CC500, function code 5 and 16 needs to be issued as well. To issue them, first make sure that the connection has already been established and running then go to the menu and run the dialog box "User Defined Command String" from [Setup->Extended->User Msg] as shown in the screen captures below:





Additional Resources

Although every effort has been taken to ensure that this document is free from errors, some may still remain. If found please send an email to: info@daeinstrument.com, in the subject line write “Errata” and please indicate the name of this document “CC500 Modbus Reference”, revision number, page number and indicate the error with its correction.

We have made sure that this document is as clear and useful to you as possible, but any suggestions on improving this document to serve you even better would be welcome. Send comments and suggestions to: info@daeinstrument.com, in the subject line, write “Comments” and please indicate the name of this document “CC500 Modbus Reference”. Questions are also welcome.

This document only covers the Modbus protocol registers as used by the CC500 gateway, for hardware interfacing and other information please refer to the other documentation for the CC500.

Precomputed Tables

These precomputed tables are for control commands function code 5 only. The CC500 device address is assumed to be set to 1. The CRC is the last two bytes of the command query and is included in the command query.

Set Group Off/On

Group	Group Off Command Query	Group On Command Query	Group	Group Off Command Query	Group On Command Query
1	1,5,0,1,0,0,156,10	1,5,0,1,255,0,221,250	2	1,5,0,2,0,0,108,10	1,5,0,2,255,0,45,250
3	1,5,0,3,0,0,61,202	1,5,0,3,255,0,124,58	4	1,5,0,4,0,0,140,11	1,5,0,4,255,0,205,251
5	1,5,0,5,0,0,221,203	1,5,0,5,255,0,156,59	6	1,5,0,6,0,0,45,203	1,5,0,6,255,0,108,59
7	1,5,0,7,0,0,124,11	1,5,0,7,255,0,61,251	8	1,5,0,8,0,0,76,8	1,5,0,8,255,0,13,248
9	1,5,0,9,0,0,29,200	1,5,0,9,255,0,92,56	10	1,5,0,10,0,0,237,200	1,5,0,10,255,0,172,56
11	1,5,0,11,0,0,188,8	1,5,0,11,255,0,253,248	12	1,5,0,12,0,0,13,201	1,5,0,12,255,0,76,57
13	1,5,0,13,0,0,92,9	1,5,0,13,255,0,29,249	14	1,5,0,14,0,0,172,9	1,5,0,14,255,0,237,249
15	1,5,0,15,0,0,253,201	1,5,0,15,255,0,188,57	16	1,5,0,16,0,0,204,15	1,5,0,16,255,0,141,255
17	1,5,0,17,0,0,157,207	1,5,0,17,255,0,220,63	18	1,5,0,18,0,0,109,207	1,5,0,18,255,0,44,63
19	1,5,0,19,0,0,60,15	1,5,0,19,255,0,125,255	20	1,5,0,20,0,0,141,206	1,5,0,20,255,0,204,62
21	1,5,0,21,0,0,220,14	1,5,0,21,255,0,157,254	22	1,5,0,22,0,0,44,14	1,5,0,22,255,0,109,254
23	1,5,0,23,0,0,125,206	1,5,0,23,255,0,60,62	24	1,5,0,24,0,0,77,205	1,5,0,24,255,0,12,61
25	1,5,0,25,0,0,28,13	1,5,0,25,255,0,93,253	26	1,5,0,26,0,0,236,13	1,5,0,26,255,0,173,253
27	1,5,0,27,0,0,189,205	1,5,0,27,255,0,252,61	28	1,5,0,28,0,0,12,12	1,5,0,28,255,0,77,252
29	1,5,0,29,0,0,93,204	1,5,0,29,255,0,28,60	30	1,5,0,30,0,0,173,204	1,5,0,30,255,0,236,60
31	1,5,0,31,0,0,252,12	1,5,0,31,255,0,189,252	32	1,5,0,32,0,0,204,0	1,5,0,32,255,0,141,240
33	1,5,0,33,0,0,157,192	1,5,0,33,255,0,220,48	34	1,5,0,34,0,0,109,192	1,5,0,34,255,0,44,48
35	1,5,0,35,0,0,60,0	1,5,0,35,255,0,125,240	36	1,5,0,36,0,0,141,193	1,5,0,36,255,0,204,49
37	1,5,0,37,0,0,220,1	1,5,0,37,255,0,157,241	38	1,5,0,38,0,0,44,1	1,5,0,38,255,0,109,241
39	1,5,0,39,0,0,125,193	1,5,0,39,255,0,60,49	40	1,5,0,40,0,0,77,194	1,5,0,40,255,0,12,50
41	1,5,0,41,0,0,28,2	1,5,0,41,255,0,93,242	42	1,5,0,42,0,0,236,2	1,5,0,42,255,0,173,242
43	1,5,0,43,0,0,189,194	1,5,0,43,255,0,252,50	44	1,5,0,44,0,0,12,3	1,5,0,44,255,0,77,243
45	1,5,0,45,0,0,93,195	1,5,0,45,255,0,28,51	46	1,5,0,46,0,0,173,195	1,5,0,46,255,0,236,51
47	1,5,0,47,0,0,252,3	1,5,0,47,255,0,189,243	48	1,5,0,48,0,0,205,197	1,5,0,48,255,0,140,53
49	1,5,0,49,0,0,156,5	1,5,0,49,255,0,221,245	50	1,5,0,50,0,0,108,5	1,5,0,50,255,0,45,245
51	1,5,0,51,0,0,61,197	1,5,0,51,255,0,124,53	52	1,5,0,52,0,0,140,4	1,5,0,52,255,0,205,244
53	1,5,0,53,0,0,221,196	1,5,0,53,255,0,156,52	54	1,5,0,54,0,0,45,196	1,5,0,54,255,0,108,52
55	1,5,0,55,0,0,124,4	1,5,0,55,255,0,61,244	56	1,5,0,56,0,0,76,7	1,5,0,56,255,0,13,247
57	1,5,0,57,0,0,29,199	1,5,0,57,255,0,92,55	58	1,5,0,58,0,0,237,199	1,5,0,58,255,0,172,55
59	1,5,0,59,0,0,188,7	1,5,0,59,255,0,253,247	60	1,5,0,60,0,0,13,198	1,5,0,60,255,0,76,54
61	1,5,0,61,0,0,92,6	1,5,0,61,255,0,29,246	62	1,5,0,62,0,0,172,6	1,5,0,62,255,0,237,246
63	1,5,0,63,0,0,253,198	1,5,0,63,255,0,188,54	---	---	---

Activate Pattern

Pat	Activate Pattern Command Query	Pat	Activate Pattern Command Query	Pat	Activate Pattern Command Query	Pat	Activate Pattern Command Query
1	1,5,0,64,255,0,141,238	2	1,5,0,65,255,0,220,46	3	1,5,0,66,255,0,44,46	4	1,5,0,67,255,0,125,238
5	1,5,0,68,255,0,204,47	6	1,5,0,69,255,0,157,239	7	1,5,0,70,255,0,109,239	8	1,5,0,71,255,0,60,47
9	1,5,0,72,255,0,12,44	10	1,5,0,73,255,0,93,236	11	1,5,0,74,255,0,173,236	12	1,5,0,75,255,0,252,44
13	1,5,0,76,255,0,77,237	14	1,5,0,77,255,0,28,45	15	1,5,0,78,255,0,236,45	16	1,5,0,79,255,0,189,237
17	1,5,0,80,255,0,140,43	18	1,5,0,81,255,0,221,235	19	1,5,0,82,255,0,45,235	20	1,5,0,83,255,0,124,43
21	1,5,0,84,255,0,205,234	22	1,5,0,85,255,0,156,42	23	1,5,0,86,255,0,108,42	24	1,5,0,87,255,0,61,234
25	1,5,0,88,255,0,13,233	26	1,5,0,89,255,0,92,41	27	1,5,0,90,255,0,172,41	28	1,5,0,91,255,0,253,233
29	1,5,0,92,255,0,76,40	30	1,5,0,93,255,0,29,232	31	1,5,0,94,255,0,237,232	32	1,5,0,95,255,0,188,40
33	1,5,0,96,255,0,140,36	34	1,5,0,97,255,0,221,228	35	1,5,0,98,255,0,45,228	36	1,5,0,99,255,0,124,36
37	1,5,0,100,255,0,205,229	38	1,5,0,101,255,0,156,37	39	1,5,0,102,255,0,108,37	40	1,5,0,103,255,0,61,229
41	1,5,0,104,255,0,13,230	42	1,5,0,105,255,0,92,38	43	1,5,0,106,255,0,172,38	44	1,5,0,107,255,0,253,230
45	1,5,0,108,255,0,76,39	46	1,5,0,109,255,0,29,231	47	1,5,0,110,255,0,237,231	48	1,5,0,111,255,0,188,39
49	1,5,0,112,255,0,141,225	50	1,5,0,113,255,0,220,33	51	1,5,0,114,255,0,44,33	52	1,5,0,115,255,0,125,225
53	1,5,0,116,255,0,204,32	54	1,5,0,117,255,0,157,224	55	1,5,0,118,255,0,109,224	56	1,5,0,119,255,0,60,32
57	1,5,0,120,255,0,12,35	58	1,5,0,121,255,0,93,227	59	1,5,0,122,255,0,173,227	60	1,5,0,123,255,0,252,35
61	1,5,0,124,255,0,77,226	62	1,5,0,125,255,0,28,34	63	1,5,0,126,255,0,236,34	64	1,5,0,127,255,0,189,226

Set DO Off/On

LT	DO	Set DO Off Command Query	Set DO On Command Query
1	1	1,5,1,0,0,0,204,54	1,5,1,0,255,0,141,198
	2	1,5,1,1,0,0,157,246	1,5,1,1,255,0,220,6
	3	1,5,1,2,0,0,109,246	1,5,1,2,255,0,44,6
	4	1,5,1,3,0,0,60,54	1,5,1,3,255,0,125,198
	5	1,5,1,4,0,0,141,247	1,5,1,4,255,0,204,7
	6	1,5,1,5,0,0,220,55	1,5,1,5,255,0,157,199
	7	1,5,1,6,0,0,44,55	1,5,1,6,255,0,109,199
	8	1,5,1,7,0,0,125,247	1,5,1,7,255,0,60,7
3	1	1,5,1,16,0,0,205,243	1,5,1,16,255,0,140,3
	2	1,5,1,17,0,0,156,51	1,5,1,17,255,0,221,195
	3	1,5,1,18,0,0,108,51	1,5,1,18,255,0,45,195
	4	1,5,1,19,0,0,61,243	1,5,1,19,255,0,124,3
	5	1,5,1,20,0,0,140,50	1,5,1,20,255,0,205,194
	6	1,5,1,21,0,0,221,242	1,5,1,21,255,0,156,2
	7	1,5,1,22,0,0,45,242	1,5,1,22,255,0,108,2
	8	1,5,1,23,0,0,124,50	1,5,1,23,255,0,61,194
5	1	1,5,1,32,0,0,205,252	1,5,1,32,255,0,140,12
	2	1,5,1,33,0,0,156,60	1,5,1,33,255,0,221,204
	3	1,5,1,34,0,0,108,60	1,5,1,34,255,0,45,204
	4	1,5,1,35,0,0,61,252	1,5,1,35,255,0,124,12
	5	1,5,1,36,0,0,140,61	1,5,1,36,255,0,205,205
	6	1,5,1,37,0,0,221,253	1,5,1,37,255,0,156,13
	7	1,5,1,38,0,0,45,253	1,5,1,38,255,0,108,13
	8	1,5,1,39,0,0,124,61	1,5,1,39,255,0,61,205
7	1	1,5,1,48,0,0,204,57	1,5,1,48,255,0,141,201
	2	1,5,1,49,0,0,157,249	1,5,1,49,255,0,220,9
	3	1,5,1,50,0,0,109,249	1,5,1,50,255,0,44,9
	4	1,5,1,51,0,0,60,57	1,5,1,51,255,0,125,201
	5	1,5,1,52,0,0,141,248	1,5,1,52,255,0,204,8
	6	1,5,1,53,0,0,220,56	1,5,1,53,255,0,157,200
	7	1,5,1,54,0,0,44,56	1,5,1,54,255,0,109,200
	8	1,5,1,55,0,0,125,248	1,5,1,55,255,0,60,8
9	1	1,5,1,64,0,0,205,226	1,5,1,64,255,0,140,18
	2	1,5,1,65,0,0,156,34	1,5,1,65,255,0,221,210
	3	1,5,1,66,0,0,108,34	1,5,1,66,255,0,45,210
	4	1,5,1,67,0,0,61,226	1,5,1,67,255,0,124,18
	5	1,5,1,68,0,0,140,35	1,5,1,68,255,0,205,211
	6	1,5,1,69,0,0,221,227	1,5,1,69,255,0,156,19
	7	1,5,1,70,0,0,45,227	1,5,1,70,255,0,108,19
	8	1,5,1,71,0,0,124,35	1,5,1,71,255,0,61,211
11	1	1,5,1,80,0,0,204,39	1,5,1,80,255,0,141,215
	2	1,5,1,81,0,0,157,231	1,5,1,81,255,0,220,23
	3	1,5,1,82,0,0,109,231	1,5,1,82,255,0,44,23
	4	1,5,1,83,0,0,60,39	1,5,1,83,255,0,125,215
	5	1,5,1,84,0,0,141,230	1,5,1,84,255,0,204,22
	6	1,5,1,85,0,0,220,38	1,5,1,85,255,0,157,214
	7	1,5,1,86,0,0,44,38	1,5,1,86,255,0,109,214
	8	1,5,1,87,0,0,125,230	1,5,1,87,255,0,60,22
13	1	1,5,1,96,0,0,204,40	1,5,1,96,255,0,141,216
	2	1,5,1,97,0,0,157,232	1,5,1,97,255,0,220,24
	3	1,5,1,98,0,0,109,232	1,5,1,98,255,0,44,24
	4	1,5,1,99,0,0,60,40	1,5,1,99,255,0,125,216
	5	1,5,1,100,0,0,141,233	1,5,1,100,255,0,204,25
	6	1,5,1,101,0,0,220,41	1,5,1,101,255,0,157,217
	7	1,5,1,102,0,0,44,41	1,5,1,102,255,0,109,217
	8	1,5,1,103,0,0,125,233	1,5,1,103,255,0,60,25
	1	1,5,1,112,0,0,205,237	1,5,1,112,255,0,140,29
	2	1,5,1,113,0,0,156,45	1,5,1,113,255,0,221,221
	3	1,5,1,114,0,0,108,45	1,5,1,114,255,0,45,221

LT	DO	Set DO Off Command Query	Set DO On Command Query
2	1	1,5,1,8,0,0,77,244	1,5,1,8,255,0,12,4
	2	1,5,1,9,0,0,28,52	1,5,1,9,255,0,93,196
	3	1,5,1,10,0,0,236,52	1,5,1,10,255,0,173,196
	4	1,5,1,11,0,0,189,244	1,5,1,11,255,0,252,4
	5	1,5,1,12,0,0,12,53	1,5,1,12,255,0,77,197
	6	1,5,1,13,0,0,93,245	1,5,1,13,255,0,28,5
	7	1,5,1,14,0,0,173,245	1,5,1,14,255,0,236,5
	8	1,5,1,15,0,0,252,53	1,5,1,15,255,0,189,197
4	1	1,5,1,24,0,0,76,49	1,5,1,24,255,0,13,193
	2	1,5,1,25,0,0,29,241	1,5,1,25,255,0,92,1
	3	1,5,1,26,0,0,237,241	1,5,1,26,255,0,172,1
	4	1,5,1,27,0,0,188,49	1,5,1,27,255,0,253,193
	5	1,5,1,28,0,0,13,240	1,5,1,28,255,0,76,0
	6	1,5,1,29,0,0,92,48	1,5,1,29,255,0,29,192
	7	1,5,1,30,0,0,172,48	1,5,1,30,255,0,237,192
	8	1,5,1,31,0,0,253,240	1,5,1,31,255,0,188,0
6	1	1,5,1,40,0,0,76,62	1,5,1,40,255,0,13,206
	2	1,5,1,41,0,0,29,254	1,5,1,41,255,0,92,14
	3	1,5,1,42,0,0,237,254	1,5,1,42,255,0,172,14
	4	1,5,1,43,0,0,188,62	1,5,1,43,255,0,253,206
	5	1,5,1,44,0,0,13,255	1,5,1,44,255,0,76,15
	6	1,5,1,45,0,0,92,63	1,5,1,45,255,0,29,207
	7	1,5,1,46,0,0,172,63	1,5,1,46,255,0,237,207
	8	1,5,1,47,0,0,253,255	1,5,1,47,255,0,188,15
8	1	1,5,1,56,0,0,77,251	1,5,1,56,255,0,12,11
	2	1,5,1,57,0,0,28,59	1,5,1,57,255,0,93,203
	3	1,5,1,58,0,0,236,59	1,5,1,58,255,0,173,203
	4	1,5,1,59,0,0,189,251	1,5,1,59,255,0,252,11
	5	1,5,1,60,0,0,12,58	1,5,1,60,255,0,77,202
	6	1,5,1,61,0,0,93,250	1,5,1,61,255,0,28,10
	7	1,5,1,62,0,0,173,250	1,5,1,62,255,0,236,10
	8	1,5,1,63,0,0,252,58	1,5,1,63,255,0,189,202
10	1	1,5,1,72,0,0,76,32	1,5,1,72,255,0,13,208
	2	1,5,1,73,0,0,29,224	1,5,1,73,255,0,92,16
	3	1,5,1,74,0,0,237,224	1,5,1,74,255,0,172,16
	4	1,5,1,75,0,0,188,32	1,5,1,75,255,0,253,208
	5	1,5,1,76,0,0,13,225	1,5,1,76,255,0,76,17
	6	1,5,1,77,0,0,92,33	1,5,1,77,255,0,29,209
	7	1,5,1,78,0,0,172,33	1,5,1,78,255,0,237,209
	8	1,5,1,79,0,0,253,225	1,5,1,79,255,0,188,17
12	1	1,5,1,88,0,0,77,229	1,5,1,88,255,0,12,21
	2	1,5,1,89,0,0,28,37	1,5,1,89,255,0,93,213
	3	1,5,1,90,0,0,236,37	1,5,1,90,255,0,173,213
	4	1,5,1,91,0,0,189,229	1,5,1,91,255,0,252,21
	5	1,5,1,92,0,0,12,36	1,5,1,92,255,0,77,212
	6	1,5,1,93,0,0,93,228	1,5,1,93,255,0,28,20
	7	1,5,1,94,0,0,173,228	1,5,1,94,255,0,236,20
	8	1,5,1,95,0,0,252,36	1,5,1,95,255,0,189,212
14	1	1,5,1,104,0,0,77,234	1,5,1,104,255,0,12,26
	2	1,5,1,105,0,0,28,42	1,5,1,105,255,0,93,218
	3	1,5,1,106,0,0,236,42	1,5,1,106,255,0,173,218
	4	1,5,1,107,0,0,189,234	1,5,1,107,255,0,252,26
	5	1,5,1,108,0,0,12,43	1,5,1,108,255,0,77,219
	6	1,5,1,109,0,0,93,235	1,5,1,109,255,0,28,27
	7	1,5,1,110,0,0,173,235	1,5,1,110,255,0,236,27
	8	1,5,1,111,0,0,252,43	1,5,1,111,255,0,189,219
	1	1,5,1,120,0,0,76,47	1,5,1,120,255,0,13,223
	2	1,5,1,121,0,0,29,239	1,5,1,121,255,0,92,31
	3	1,5,1,122,0,0,237,239	1,5,1,122,255,0,172,31

LT	DO	Set DO Off Command Query	Set DO On Command Query
15	4	1,5,1,115,0,0,61,237	1,5,1,115,255,0,124,29
	5	1,5,1,116,0,0,140,44	1,5,1,116,255,0,205,220
	6	1,5,1,117,0,0,221,236	1,5,1,117,255,0,156,28
	7	1,5,1,118,0,0,45,236	1,5,1,118,255,0,108,28
	8	1,5,1,119,0,0,124,44	1,5,1,119,255,0,61,220

LT	DO	Set DO Off Command Query	Set DO On Command Query
16	4	1,5,1,123,0,0,188,47	1,5,1,123,255,0,253,223
	5	1,5,1,124,0,0,13,238	1,5,1,124,255,0,76,30
	6	1,5,1,125,0,0,92,46	1,5,1,125,255,0,29,222
	7	1,5,1,126,0,0,172,46	1,5,1,126,255,0,237,222
	8	1,5,1,127,0,0,253,238	1,5,1,127,255,0,188,30

Single DO Pulse Out

LT	DO	Single DO Pulse Out Command Query	LT	DO	Single DO Pulse Out Command Query	LT	DO	Single DO Pulse Out Command Query	LT	DO	Single DO Pulse Out Command Query
1	1	1,5,3,0,255,0,140,126	2	1	1,5,3,8,255,0,13,188	3	1	1,5,3,16,255,0,141,187	4	1	1,5,3,24,255,0,12,121
	2	1,5,3,1,255,0,221,190		2	1,5,3,9,255,0,92,124		2	1,5,3,17,255,0,220,123		2	1,5,3,25,255,0,93,185
	3	1,5,3,2,255,0,45,190		3	1,5,3,10,255,0,172,124		3	1,5,3,18,255,0,44,123		3	1,5,3,26,255,0,173,185
	4	1,5,3,3,255,0,124,126		4	1,5,3,11,255,0,253,188		4	1,5,3,19,255,0,125,187		4	1,5,3,27,255,0,252,121
	5	1,5,3,4,255,0,205,191		5	1,5,3,12,255,0,76,125		5	1,5,3,20,255,0,204,122		5	1,5,3,28,255,0,77,184
	6	1,5,3,5,255,0,156,127		6	1,5,3,13,255,0,29,189		6	1,5,3,21,255,0,157,186		6	1,5,3,29,255,0,28,120
	7	1,5,3,6,255,0,108,127		7	1,5,3,14,255,0,237,189		7	1,5,3,22,255,0,109,186		7	1,5,3,30,255,0,236,120
	8	1,5,3,7,255,0,61,191		8	1,5,3,15,255,0,188,125		8	1,5,3,23,255,0,60,122		8	1,5,3,31,255,0,189,184
5	1	1,5,3,32,255,0,141,180	6	1	1,5,3,40,255,0,12,118	7	1	1,5,3,48,255,0,140,113	8	1	1,5,3,56,255,0,13,179
	2	1,5,3,33,255,0,220,116		2	1,5,3,41,255,0,93,182		2	1,5,3,49,255,0,221,177		2	1,5,3,57,255,0,92,115
	3	1,5,3,34,255,0,44,116		3	1,5,3,42,255,0,173,182		3	1,5,3,50,255,0,45,177		3	1,5,3,58,255,0,172,115
	4	1,5,3,35,255,0,125,180		4	1,5,3,43,255,0,252,118		4	1,5,3,51,255,0,124,113		4	1,5,3,59,255,0,253,179
	5	1,5,3,36,255,0,204,117		5	1,5,3,44,255,0,77,183		5	1,5,3,52,255,0,205,176		5	1,5,3,60,255,0,76,114
	6	1,5,3,37,255,0,157,181		6	1,5,3,45,255,0,28,119		6	1,5,3,53,255,0,156,112		6	1,5,3,61,255,0,29,178
	7	1,5,3,38,255,0,109,181		7	1,5,3,46,255,0,236,119		7	1,5,3,54,255,0,108,112		7	1,5,3,62,255,0,237,178
	8	1,5,3,39,255,0,60,117		8	1,5,3,47,255,0,189,183		8	1,5,3,55,255,0,61,176		8	1,5,3,63,255,0,188,114
9	1	1,5,3,64,255,0,141,170	10	1	1,5,3,72,255,0,12,104	11	1	1,5,3,80,255,0,140,111	12	1	1,5,3,88,255,0,13,173
	2	1,5,3,65,255,0,220,106		2	1,5,3,73,255,0,93,168		2	1,5,3,81,255,0,221,175		2	1,5,3,89,255,0,92,109
	3	1,5,3,66,255,0,44,106		3	1,5,3,74,255,0,173,168		3	1,5,3,82,255,0,45,175		3	1,5,3,90,255,0,172,109
	4	1,5,3,67,255,0,125,170		4	1,5,3,75,255,0,252,104		4	1,5,3,83,255,0,124,111		4	1,5,3,91,255,0,253,173
	5	1,5,3,68,255,0,204,107		5	1,5,3,76,255,0,77,169		5	1,5,3,84,255,0,205,174		5	1,5,3,92,255,0,76,108
	6	1,5,3,69,255,0,157,171		6	1,5,3,77,255,0,28,105		6	1,5,3,85,255,0,156,110		6	1,5,3,93,255,0,29,172
	7	1,5,3,70,255,0,109,171		7	1,5,3,78,255,0,236,105		7	1,5,3,86,255,0,108,110		7	1,5,3,94,255,0,237,172
	8	1,5,3,71,255,0,60,107		8	1,5,3,79,255,0,189,169		8	1,5,3,87,255,0,61,174		8	1,5,3,95,255,0,188,108
13	1	1,5,3,96,255,0,140,96	14	1	1,5,3,104,255,0,13,162	15	1	1,5,3,112,255,0,141,165	16	1	1,5,3,120,255,0,12,103
	2	1,5,3,97,255,0,221,160		2	1,5,3,105,255,0,92,98		2	1,5,3,113,255,0,220,101		2	1,5,3,121,255,0,93,167
	3	1,5,3,98,255,0,45,160		3	1,5,3,106,255,0,172,98		3	1,5,3,114,255,0,44,101		3	1,5,3,122,255,0,173,167
	4	1,5,3,99,255,0,124,96		4	1,5,3,107,255,0,253,162		4	1,5,3,115,255,0,125,165		4	1,5,3,123,255,0,252,103
	5	1,5,3,100,255,0,205,161		5	1,5,3,108,255,0,76,99		5	1,5,3,116,255,0,204,100		5	1,5,3,124,255,0,77,166
	6	1,5,3,101,255,0,156,97		6	1,5,3,109,255,0,29,163		6	1,5,3,117,255,0,157,164		6	1,5,3,125,255,0,28,102
	7	1,5,3,102,255,0,108,97		7	1,5,3,110,255,0,237,163		7	1,5,3,118,255,0,109,164		7	1,5,3,126,255,0,236,102
	8	1,5,3,103,255,0,61,161		8	1,5,3,111,255,0,188,99		8	1,5,3,119,255,0,60,100		8	1,5,3,127,255,0,189,166

Dual DO Pulse Out

LT	DO		Dual DO Pulse Out Command Query
1	1	2	1,5,5,0,255,0,140,246
	3	4	1,5,5,1,255,0,221,54
	5	6	1,5,5,2,255,0,45,54
	7	8	1,5,5,3,255,0,124,246
2	1	2	1,5,5,4,255,0,205,55
	3	4	1,5,5,5,255,0,156,247
	5	6	1,5,5,6,255,0,108,247
	7	8	1,5,5,7,255,0,61,55
3	1	2	1,5,5,8,255,0,13,52
	3	4	1,5,5,9,255,0,92,244
	5	6	1,5,5,10,255,0,172,244
	7	8	1,5,5,11,255,0,253,52
4	1	2	1,5,5,12,255,0,76,245
	3	4	1,5,5,13,255,0,29,53
	5	6	1,5,5,14,255,0,237,53
	7	8	1,5,5,15,255,0,188,245
5	1	2	1,5,5,16,255,0,141,51
	3	4	1,5,5,17,255,0,220,243
	5	6	1,5,5,18,255,0,44,243
	7	8	1,5,5,19,255,0,125,51
6	1	2	1,5,5,20,255,0,204,242
	3	4	1,5,5,21,255,0,157,50
	5	6	1,5,5,22,255,0,109,50
	7	8	1,5,5,23,255,0,60,242
7	1	2	1,5,5,24,255,0,12,241
	3	4	1,5,5,25,255,0,93,49
	5	6	1,5,5,26,255,0,173,49
	7	8	1,5,5,27,255,0,252,241
8	1	2	1,5,5,28,255,0,77,48
	3	4	1,5,5,29,255,0,28,240
	5	6	1,5,5,30,255,0,236,240
	7	8	1,5,5,31,255,0,189,48
9	1	2	1,5,5,32,255,0,141,60
	3	4	1,5,5,33,255,0,220,252
	5	6	1,5,5,34,255,0,44,252
	7	8	1,5,5,35,255,0,125,60
10	1	2	1,5,5,36,255,0,204,253
	3	4	1,5,5,37,255,0,157,61
	5	6	1,5,5,38,255,0,109,61
	7	8	1,5,5,39,255,0,60,253
11	1	2	1,5,5,40,255,0,12,254
	3	4	1,5,5,41,255,0,93,62
	5	6	1,5,5,42,255,0,173,62
	7	8	1,5,5,43,255,0,252,254
12	1	2	1,5,5,44,255,0,77,63
	3	4	1,5,5,45,255,0,28,255
	5	6	1,5,5,46,255,0,236,255
	7	8	1,5,5,47,255,0,189,63
13	1	2	1,5,5,48,255,0,140,249
	3	4	1,5,5,49,255,0,221,57
	5	6	1,5,5,50,255,0,45,57
	7	8	1,5,5,51,255,0,124,249
14	1	2	1,5,5,52,255,0,205,56
	3	4	1,5,5,53,255,0,156,248
	5	6	1,5,5,54,255,0,108,248
	7	8	1,5,5,55,255,0,61,56
15	1	2	1,5,5,56,255,0,13,59
	3	4	1,5,5,57,255,0,92,251
	5	6	1,5,5,58,255,0,172,251
	7	8	1,5,5,59,255,0,253,59
16	1	2	1,5,5,60,255,0,76,250
	3	4	1,5,5,61,255,0,29,58
	5	6	1,5,5,62,255,0,237,58
	7	8	1,5,5,63,255,0,188,250