

Thank you for purchasing iS7 CC-Link option module of LS Variable Frequency Drives!

Safety Instruction

- To prevent injury and danger in advance for safe and correct use of the product, be sure to follow the Safety Instructions.
- The instructions are divided as 'WARNING' and 'CAUTION' which mean as follow.



WARNING

This symbol indicates the possibility of death or serious injury.



CAUTION

This symbol indicates the possibility of injury or damage to property.

- The meaning of each symbol in this manual and on your equipment is as follows.



This is the safety alert symbol.



This is the dangerous voltage alert symbol.

- After reading the manual, keep it in the place that the user always can contact easily.
- Before you proceed, be sure to read and become familiar with the safety precautions at the beginning of this manual. If you have any questions, seek expert advice before you proceed. Do not proceed if you are unsure of the safety precautions or any procedure.



WARNING

- **Be cautious about dealing with CMOS elements of option module.**
It can cause malfunction by static electricity.
- **Connection changing like communication wire change must be done with power off.**
It can cause communication faulty or malfunction.
- **Be sure to connect exactly between Inverter and option module.**
It can cause communication faulty or malfunction.
- **Check parameter unit when setting parameter.**
It can cause communication faulty

Introduction

CC-Link Master can operate the inverter and monitor the state of inverter in CC-Link network through SV-iS7 CC-Link communication option module.

SV-iS7 CC-Link provides the version 1.10 of CC-Link.

1. Specification of CC-Link Communication Option Module

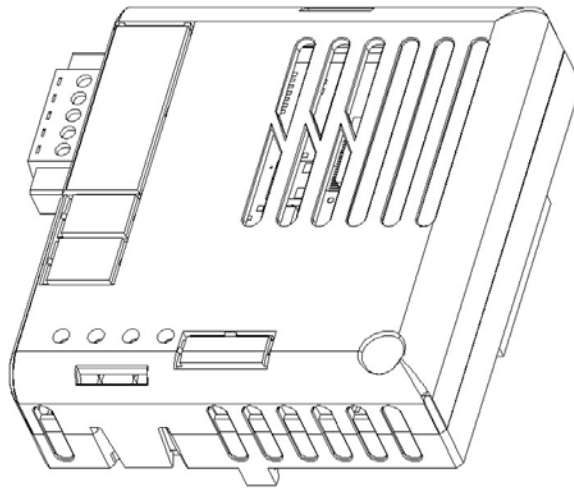
Transmission Speed	156k, 625k, 2.5M, 5M, 10Mbps
Station Type	Remote device station
Number of Occupied Stations	1 station
Version	V1.10
The Number of Station connected	$(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d) \leq 64$ a: Number of modules occupying 1 station b: Number of modules occupying 2 station c: Number of modules occupying 3 station d: Number of modules occupying 4 station $(16 \times A) + (54 \times B) + (88 \times C) \leq 2304$ A: Number of remote I/O stations ----- Max. 64 B: Number of remote device stations ----- Max. 42 C: Number of Local/Intelligent device stations ----- Max. 26
Interface	5 pin pluggable connector
Cable	CC-Link dedicated cable, Compatible dedicated cable with CC-Link Ver 1.10
External Diameter	Less than 8.0 mm

2. Product Components

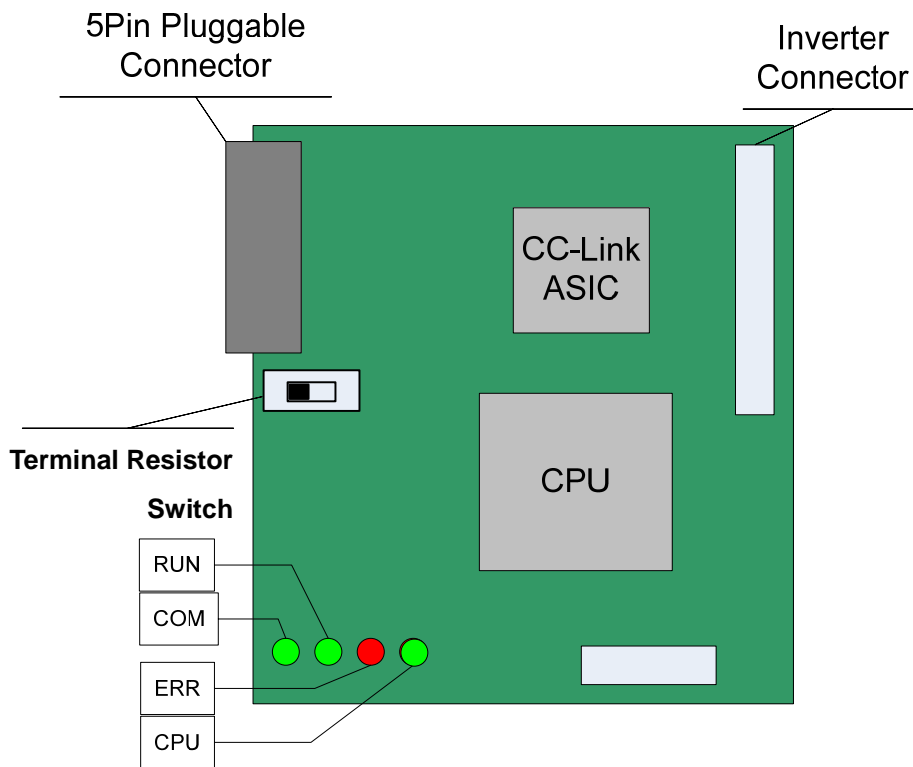
- SV-iS7 CC-Link communication option module 1 ea
- Screw for fixing on the inverter 1 ea
- SV-iS7 CC-Link User Manual 1ea

3. SV-iS7 CC-Link Exterior and Installation

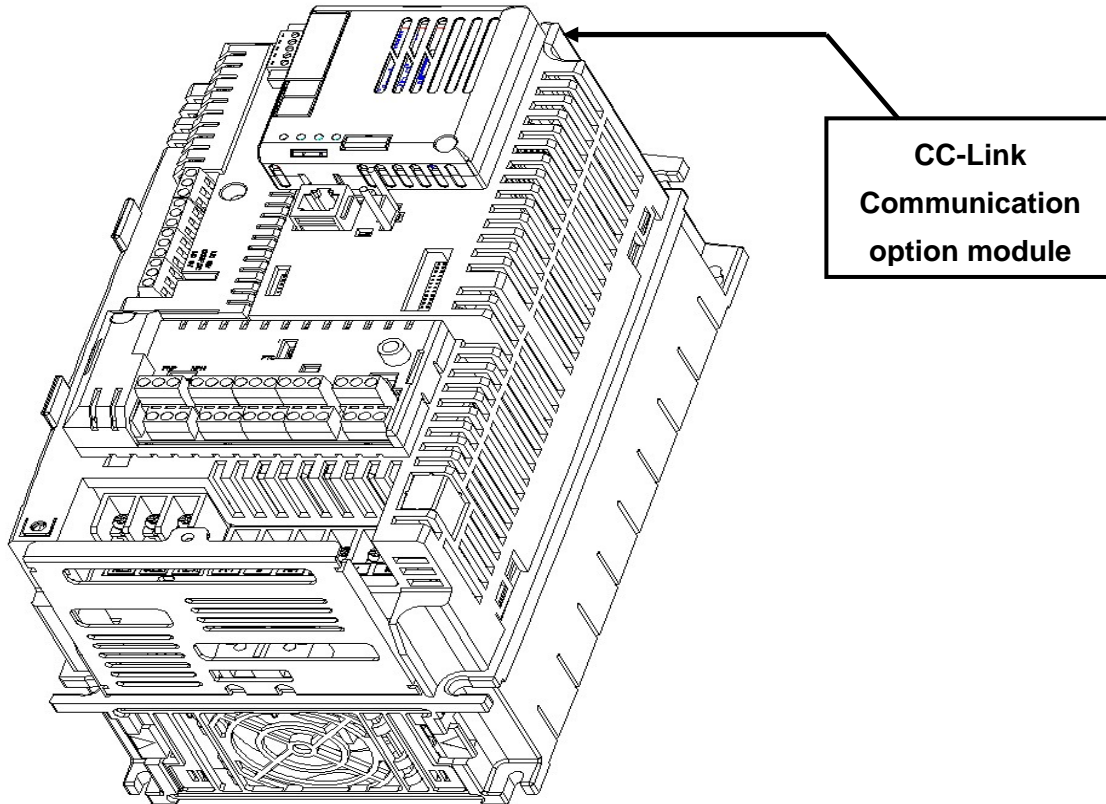
(1) Outside of the communication option module



(2) Inside of the communication option module

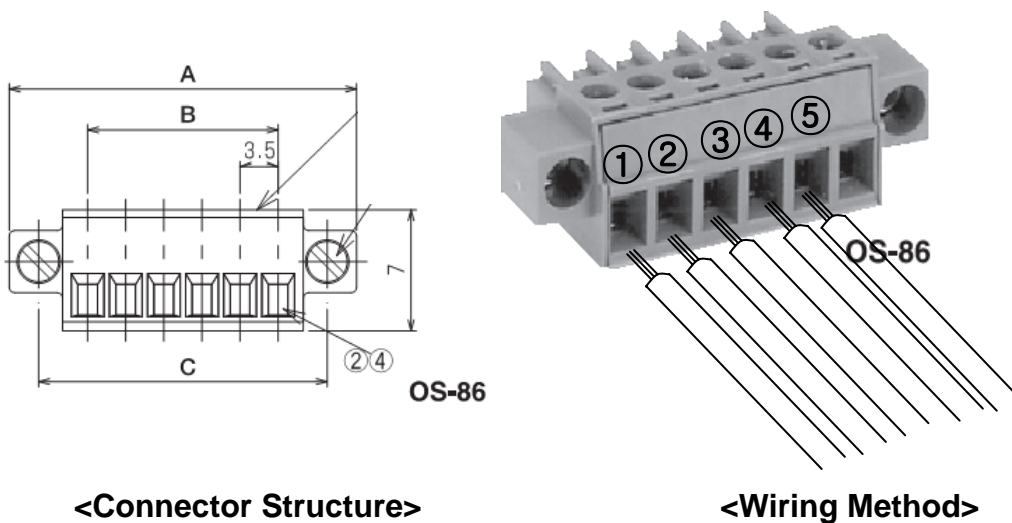


(3) Mounting the communication option module on iS7 inverter



(4) CC-Link signal connector structure and wiring method

- ① DA (Blue) ②DB (White) ③DG (Yellow) ④SLD (Shielded twisted Cable) ⑤ FG



<Connector Structure>

<Wiring Method>

※ Signal connector OSADA OS-86-5P must be used for iS7 CC-Link communication option module. (5-Pin connector)

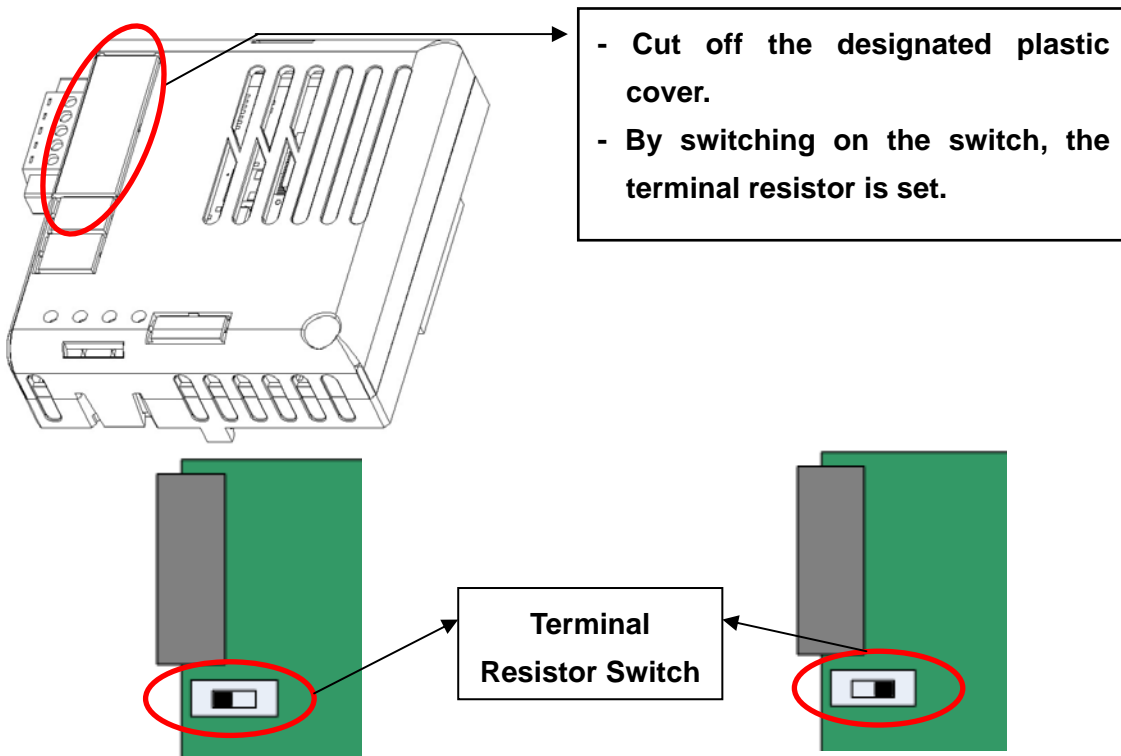
4. Network Connection

Connection terminal of communication cable

No.	Signal	Description	Cable Color
1	DA	Transmitted/Received data	Blue
2	DB	Transmitted/Received data	White
3	DG	Signal ground	Yellow
4	SLD	Shielded cable	Shielded twisted Cable
5	FG	Frame ground	-

<Setting method of terminal resistor>

※ If the iS7 CC-Link communication option module is placed at the end of the network, the last option module must turn On the setting switch of terminal resistor. Terminal resistor is 110 Ω 1/2W.



When the switch of terminal resistor is placed in left side (Off)

→ Terminal resistor is not available.

When the switch of terminal resistor is placed in right side (On)

→ Terminal resistor is available.

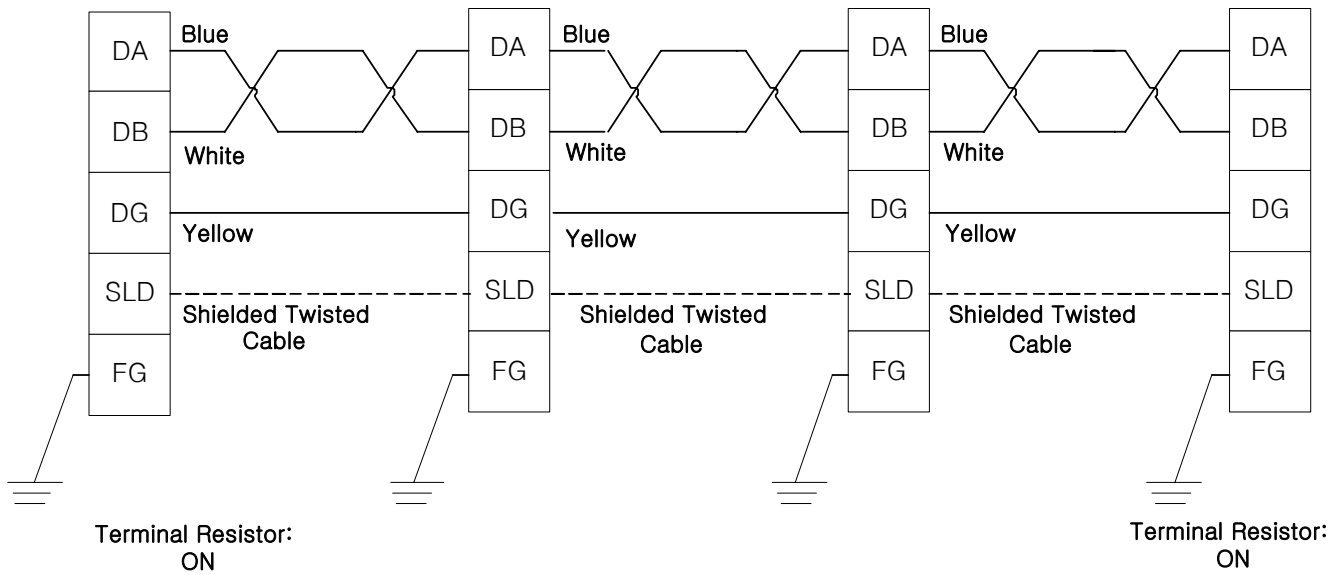
<Hardware Installation>

Warning) Configure the communication network after turn off the power of inverter

Wiring of CC-Link communication cable

Connect the dedicated CC-Link communication cable to terminal block as following procedure.

To reduce the noise, CC-Link communication module at both ends of the network has to be terminated. Turn on the setting switch of terminal resistor on CC-Link communication module.



<Communication Cable Feature>

We recommend the cable as below described cable. If not, we can not guarantee the performance of CC-Link.

Items	Specification	
Type	Shielded twisted cable ^{note1)}	
The number of Cable Core	3	
Conductor Size	20AWG	
Conductor Resistor (20℃)	37.8Ω / km or less	
Insulation Resistor	10000MΩ / km or more	
Withstanding Voltage	DC500 V 1 minute	
Capacitance (1 kHz)	60 nF / km or less	
Characteristic Impedance ^{note2)}	1MHz	110 ± 15Ω
	5MHz	110 ± 6Ω
Cross Section		
External Diameter	7 mm	

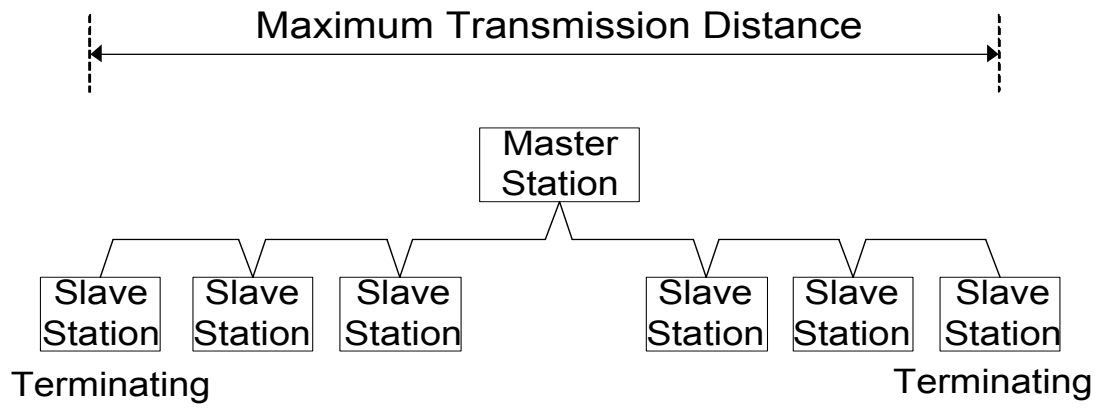
^{note1)} PVF EV-AMESB [LS cable manufactured] recommended

^{note2)} Measuring Method of Characteristic Impedance

- Cable Length: 100m or more

Measuring method is not designated, but Open/Short method has to measure the characteristic impedance in range within each specified frequency by approximate value which is measured value.

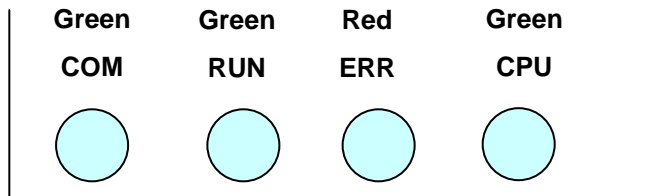
<Maximum Transmission Distance>



Baudrate	156kbps	625kbps	2.5Mbps	5Mbps	10Mbps
Cable Length between Stations	20m or more				
Max. Transmission Distance	1200m	900m	400m	160m	100m

5. LED Display

3 green LEDs and 1 red LED on the CC-Link communication module displays the status of CC-Link communication module. LED is organized as following.



LED Name	Color	Function
COM	Green	On – Communication transmitting/receiving. Off – Communication transmitting/receiving is not established. Check if the communication cable is connected correctly.
RUN	Green	On – Station ID and Baud Rate is normally set and Refresh data is received normally. Off – CC-Link communication is not established. Check if COM-09(Station ID) and COM-10(Baud rate) is set correctly.
ERR	Red	On – CRC Error Off – Normal State
CPU	Green	Flickering at the 1 second interval – It means that CC-Link communication module is energized and the status is normal. Off – It means that CC-Link communication module is de-energized or CC-Link communication module has a fault.
		Flickering at the 200m second interval – It means that the changed value of Station ID and Baudrate is not saved successfully in internal memory of CPU.
		Flickering at the 2 second interval – It means that the interface communication between CC-Link communication module and inverter has an error.

6. Trouble Shooting

LED Display				Cause	Countermeasure
COM	RUN	ERR	CPU		
OFF	OFF	OFF	OFF	Power supply is not energized.	Check if the communication module is installed on the inverter. Check if the inverter is turned On.
-	-	-	Flickering with 200m cycle	Abnormal saving in internal memory	Check if communication cable and power supply cable is separated. After the power of inverter is turned Off, and then energize the power of inverter.
-	-	-	Flickering with 2 s	Abnormal Interface communication between communication module and inverter	Check if communication cable and power supply cable is separated. After the power of inverter is turned Off, and then energize the power of inverter.
OFF	OFF	-	Flickering with 1 s	Communication is not established.	Check if communication cable is connected correctly.
-	OFF	-	Flickering with 1 s	The value of StationID and Baudrate is not correct.	Set the value of Station ID and Baudrate correctly, and then do Comm Update.
-	ON	Flickering	Flickering with 1 s	After Communication module is turned On, the value of Station ID and Baudrate is changed.	Change the value of Station ID and Baudrate to the previous value or Do Comm Update to apply the changed value of Station ID and Baudrate.
ON	ON	Flickering	Flickering with 1 s	CRC Error Occurrence	CRC error is occurred by influenced of noise. Check if communication cable and power supply cable is separated.

7. Quick Communication Start

Install the CC-Link communication module while inverter power supply is turned off. After inverter power supply turns on, check if CNF-30 parameter is 'CC-Link'. Connect to the network with communication cable via CC-Link communication module.

- (1) Set the Station ID of inverter at parameter COM-7 FBus ID.
- (2) Set Baudrate at COM-10 Opt .
- (3) Set to 'Yes' at COM-94 Comm Update.

Check if RUN LED of CC-Link Communication module is turned On. If not, Check if the parameter value of COM-7 and COM-1 of Keypad is correct.

8. Keypad Parameter related with CC-Link Communication

Code	Parameter Name	Initial Value	Range
CNF-30	Option-1 Type	-	-
DRV-06	Cmd Source	Fx/Rx-1	Keypad Fx/Rx-1 Fx/Rx-2 Int. 485 FieldBus PLC
DRV-07	Freq Ref Src	Keypad-1	Keypad-1 Keypad-2 V1 I1 V2 I2 Int. 485 Encoder FieldBus PLC
PRT-12	Lost Cmd Mode	None	None FreeRun Dec Hold Input Hold Output Lost Preset
PRT-13	Lost Cmd Time	1.0sec	0.1~120.0sec
PRT-14	Lost Preset F	0.00Hz	0.00~400.00Hz
COM-06	FBus S/W Ver	-	-
COM-07	FBus ID	1	0~64
COM-09	FBus LED	-	-

Code	Parameter Name	Initial Value	Range
COM-10	Opt Parameter1	0	0 (156k) 1 (625k) 2 (2.5M) 3 (5M) 4 (10M)
COM-31 ~COM-38	Para Status-1 ~ Para Status-8	-	0x0000 ~ 0xFFFF
COM-51 ~COM-58	Para Control-1 ~ Para Control-8	-	0x0000 ~ 0xFFFF
COM-94	Comm Update	No	No Yes

(1) Option-1 Type (CNF-30)

- ✓ It displays the name of communication module installed on the inverter.
- ✓ It displays 'CC-Link' when CC-Link communication module is installed correctly and there is no fault.

(2) Cmd Source (DRV-06)

- ✓ It sets the run command source of inverter
- ✓ The parameter sets to 'Fieldbus' when it commands Run/Stop operation to inverter by CC-Link communication.

(3) Freq Ref Src (DRV-07)

- ✓ It sets the frequency command source of inverter.
The parameter sets to 'Fieldbus' when it commands Command frequency by CC-Link communication.

(4) Lost Cmd Mode (PRT-12)

✓ It designates the Run mode when Lost Command is occurred during the time of PRT-13 Lost Cmd Time.

None: It does anything when Lost Command is occurred.

FreeRun: After the status of inverter is changed to Lost Command, motor will free-run to stop and Trip will be occurred.

Dec: After the status of inverter is changed to Lost Command, motor will decelerate to stop and Lost Command Stop will be occurred.

Hold Input: Running with the last Run command and Lost Command Warning will be occurred.

Hold Output: Running with the current run speed and Lost Command Warning will be occurred.

Lost Preset: Running with the preset value of PRT-14 and Lost Command Warning will be occurred.

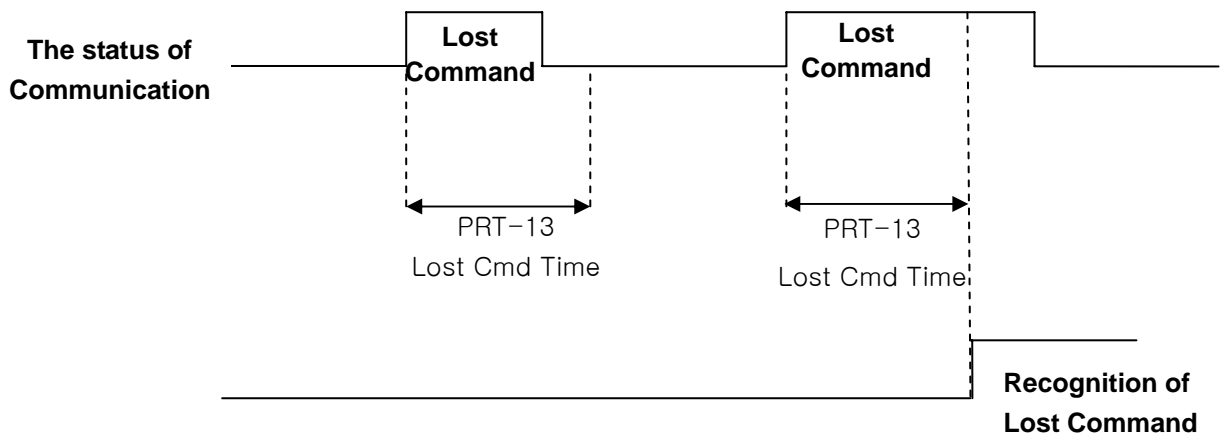
(5) Lost Preset F (PRT-14) – Lost Preset Frequency

✓ When PRT-12 Lost Cmd Mode is set to Lost Preset, inverter will operate with the frequency which is set in Lost Preset F at Lost Preset Frequency occurred.

(6) Lost Cmd Time (PRT-13) – Decision time of Lost Preset Frequency

✓ If Preset Frequency is lost for the preset time of PRT-13 Lost Cmd Time, it is recognized to Lost Preset Frequency.

✓ If the communication is restored within the time of PRT-13 Lost Cmd Time, it is not recognized to Lost Command'



(7) FBus S/W Ver (COM-06)

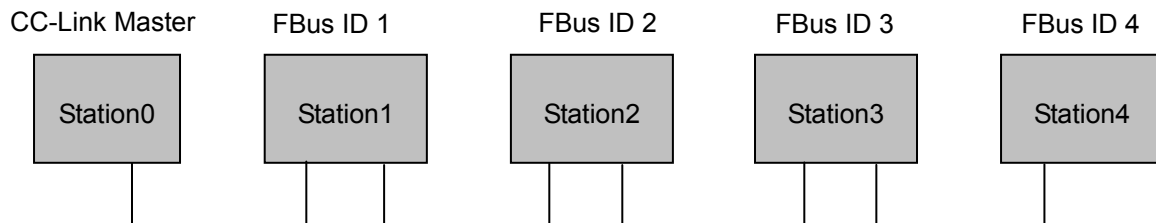
- ✓ It displays the version of communication module installed on the inverter.

(8) FBus ID (COM-07) – Station Number setting

- ✓ It sets the Station ID of CC-Link. It can set Station Number from 0 to 64.
- ✓ Station ID can not be duplicated. Check if Station ID is not duplicated.
- ✓ The value of Station ID will be applied to CC-Link option module after Comm Update sets to 'YES'.

★ ★ ★ Caution

Example of network connection)



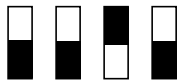
- ✓ Same station numbers can not be used more than once in a network.
- ✓ Set the station number sequentially in order of connection. (Do not create a dead station as station 1, station 2, and station 4.)

(9) FBus LED (COM-09) – LED display for On/Off

- ✓ It displays the status information of CC-Link communication.
- ✓ It displays 4 LEDs at COM-0 FBus LED.
- ✓ LED status is displayed at COM-9 FBus LED parameter by keypad. 3 LEDs among 4 LEDs displayed indicates the status of CC-Link communication option module. It displays the information about CPU status, Inverter Interface disconnection and failure of saving the Station ID and Baud Rate to EEPROM in order of from right to left.

Bit	Description	Status	Causes of Status
0	CPU LED	Flicker	Normal communication
1	ERR LED	On or Flicker	Fault has occurred.
2	RUN LED	On	Communication is established.
3	COM LED	On	Data is transmitting and receiving.

Example of COM-09 LED status)



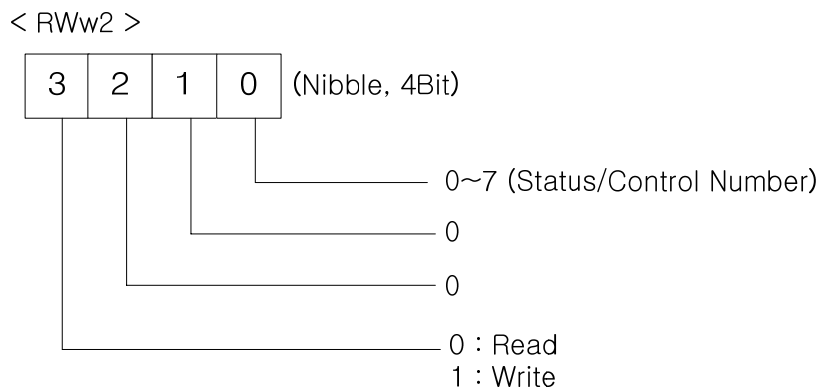
COM LED	RUN LED	ERR LED	CPU LED
OFF	OFF	ON	OFF

(10) Opt Parameter1 (COM-10) – Baud Rate setting

- ✓ It sets the parameter of Baudrate of CC-Link communication. It can be set from 0 (156 Kbps) to 4 (10 Mbps).
- ✓ The value of Baudrate will be applied to CC-Link option module after Comm Update sets to 'YES'.

(11) Para Status-1~8 (COM-31~38)

- ✓ It sets the inverter address to read in Para Status 1~8 when read operation of command code RWw2 of remote register is executed.
- ✓ It describes the method to read the Para Status 1~8 with command code RWw2.
- ✓ Input of the value of RWw2 is described as shown in the figure below. To access to Status, the value of Nibble 3, Nibble 2 and Nibble 1 must be 0.
- ✓ Nibble 0 determines which value of status will be read among Para Status 1~8. If the value of Nibble 0 is 0, it is Para Status-1. If the value of Nibble 0 is 1, it is Para Status-2.
- ✓ For example, If RWw2 sets to 0x0003, the saved value in address which is set in Para Status-4 will be read.



(12) Para Control1~8 (COM-51~58)

- ✓ It sets the inverter address to write in Para Control 1~8 when write operation of command code RWw2 of remote register is executed.
- ✓ It describes the method to write the Para Control 1~8 with command code RWw2.
- ✓ The value of Nibble 3 must be 1 (Write) to write Control.
- ✓ The value of Nibble 2 and 1 must be 0.
- ✓ Nibble 0 determines which value of status will be written among Para Control 1~8. If the value of Nibble 0 is 0, it is Para Control-1. If the value of Nibble 0 is 1, it is Para Control-2.
- ✓ For example, If RWw2 sets to 0x1004, the saved value in address RWw3 which is set in Para Status-5 will be written.

(13) Comm Update (COM-94)

- ✓ The value of COM-07 FBus ID and COM-10 Opt Parameter 1 will be applied to CC-Link option module after Comm Update sets to 'YES'.
- ✓ The changed Station ID and communication speed will be applied to CC-Link option module after Comm Update sets to 'YES'.

9. CC-Link Data List

Inverter occupies the buffer memory 1 station of master.

It means the input/output data information between master and inverter.

9.1 Details of Remote Input and Output Signals

Remote Output Signals (Master unit to Inverter)		Remote Input Signals (Inverter to Master unit)	
Device No.	Signal Function	Device No.	Signal Function
RY0	Forward running command	RX0	Forward running
RY1	Reverse running command	RX1	Reverse running
RY2~8	N/A	RX2	Accelerating
		RX3	Decelerating
		RX4	Reach to preset speed
		RX5	DC Braking
		RX6	N/A
		RX7	Relay1 output terminal
RX8	Relay2 output terminal		
RY9	Output stop	RX9	Q1 output terminal
RYA~B	N/A	RXA	N/A
		RXB	N/A
RYC	Monitor command	RXC	Monitoring
RYD	Frequency setting command 1 (RAM)	RXD	Frequency setting completion 1 (RAM)
RYE	Frequency setting command 2 (EEPROM)	RXE	Frequency setting completion 2
RYF	Instruction code execution request	RXF	Instruction code execution completion (EEPROM)
RY10~19	N/A	RX10~19	N/A
RY1A	Error reset request flag	RX1A	Error status flag
RY1B	N/A	RX1B	Available status to run
RY1C~1F	System reservation	RX1C~1F	System reservation

9.2 Remote output

Remote Output Signals (Master to Inverter)		
Device No.	Signal Function	Description
RY0	Forward running command	ON Forward running start OFF Stop command
RY1	Reverse running command	ON Reverse running start OFF Stop command
RY2~8	N/A	-
RY9	Interrupting of inverter output	When it turns On, motor free-run to stop.
RYA~B	N/A	-
RYC	Monitor command	When monitor command (RYC) is switched On, the corresponding monitor value to RWw1 is saved in RWr1. RXC (Monitoring) switches On.
RYD	Frequency setting command 1 (RAM)	When frequency setting command 1 (RYD) is switched On, command frequency (RWw1) is written to RAM of the inverter. Frequency setting completion 1 (RXD) is turned On after completion of write.
RYE	Frequency setting command 2 (RAM, EEPROM)	When the frequency setting command (RYE) is switched on, the set frequency (RWw1) is written to RAM and EEPROM of the inverter. On completion of write, frequency setting completion (RXD) switches on. The set frequency is remained even if power of inverter is switched On/Off.
RYF	Request for command code execution	It requests the execution of the command code (RWw2). In case command code is Write request, the value of RWw3 is valid.
RY10~19	N/A	-
RY1A	Inverter Reset	If an inverter has a fault, RY1A is switched On. It makes that the inverter is reset to remove the trip after removing the cause of the fault.
RY1B	N/A	-
RY1C~1F	System reservation	-

9.3 Remote Input

Remote Input Signals (Inverter to Master)		
Device No.	Signal Function	Description
RX0	Forward running command	ON Forward running OFF Other than forward running (during stop or reverse running)
RX1	Reverse running command	ON Reverse running OFF Other than reverse running (during stop or forward running)
RX2	Accelerating	Accelerating when it is turned On
RX3	Decelerating	Decelerating when it is turned On
RX4	Reach to preset speed	Reach to preset speed when it is turned On
RX5	N/A	-
RX6	N/A	-
RX7	Relay1 output terminal	Terminal output when it is turned On
RX8	Relay2 output terminal	Terminal output when it is turned On
RX9	Q1 output terminal	Terminal output when it is turned On
RXA	N/A	-
RXB	N/A	-
RXC	Monitoring	Switched On when monitor data is updating. When the monitor command (RYC) is switched On, the monitor value (RWw0) is set to RWr0 and monitoring (RXC) switches On. Switched Off (RXC) when the monitor command (RYC) is switched Off.
RXD	Frequency setting completion 1 (RAM)	Switched On (RXD) when the set frequency is written to the inverter by frequency setting switching On (RYD).
RXE	Frequency setting completion 2	Switched On (RXE) when frequency command is written to the inverter by Frequency setting

Remote Input Signals (Inverter to Master)		
Device No.	Signal Function	Description
	(EEPROM)	command 2 (RYE) switching ON.
RXF	Instruction code execution completion	When the instruction code execution request (RYF) is switched on, processing corresponding to the instruction code set to RWw2 is executed. The instruction code execution completion (RXF) is switched On after completion of execution of instruction code. When an instruction code execution error occurs, a value other than '0' is set in the reply code (RWr2).
RX10~19	N/A	-
RX1A	Trip status	It turns On when the trip of inverter has occurred.
RX1B	Available status to run	It turns On when the inverter can be available. It means that the inverter power is supplied stably and there is no fault.
RX1C~1F	System reservation	-

9.4 Remote Register (Master to Inverter)

Remote Register	Name	Description	Request for Execution
RWw0	Monitor code	Set the monitor code to be referenced. By switching On the monitor command flag (RYC), the corresponding to monitored data is written to RWr0 and Monitoring (RXC) switches On.	RYC
RWw1	Set frequency (0.01 Hz Scale)	Specify the set frequency. At this time, when Frequency setting command 1 (RYD) is switched On, it is stored in RAM of the inverter. When Frequency setting command 2 (RYE) is switched On, it is stored in EEPROM that it can save the set frequency even if power is switched Off and then On. To command the frequency through communication, Ref Freq Src of DRV-07 must be set to 'Fieldbus'.	RYD RYE
RWw2	Command code	Set the command code for execution of read/ write/ error history/ error reset, etc. of parameter. The corresponding process to command code (RWw2) is executed by switching On command code execution request flag (RYF) after completion of command code (RWw2) setting. Command code execution completion flag (RXF) switches On after completion of command execution. When command code is Write, the data of Write set in RWw3.	RYF
RWw3	Write data	Command code execution request flag (RYF) switches On after setting of Write data and command code.	

(Inverter to Master)

Remote register	Name	Description	Request for execution
RWr0	Monitor data	Monitor value specified to the upper Byte of RWw0 of monitor code is set in RWr0 and Monitoring (RXC) switches On.	RYC
RWr1	Output frequency	-	RYD RYE
RWr2	Reply code	When Command code (RWw2) and Write data (RWw3) is normal, 0x00 is set in reply code (RWr2). If not, the value from 0x01 to 0x03 is set in replay code.	RYF
RWr3	Read data	When command code (RWw2) is Read, the corresponding read data is set.	

9.5 Monitor code

Instance ID	Object Name		Unit
	Upper 1Byte	Lower 1Byte	
0x00	Not monitor		0.01 Hz
0x01	Output frequency		0.01 Hz
0x02	Output current		0.01 A
0x03	Output voltage		1V
0x04	N/A		
0x05	Preset frequency		0.01Hz
0x06	Run speed		1 rpm
0x07	Motor output torque		0.1%
0x08	DC Link voltage		0.1 V
0x09~0x0C	N/A		
0x0D	Output power		0.1kW
0x0E	Output electric power		0.01kW
0x0F	Status of input terminal		Note1)
0x10	Status of output terminal		Note2)
0x11~0x15	N/A		
0x16	Run status of inverter		Note3)
0x17	Run time of inverter		Hour

Note1) Bit information of input terminal

RWr3

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	P11	P10	P9	P8	P7	P6	P5	P4	P3	P2	P1

When status of each input terminal is turned On, the value is 1.

When status of each input terminal is turned Off, the value is 0.

Note2) Bit information of output terminal

RWr3

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	-	-	Q4	Q3	Q2	Q1	R2	R1

When status of each output terminal is turned On, the value is 1.

When status of each output terminal is turned Off, the value is 0.

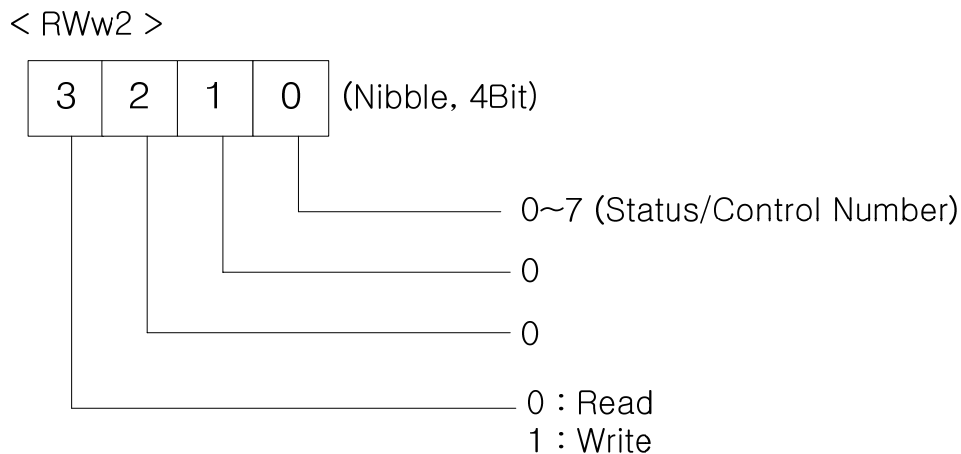
R1 means Relay1 and R2 means Relay2.

Note3) Bit information of inverter run status

B15	0 : Normal status	
B14	4 : Warning occurrence	
B13	8 : Fault occurrence	
B12	(It operates according to the value of PRT-30 Trip Out Mode.)	
B11	-	
B10		
B9		
B8		
B7		
B6	3 : Constant speed	4 : Decelerating
B5	5 : Deceleration to stop	6 : H/W OCS
B4	7 : S/W OCS	8 : Dwell operation
B3	0 : Stop	
B2	1 : Forward running	
B1	2 : Reverse running	
B0	3 : DC operation (Zero speed control)	

9.6 Command code

It sets the command code at remote register. It saves the executed value in remote register RWr after execution of read command code.



Command code is divided in 2 kinds.

First command code, It reads the data from the address set in COM-31~38 Para Status 1~8 by setting 0x0000 ~ 0x0007 in RWw2.

Second command code, It writes the RWw3 data to the address set in COM-51~58 Para Control 1~8 by setting 0x1000~0x1007 in RWw3.

9.7 Response Code

It sets the response for monitor code and command code to RWr2.

Error Code	Description	Cause
0x00	Normal	It means that the code from master is executed correctly.
0x01	Insertion mode error	It means that the inserted value is not valid at Monitor code RWw0 and command code RWw2.
0x02	Abnormal command code	It means that the inserted address value is not valid at COM-31~37 Status 1~8 or COM-51~58 Control 1~8.
0x03	Range error of the data written	It means that the inserted value exceeds the range of data written.